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Essential Skills Manual

Steamfitter/Pipefitter

NOC 7252

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Canada

Prince Edward Island CANADA

ABOUT TRADE ESSENTIALS

Trade Essentials is a research project funded under the Pan-Canadian Innovations Initiative, Human Resources and Skills Development Canada, in partnership with the Apprenticeship Section of the PEI Department of Innovation and Advanced Learning.

The Trades Essentials program was designed to increase participation in trades by providing a well-defined pathway for each client to build on present skills and access services necessary for success in his or her occupation.

This new concept, focusing on essential skills and recognition of prior learning (RPL), provides assessment, interventions and coordination of services for clients. This is the first project to provide a seamless learning path to trades certification.

To create this path, a number of educational tools were created and tested for thirteen trades. These tools are available in both official languages for use in any jurisdiction.

The Tools:

- Trade Specific Essential Skills Inventories (ESI)

  Through a dynamic assessment process using contextualized Essential Skills assessments, clients can identify individual proficiency levels of the following Essential Skills: reading text, document use, numeracy, oral communication, writing and using computers.

  The Essential Skills Inventory and the Technical Skills Inventory assist the client to develop a learning path which includes measurable targets to reach his/her individual goals.

- Trade Specific Essential Skills Curriculum

  Trade specific curriculum frameworks have been created for each of the thirteen trades along with trades specific curriculum guidelines and suggested resource materials.

- Technical Skills Inventories (TSI)

  Through a self assessment process, clients are able to identify their individual trade specific skills.

The Thirteen Trades:

Automotive Service Technician - Cabinet Maker – Carpenter - Construction Electrician – Cook - Industrial Electrician – Machinist - Metal Fabricator - Oil Burner Mechanic - Plumber - Refrigeration and Air Conditioning Mechanic - Steamfitter/Pipefitter - Welder

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We are grateful to the assessors, tutors and classroom instructors who patiently piloted our materials and who gave back invaluable insights and advice.

All Trade Essentials materials have been validated by teams of tradespeople who hold Certificates of Qualification, Red Seal Endorsement. We gratefully acknowledge the crucial contribution made by the following team members:

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Ryan Rogerson (Carpenter)
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Mark Seaman (Construction Electrician)

Ken Zakem (Cook)
Rod Lukeman (Cook)
Barry Strongman (Industrial Electrician)
Gregg Francis (Industrial Electrician)
Jake Shaw (Machinist)
Sue LeFort (Machinist)
John Hebert (Metal Fabricator / Welder)
Joe Johnson (Metal Fabricator)
Jim Arsenault (Metal Fabricator)
Kent Mitchell (Oil Burner Mechanic / Steamfitter-Pipefitter)
Rod Arsenault (Oil Burner Mechanic / Refrigeration and Air Conditioning Mechanic)
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Scott Lacey (Steamfitter-Pipefitter)
Vincent Jenkins (Welder)

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MANUAL CONTENTS

Included in this Essential Skills Manual:

Essential Skills Inventory Assessor's Guide

Essential Skills Inventory

Essential Skills Answer Key

Essential Skills Curriculum Instructor Guide

Curriculum Frameworks and Guidelines

Technical Skills Inventory

Essential Skills Inventory Assessor's Guide

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GLOSSARY

The definitions are intended as a guide for the language used in the Essential Skills Inventories.

ABE	Adult Basic Education
Apprentice	For the purpose of this Guide, apprentice is an inclusive term that refers to anyone working in a trade except those already certified.
Authentic workplace documents	Actual documents obtained from an employer that may be used as teaching tools. An example document is a Material Safety Data Sheet (MSDS).
Block Release Training	A period of in-school training for apprentices. It may also be referred to as Period Training or a Level.
Dynamic (interactive) Assessment	A flexible, holistic, context-sensitive approach used to evaluate learning.
Essential Skills	The set of nine skills defined by Human Resources and Skills Development Canada as being common to all occupations. The skills are: reading text (technical language), document use, numeracy (math), oral communication, writing, computer use, thinking skills, continuous learning and working with others.
Essential Skills Profile	A document that describes how each Essential Skill is used by an occupational group.
GED	General Education Diploma; a Grade 12 equivalency for adults.
Grade 12	A diploma issued by a provincial or territorial government that recognizes completion of High School. It is a challenge to use this as a common credential, since there are several different Grade 12 diplomas.

Intervention	For the purpose of this Guide, intervention refers to a trade-specific Essential Skills program delivered to either a group or an individual.
Journeyperson	A person who holds a Certificate of Qualification in a designated trade. A certified journeyperson is allowed to train and mentor apprentices.
Red Seal	A seal of endorsement applied to a Certification of Qualification for a trade. It allows for mobility among provinces and territories. A certified journeyperson is allowed to train and mentor apprentices.
Trade Essentials	A three-year research project to develop Essential Skills and Prior Learning assessments and curricula specific to 13 trades and to pilot the materials with six of those trades. The 13 trades included in this project were: Automotive Service Technician, Carpenter, Cabinetmaker, Cook, Construction Electrician, Industrial Electrician, Machinist, Metal Fabricator, Oil Burner Mechanic, Plumber, Refrigeration and Air Conditioning Mechanic, Steamfitter/Pipefitter and Welder. Materials were piloted with Carpenters, Steamfitter/Pipefitters, Welders, Automotive Service Technicians, Plumbers and Cooks.

1 SECTION 1

1.1 Introduction

The Essential Skills Inventories include:

- *reading text*
- *document use*
- *numeracy*
- *oral communication*
- *computer use*
- *writing*

The Essential Skills Inventories were developed during a three-year Trade Essentials project whose mandate was to develop Essential Skills assessments and curricula for 13 trades. These materials provide an opportunity for tradespeople to identify and update the Essential Skills required for their respective trades as an important step towards successful trade certification. The Essential Skills Inventory is a tool used to identify both strengths and weaknesses in trade-specific Essential Skills profiles.

2 SECTION 2

Essential Skills Inventories:

Automotive Service Technician	*7321*
Carpenter	*7271*
Cabinetmaker	*7272*
Cook	*6242*
Construction Electrician	*7241*
Industrial Electrician	*7242*
Machinist	*7231*
Metal Fabricator	*7263*
Oil Burner Mechanic	*7331*
Plumber	*7251*
Refrigeration and Air Conditioning Mechanic	*7313*
Steamfitter/Pipefitter	*7252*
Welder	*7265*

2.1 Interactive Assessment

Adult learners have different needs than "traditional" students so strategies must be developed to engage, motivate and build their confidence.

The Essential Skills Inventories use an innovative, interactive (dynamic) approach to assessment that is both client-centred and asset-based. An asset-based approach compares the apprentices' present Essential Skills to the skills needed for their trade, connecting what they already know with what they need to learn.

The Inventory is a process more than a product and requires skilled and experienced assessors to establish an atmosphere where apprentices are comfortable enough to think about and explore their learning in an Essential Skills context. ***Assessors need the "inner technology" to be sensitive to the needs of the apprentice and to know when to stop an Essential Skills Inventory if the apprentice is struggling.*** The interactive assessment explores not only what the apprentice knows and can do, but also, gives an awareness of how the apprentice learns.

This type of assessment can be used in a pre- and post-format but cannot be referred to normative tables for interpretation. It is designed as a starting point for instruction in Essential Skills for the trades.

By using the trade-specific Essential Skills Inventory you can help an apprentice identify those skills to be updated by building upon the skills he/she already has. This process provides immediate, individual feedback to the learner. This is an assessment used *for* learning, not *of* learning.

Motivation is fundamental to change and this process helps an apprentice become motivated, engaged and confident in learning. Confidence can never be disconnected from skills. However, the apprentice does need to have a readiness, willingness and an ability to learn in order to be successful. In addition, many adults fear returning to a structured learning environment after a lengthy absence. It is very difficult to discover the learning needs of adults without the creation of a "safe environment". This is even more evident with those who have the greatest learning needs.

We need assessment and training so the workforce has the required Essential Skills to adapt to changing demands.

***Why** do apprentices need to go through this process?*

At present, there is neither a process nor a place for those who are already working in a trade to update their trade-related Essential Skills other than completing Block training. Awareness of the trade-specific Essential Skills and the knowledge of the scope of a trade is a starting point on the path to certification. Individual assessments (inventories) followed by appropriate interventions (supports) provide the opportunity for eventual certification in the trade. The objective of this process is to help apprentices be successful in passing certification exams whether they be Block or Interprovincial Red Seal exams.

2.2 Adult Education

It is very important to be mindful of both the principles of Adult Education and the characteristics of adult learners.

2.2.1 Principles of Adult Education [1]

- ***Adults must want to learn.***
  Trade Essentials clients have stated the primary reason for participating in an Essential Skills program and

[1] Adapted from www.literacy.ca, *Movement for Canadian Literacy, Principles of Adult Education*

obtaining certification was personal satisfaction, not job mobility or an increase in pay.

- ***Adults will learn only what they believe they need to learn.***
  They have a practical approach to learning as they need to know how this learning affects them now.

- ***Adults learn by doing.***
  Ninety-eight percent of the apprentices in the Trade Essentials Project identified their preferred learning style as kinesthetic.

- ***Adult learning focuses on problems and the problems must be realistic.***
  The Essential Skills Inventories use trade-specific materials and focus on the apprentice's ability to solve problems since that is the nature of their jobs.

- ***Experience affects adult learning.***
  All apprentices bring a varied background of acquired skills and knowledge together with an attitude about learning.

- ***Adults learn best in an informal situation.***
  Many of the apprentices indicated they appreciate the opportunity to learn with their peers at a time convenient to them (evenings, Saturdays) and in a setting where they are comfortable sharing their knowledge with others. For the first time, there is a place dedicated to apprentices where they can access the information and the support they need.

- ***Adults want guidance.***
  While experienced in their individual trades, apprentices may need help to create a learning plan to meet their objective.

2.2.2 Characteristics of Adult Learners [2]

- ***Adult students are mature people and prefer to be treated as such.*** Being "lectured at" can cause resentment and frustration. Apprentices are usually kinesthetic learners and need to be active when

[2] Adapted from www.assetproject.info. *Learner Centred Methodologies*, Wynne, R.

learning. They also learn from each other in a classroom setting.

- ***Adults are goal/relevancy–oriented.*** Adults need to know why they are learning because their needs are concrete and immediate. They will be more interested in theory if it links to practical application.

- ***Adults may have insufficient confidence.*** A number of apprentices *may* have had prior experiences within the education system that have led to feelings of inadequacy, fear of study and failure. Many apprentices have been out of a formal learning situation for 20 years or more. Returning to a classroom environment can be daunting and challenging.

- ***Adults are often tired when they come to class as they are juggling work, family and other responsibilities.*** Most apprentices are working full time and are attending a program in the evenings and on occasional Saturdays. Many drive considerable distances, as well as driving in winter conditions.

- ***Adults learn best when they are ready to learn and when they have identified their own learning needs as opposed to being controlled by someone else.*** They want to choose options based on their own needs. Providing the apprentices with a chance to self-assess and identify their strengths and weaknesses is an important first step.

  Adults learn at different rates and in various ways according to their learning styles, educational levels, experiences and relationships. The first section of the ESI is a Learning Styles Inventory. Most apprentices have never identified their own learning styles and this is often an "aha" moment for them. Being able to use this information for learning and studying techniques is invaluable to them.

- ***Adults have accumulated life/work experiences.*** They tend to favour learning that draws on their prior skills and knowledge. The Essential Skills Inventory is an assessment *for* learning, providing an opportunity for each apprentice to realize what he/she already knows and to move forward from that base. The Essential Skills Inventory identifies skills in need of updating using in-context materials and a guided self-

assessment. The skills may have been learned in a formal setting or on the job.

3 SECTION 3

3.1 The Essential Skills Inventory

Conducted in a manner that engages the apprentice and helps build confidence, the completed Inventory provides a picture of the apprentice's learning needs while recognizing the skills that have already been acquired. The Inventory is as much a process as a product. The time required to complete an Inventory will vary depending on the apprentice but should be completed in one and a half to two hours. Six of the nine Essential Skills are assessed in these Inventories and are in this order: reading text (technical language), document use, numeracy, oral communication, computer use and writing. The Inventory is divided into sections and the section questions are ordered from simple to complex.

3.1.1 Process

Sit *beside,* not across from, the apprentice as a table or desk impedes good communication and can be interpreted as one person being in a position of authority over another. If a round table is available, use it. Apprentices are not often asked to self assess, but will do so willingly if they are comfortable with the assessor and understand the process.

3.1.2 Essential Skills Profiles

The concept of Essential Skills and Essential Skills Profiles will likely be new to the apprentice. At the beginning of the interview therefore, introduce the trade-specific Essential Skills Profile. Give the apprentice a hard copy of the profile to take away with him/her. Encourage a thorough review of the profile as well as the Essential Skills website (www.hrsdc.gc.ca/essentialskills) for additional information.

Knowledge is knowing … or knowing where to find out.

- Alvin Toffler

When introducing the profile, include these points:

- The profiles are Canadian. They were developed by interviewing fellow tradespersons, supervisors, managers and researchers in workplaces across the country.

- Over 350 occupational profiles are available on the website with development ongoing for additional profiles.

- Nine skills are identified as core skills common to all occupations. (The Trade Essentials Project developed learning materials for six of the nine Essential Skills).

- The Essential Skills are used in different ways and at different degrees of complexity, depending on the occupation.

- The complexity levels have nothing to do with Grade levels; they refer to the degree of difficulty of tasks completed at work. A scale of 1-5 is used for complexity levels and, even though there is a range in complexity levels, one must be able to complete tasks at the most complex level.

It is important to keep this discussion brief and framed in a positive manner. Adults do not want to spend time re-learning what they already know so it is helpful to give examples of the advantages of using the profile. Suggestions are: a) a plumbing apprentice may not ever need to know how to solve quadratic equations but will need to be very good at measurement and calculations for such uses as determining grade, elevation and slope, b) an apprentice may not have to read an entire operating manual but will need to find and use specific pieces of information from the manual, c) an apprentice will have to be very accurate when completing an incident or an accident report but will not be required to write an essay. The writing, in this instance, does not have to be long or complicated but it does need to be accurate and precise. It is important to make the connections between what they have learned in a more "academic" setting and how to apply those skills in a work setting.

Gather the supplies you need prior to beginning the Essential Skills Inventory:

- *scientific calculator*
- *pencils and an eraser*
- *intake form*
- *skills summary form*
- *ESI printed on coloured paper*
- *Answer Key*

3.1.3 Preparation

Print the apprentice's copy of the ES Inventory on light-coloured paper, preferably beige, as it reflects less light than white paper so is easier to read; the black print actually is clearer on a pastel background. The font used is Verdana, a sans serif font, 11 point, which is slightly easier to read than a serif font; 11 point is also easier to read than a smaller font.

The rationale for this formatting is that there is a need to provide equal opportunity for all apprentices without compromising standards. No two learners (apprentices) are the same. There is a possibility that an apprentice could have a learning disability and unless the apprentice has disclosed that information or provided documentation, you do not know who is at risk. Using standard formatting does not give an advantage to anyone.

Before you begin the actual Inventory, it is very important to explain to the apprentice that you will complete the Skills Summary Form as the assessment proceeds and you will give him/her a copy at the end of the interview. This avoids any discomfort that would be caused if the apprentice does not know why you are recording information during the Inventory. It is important to provide immediate feedback from the Inventory so the apprentice has a picture of the Essential Skills he/she needs to update. This also helps to mitigate anxiety prior to beginning an intervention.

Before you begin an Inventory, be sure to have these items:

- Two copies of the trade-specific **Essential Skills Profile** (one for the apprentice and one for you).
- Appropriate forms. You will need copies of the **Intake Form** and the **Skills Summary Form** (find samples in Appendix A).
- A copy of the **Essential Skills Inventory printed on pastel-coloured paper**, preferably beige or buff. You may want to work from a single copy with the apprentice or have a separate copy for yourself. Do whatever is comfortable for you and the apprentice.
- A copy of the **Answer Key**.
- A **pencil and an eraser**.
- A **basic scientific calculator**.

Although an apprentice may use a programmable or trade-specific calculator on the worksite, these types of calculators *cannot* be used when writing a Block or an Interprovincial exam. However, the prudent use of a basic scientific calculator should be encouraged while completing the Essential Skills Inventory. (One suggestion is the Casio FX-260 Solar.) A calculator is also a time saver on the job which results in increased efficiency and cost savings. Therefore the apprentice needs to be very familiar with its use. For anyone with a learning disability, the calculator can be a particularly helpful tool. The use of a calculator does

not, however, preclude the apprentice's ability to understand mathematical concepts and to estimate reasonable answers.

3.1.4 Sections of the Inventory

3.1.4.1 Learning Styles

Briefly explain the concept of learning styles (refer to Appendix B for more information). Then ask the apprentice to read each of the statements in the Inventory relatively quickly. Tell him/her to check any statements that are true personally, all or most of the time. It is best for the apprentice to go with a first reaction to the statement rather than to spend too much time thinking about it. If a statement does not apply, it is to be left blank. If there are *three or more* checks in one category, that indicates a preferred learning style. A pattern will emerge from the answers; most apprentices will have more than one learning style.

Follow the same instructions for the section on learning in a group or learning alone. This is important information for the apprentice and for the instructor.

3.1.4.2 Technical Language (Reading text)

This section begins with lists of words that are contextualized to the trade and have been taken from either the Essential Skills Profile (ESP) or the National Occupational Analysis (NOA) glossary. The lists are arranged in order from simple to complex, each list containing ten words.

The Essential Skills Inventory provides a wealth of information about the apprentices and their learning.

Ask the apprentice to choose a list he/she would be comfortable reading aloud. As long as the apprentice has *seven out of ten* words correct in any list, ask him/her to continue reading aloud as far as possible with the lists. Some apprentices will begin reading at a lower level and continue to the end of list four; others will read list four on the first try. It is important for the apprentice to begin reading at a point of comfort and to proceed from there. *If an apprentice struggles with the first list, stop there.* Use the list to indicate a beginning point for the technical reading excerpts. For example, if an apprentice reads six out of ten words (less than seven) in list three, refer to section two in the reading. ***A crucial aspect of the technical reading is to know when to stop if the apprentice is struggling***

with a skill. This is one of the most important skills for you to have as an assessor, that is, to be sensitive and responsive to the needs of each apprentice.

Before using the reading excerpts, ask each apprentice to read the list of pseudowords (nonsense words). Explain the reason for using this list; that decoding words is an important reading skill for comprehension, speed and fluency. If the apprentice struggles with this list and cannot read most of the words, this is a warning that the apprentice may have reading difficulties.

The reading excerpts consist of trade-related materials. A readability index has been completed on each passage as a guide for the difficulty of the reading. Give the apprentice the appropriate reading. Ask him/her to read the questions first, then find the answers to the questions from the excerpt. Explain that the answers to certain questions are not direct matches of information but require "reading between the lines" to find the answer. The questions have been intentionally placed at the beginning of the reading to help the apprentice become a "directed" reader.

Record the section(s) with which the apprentice experiences difficulty (if any). While the reading is not timed, you will want to record if an apprentice takes an exceptionally long time to answer the questions. All apprentices need to be able to read and understand at a post–secondary level (level 3) if they are to be able to confidently use materials at work and to keep pace with workplace changes.

If the apprentice does not need to update reading skills, complete the Skills Summary Form with "No updating required". If the apprentice has difficulty answering any questions in a particular section, record the Section Number on the Skills Summary Form.

3.1.4.3 Document Use

The document use sections contain information that is presented in a format other than text. There may be charts, graphs, tables, schematics and/or blueprints that are trade-related. There is always a question taken from the National Occupational Analysis (NOA), in the form of a pie chart that explains the construction of the Interprovincial (Red Seal) exam and the percentage of questions on each topic (block) for the particular trade. This question not only indicates if

the apprentice can find and use information from a pie chart but also gives you, the assessor, the opportunity to give a brief explanation of the exam format and the scope of the specific trade.

Record the Section and **the type of document** with which an apprentice experiences difficulty. If there is no apparent difficulty, record "No updating required".

3.1.4.4 Numeracy

The numeracy sections are arranged from simple to complex and are based on the Math Skills Summary identified in the Essential Skills Profile for each trade. Not all skills are included for the sake of brevity of the Inventory but enough are included to give an instructor a picture of the skills of the apprentices. There is a *Math Legend* included in each Inventory that identifies the math concept illustrated by each question. Refer to this as you proceed through the Inventory and record the skills needing updates on the Skills Summary Sheet.

Section 1 (S-1) begins with using whole numbers. It is important to have a place for the apprentice to begin where he/she is comfortable and confident and then proceed to more difficult concepts. The apprentice will likely choose to skip the work with whole numbers. An apprentice does not have to write the answers to all the questions as this is often far too time-consuming. You can decide to ask the apprentice *how* to find the answer. *The process is as important as the product. S*top Inventory if the apprentice is struggling. The numeracy sections take the most amount of time when completing an Inventory.

Record the section number and the concepts the apprentice needs to update. This information will be required by both the apprentice and the instructor or tutor; it will also be used for a post-inventory after instruction or self-study has occurred. If your apprentice can answer all the questions, record "No updating required".

3.1.4.5 Oral Communication

There are two parts to the Oral Communication section of the Essential Skills Inventory. The Speaking Skills Rating Scale is to be completed by you, the assessor; the other is a self-assessment completed by the apprentice. After having

spent one and a half to two hours with the apprentice, you will be able to complete most sections of the scale. If not, document a particular skill as "not assessed" or "not applicable". The remaining questions are taken directly from the Essential Skills Profile for the trade. The questions (tasks) are arranged in order from simple to complex. The self-assessment scale mirrors the stages of learning or skill building, that is, "needs help", "can do alone" and "can help an apprentice". This is an opportune time to mention the fact that it is a responsibility of being a journeyperson to mentor other apprentices.

If the journeyperson indicates he/she cannot help an apprentice, record that updating is required.

3.1.4.6 Computer Use

The questions in the Computer Use section may reflect the information in the trade-specific Essential Skills Profile or may go beyond that profile. In a knowledge-based economy, it is realistic to expect a certain level of computer literacy regardless of the trade in which one is employed. The Computer Use questions reflect the basic skills required. Changes in technology will continue to occur rapidly so it is critical to have at least a basic knowledge of computer use.

Record the skills to be updated. If there are no needs identified, record "No updating required".

3.1.4.7 Writing

The first questions in the writing section are examples taken directly from the Essential Skills profile and range in difficulty from simple to complex. The scale used reflects the stages of learning: "needs help", "can do alone", and "can help an apprentice". One additional question pertains to the preparation of a resumé, a skill required by all tradespersons.

The last question is a writing sample and is common to all the Inventories. The writing sample provides an opportunity for you to observe if the apprentice is able to:

- use cursive writing (as compared to printing)
- write legibly
- complete the activity with ease or struggle to write a sentence or two

- put thoughts on paper in a logical order
- use punctuation correctly
- spell correctly
- use correct grammar

Record on the Skills Summary Form areas in need of updating, or use "No updating required".

4 SECTION 4

4.1 Essential Skills Inventory Records

Education is what remains after one has forgotten what has been learned at school.

- Albert Einstein

You will have completed the Skills Summary form by the end of the Inventory. Using this process as a means of learning the apprentice's strengths and weaknesses provides an opportunity to give each apprentice immediate, individual and confidential feedback about his/her Essential Skills needs. Inform the apprentice that a copy will go to an instructor or a tutor if an Essential Skills intervention is planned. Both the apprentice and the instructor are then cognizant of the Essential Skills needs of each apprentice.

The information from the Skills Summary can be summarized in graph form (bar graph recommended) individually, or as a group dependent on specific needs. It is also helpful for an instructor to have an accompanying narrative.

5 SECTION 5

5.1 Essential Skills Post-Inventory

5.1.1 Post-Inventory Directions

The post-inventory will be different for each apprentice dependent upon his/her learning needs as identified in the original ES Inventory. Only the skills that were to be updated are used to create the post-inventory. There is a scale used to indicate an apprentice's improvement or mastery of the skills. This post-inventory can be used at a time determined either by the instructor or after a specific number of intervention hours.

The administrative directions for the post-inventory are that it is to be given under standard test conditions, that is, each

apprentice is to complete the inventory independently and without assistance. The time required for each post-inventory will vary, but each apprentice must be allowed the time required for completion.

5.1.2 Post-Inventory Reporting Form

See Appendix A for a sample Post-Inventory form.

APPENDIX A

FORMS

ESSENTIAL SKILLS INVENTORY
INTAKE FORM

DATE: _____			TIME IN: _____
TRADE: _____			TIME OUT: _____
1.	NAME: Last _____	First _____	Middle _____
2.	Mailing Address: _____ _____ _____		Email Address: _____
3.	PHONE: Home _____	Work _____	Cell _____

4.	Who is your present employer?			
5.	Have you registered as an apprentice?	☐ YES	☐ NO	If yes, when? _____
6.	Do you have experience in other trades:	☐ YES	☐ NO	
7.	What school did you attend? (be sure to document if they have Grade 12)	_____	When? _____	
8.	How long have you been out of school?	_____		
9.	What other training have you taken?	_____		

If you have written the Red Seal exam before, continue with questions 10 and 11. If you have not written the exam before, please skip to question 12.

10.	When did you write the Red Seal exam?	_____
11.	What difficulties did you have with the exam?	_____
12.	Why do you want to write the Red Seal exam?	_____

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13.	Which Essential Skills updating programs do you believe will be most helpful for you?
14.	What would be the best time for you to attend a program?
	Days of the week? _____
	Time of Day? _____
	Months? _____
15.	How did you hear about this program? _____

NOTES:

ESSENTIAL SKILLS SUMMARY

NAME: _____ TRADE: _____

DATE: _____

Having completed the Essential Skills Inventory for your trade, this summary outlines which Essential Skills you need to update as you continue on your chosen career path.

	Auditory (hearing)	Visual (seeing)	Kinesthetic (doing)	Group	Alone
Learning Style					

1. Technical Reading _____

2. Document Use _____

3. Numeracy _____

3.1 Scientific Calculator YES _____ NO _____

4. Oral Communication _____

5. Computer Use _____

6. Writing _____

_____

Interviewer

Essential Skills Post Inventories

The results of the Essential Skills Inventories, completed by each of your apprentices prior to the beginning of your program, indicated the Essential Skills in need of updating for each apprentice.

To track each apprentice's progress, it is now time to complete a post-inventory of those same skills.

Please administer the Post-Inventory as a "test", that is, each apprentice is to complete the Inventory *without any help*. **Ask each apprentice to complete only the questions that are marked.** The time required will vary for each apprentice as each post- inventory is different; therefore please give each apprentice the time needed to complete the inventory. Upon completion, return the Inventories to Trade Essentials (with your program coordinator). The results will be returned to you to share with your apprentices. This will be one indication of each apprentice's readiness to challenge an exam whether it be the IP Red Seal exam or block exam.

If you have any questions, please contact the Trade Essentials office at 620-3623.

Thanks in advance for your cooperation.

POST INVENTORY

NAME: TRADE:

DATE: INSTRUCTOR:

Upon completion of the Essential Skills Inventory prior to the beginning of the program, your Essential Skills Summary indicated that you would benefit from instruction in the Essential Skills shown in the chart below as you prepare for licensing in your trade.

The results of the Post Inventory indicate which of your Essential Skills have improved, which need further development and those that appear to meet trade requirements. Please note that "meets trade Essential Skill requirement" means that you had the correct response to *each* question.

	Shows Improvement	**Needs further development**	**Meets trade Essential Skill requirement**
Technical Reading			
➢ Section 1			
➢ Section 2			
➢ Section 3			
➢ Section 4			
Document Use			
➢ Section 1			
➢ Section 2			
➢ Section 3			
➢ Section 4			
Numeracy			
➢ Section 1			
➢ Section 2			
➢ Section 3			
➢ Section 4			

APPENDIX B

EXTRA INFORMATION

The following information is provided as supplemental information for you the interviewer. Because the Essential Skills initial interview is a dynamic assessment involving your input and possible responses to the apprentice, you may need/want additional reference material on both Learning Styles and the Essential Skills required for the various trades.

Learning style refers to the way an individual processes information, that is, the way a person learns best. Most people tend to use one sense more than the other. However, a number of people may learn equally well regardless of how information is presented to them. Knowing your learning style is an important key to improving success in a classroom and on exams.

It is important to know *how* one learns, not just *what* one needs to learn. Completion of the Learning Styles section at the beginning of the Essential Skills Inventory will help the apprentice discover his/her learning style. This can often be an "Aha" moment for the apprentice as s/he may not have had access to this information. The learner can then reflect on, gather, or be provided with information about the study and learning techniques suited to his/her individual learning style. This knowledge should contribute to an improvement in the quality and speed of learning.

There are basically three learning styles preferences: auditory (hearing), visual (seeing), and kinesthetic (doing, experiencing).

Visual learners are those who learn best by seeing things. A visual learner may display these characteristics:

- good at spelling but may forget names
- needs quiet time to study
- needs time to think before understanding a lecture
- understands/likes charts
- good with sign language

Auditory learners are those who learn best by hearing things. An auditory learner may display these characteristics:

- not afraid to speak in a group/class
- likes to read aloud to him/herself
- likes oral reports
- good at explaining
- remembers names
- enjoys music
- good at grammar and foreign languages
- may read slowly
- follows spoken directions well
- good in study groups
- finds it difficult to stay quiet for long periods

Kinesthetic learners are those who learn by experiencing /doing things. A kinesthetic learner is one who:

- can't sit still for long
- may be good at sports
- may not have great handwriting
- likes role playing
- studies with music playing
- takes breaks when studying
- fidgets during lectures

(Adapted from http://homework tips.about.com)

Suggested strategies for studying /learning are:

Auditory	Visual	Kinesthetic
Listen to instructions and information orally	Watch for key words to summarize points	Ask questions and participate in discussions whenever possible
Sit towards the front of the room	Complete readings before class	Do something physical before sitting down to study
Repeat information silently to yourself	Use visuals like symbols and color in notes	Break reading tasks into small chunks
Work in quiet areas	Write down what you hear	Highlight, underline or take notes
Tape important information	Ask for other visual information	Take regular brief breaks to move around
Use rhymes or jingles to summarize important points	Try to remember important terminology by looking for parts of words already known	Break reading into chunks and write brief summaries
Create verbal descriptions	Color code notes	

(Adapted from The University of Western Ontario, Student Development Centre)

Note : There are many Learning Style Inventories available, some of which can be completed on line. These sites may also provide strategies for learning for each Learning Style.

Suggestions are:

www.vark-learn.com
http:homeworks.about.com
www.sdc.uwo.ca

pi (π) = 3.1415926535 ...

Perimeter formula

Square	4 * side
Rectangle	2 * (length + width)
Parallelogram	2 * (side1 + side2)
Triangle	side1 + side2 + side3
Regular n-polygon	n * side
Trapezoid	height * (base1 + base2) / 2
Trapezoid	base1 + base2 + height * [csc(theta1) + csc(theta2)]
Circle	2 * pi * radius
Ellipse	4 * radius1 * E(k,pi/2) E(k,pi/2) is the Complete Elliptic Integral of the Second Kind k = (1/radius1) * sqrt(radius1^2 - radius2^2)

Area formula

Square	side^2
Rectangle	length * width
Parallelogram	base * height
Triangle	base * height / 2
Regular n-polygon	(1/4) * n * side^2 * cot(pi/n)
Trapezoid	height * (base1 + base2) / 2
Circle	pi * radius^2
Ellipse	pi * radius1 * radius2
Cube (surface)	6 * side^2
Sphere (surface)	4 * pi * radius^2
Cylinder (surface of side)	perimeter of circle * height 2 * pi * radius * height
Cylinder (whole surface)	Areas of top and bottom circles + Area of the side
	2(pi * radius^2) + 2 * pi * radius * height
Cone (surface)	pi * radius * side
Torus (surface)	pi^2 * (radius2^2 - radius1^2)

Volume formula

Cube	$side^3$
Rectangular Prism	side1 * side2 * side3
Sphere	(4/3) * pi * $radius^3$
Ellipsoid	(4/3) * pi * radius1 * radius2 * radius3
Cylinder	pi * $radius^2$ * height
Cone	(1/3) * pi * $radius^2$ * height
Pyramid	(1/3) * (base area) * height
Torus	(1/4) * pi^2 * (r1 + r2) * $(r1 - r2)^2$

METRIC PREFIX IN ELECTRONICS

Multiplication Factor	Prefix	Symbol
1,000,000,000,000,000,000 = 10^{18}	exa	E
1,000,000,000,000,000 = 10^{15}	peta	P
1,000,000,000,000 = 10^{12}	tera	T
1,000,000,000 = 10^{9}	giga	G
1,000,000 = 10^{6}	mega	M
1,000 = 10^{3}	kilo	k
100 = 10^{2}	hector	h
10 = 10	deka	da
0.1 = 10^{-1}	deci	d
0.01 = 10^{-2}	centi	c
0.001 = 10^{-3}	milli	m
0.000 001 = 10^{-6}	micro	m
0.000,000,001 = 10^{-9}	nano	n
0.000,000,000,001 = 10^{-12}	pico	p
0.000,000,000,000,001 = 10^{-15}	femto	f
0.000,000,000,000,000,001 = 10^{-18}	atto	a

Example: 1500 Hz = 1.5 kHz = 1.5 kilohertz = 1.5 × 10^{3} Hz

Example: 0.007 A = 7 mA = 7 milliamps = 7 × 10^{-3} Amps

Each different ratio has its own formula. These are shown below.

The ratio of $\frac{\text{opposite}}{\text{hypotenuse}}$ = sine or sin

The ratio of $\frac{\text{adjacent}}{\text{hypotenuse}}$ = cosine or cos

The ratio of $\frac{\text{opposite}}{\text{adjacent}}$ = tangent or tan

NOTE
The acronyms for the three ratios are: ➢ Sine opposite hypotenuse – SOH ➢ Cosine adjacent hypotenuse – CAH ➢ Tangent opposite adjacent - TAS

These acronyms are extremely helpful as they can be used to write out the three different formulas and aid in solving trigonometry questions. These three formulas can be changed into three formula triangles and then it is a matter of substituting them into the formula. The three formula triangles are shown in Figure 9.

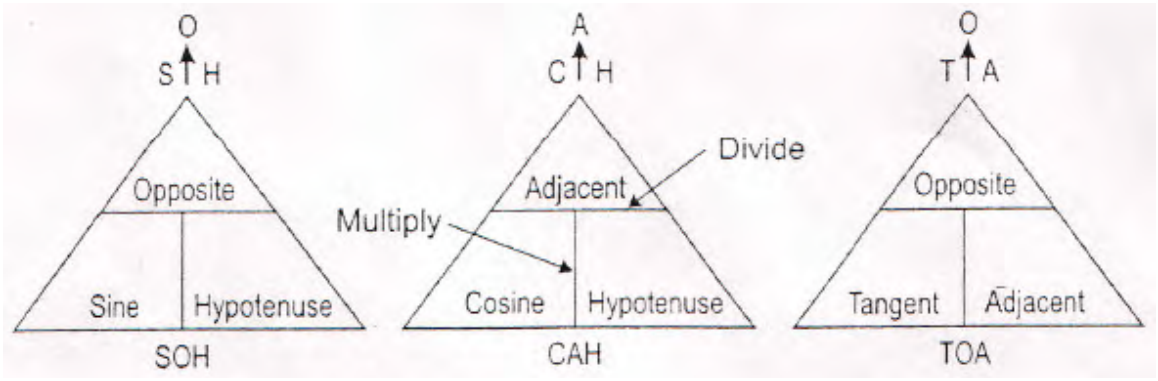

Figure 9 – Formula triangles

To use the formula triangles, cover the unknown and complete the remaining calculation. Each formula triangle can be used to construct three variations.

Essential Skills Inventory

Trade essentials

More skills … more opportunities

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STEAMFITTER/PIPEFITTER NOC 7252

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NAME: _____ DATE: _____

LEARNING STYLES CHECKLIST

Learning by hearing (auditory)

- ☐ I remember the things I hear better than the things I see.
- ☐ I learn better when someone explains to me how to do something better than when I follow a diagram.
- ☐ I find it easier to remember a telephone number I have heard than one I have read.
- ☐ I prefer to listen to the news on the radio than to read the newspaper.
- ☐ I remember the times tables by saying them to myself.
- ☐ After I am introduced to someone, I'm good at remembering his/her name.

Learning by seeing (visual)

- ☐ I remember what I've seen, better than what I have heard.
- ☐ I remember what happened by seeing the incident in my head.
- ☐ I remember what I hear by picturing it in my head.
- ☐ I am good at remembering faces.
- ☐ When someone says a number, I don't understand it until I see it written down.
- ☐ I can add simple numbers which are written down better than numbers that are in my head (e.g., 16+24+10+98).
- ☐ To remember a car license number, I picture it in my head.

Learning by doing (kinesthetic)

- ☐ When I put something together, I remember how it works.
- ☐ I remember certain directions after I have done something once or twice.
- ☐ I like to do things like simple repairs where I can use my hands.
- ☐ I can learn best if the instructor uses models, experiments and other practical tools to show what he/she is talking about.
- ☐ Using concrete examples is a good way for me to improve my math or spelling skills.
- ☐ I remember telephone numbers if I've dialed them a few times.

Learning in a group

- ☐ I like learning in a group so I can discuss the work with others.
- ☐ I enjoy helping other people in the group with their work.
- ☐ If I need to do something, I don't mind asking the person next to me.

Learning Alone

- ☐ I can concentrate best if I work on my own.
- ☐ It's hard to work if people are talking around me.
- ☐ I'd be embarrassed to show my mistakes to anyone other than an instructor.
- ☐ I can't concentrate if people are moving around the room.

(Adapted from SGL Handbook, ALSO, Ottawa)

1	2	3	4
torque	sewer	collective	abbreviation
lathe	column	entitl ement	faci lities
ohm	hazard	decimal	capacities
caulk	caution	person al	exca vation
their	ingress	conve ction	insulation
gauge	offset	multip le	temperatu re
wye	constant	diameter	interpretation
flange	ratche t	conve rsion	oxy-ace tylene
zone	current	exponen t	indication
tee	egress	termina l	environme ntal

poy

meef

fesh

moyp

toof

koyth

hafe

tibe

hoysh

thoop

marp

theg

yome

zule

NAME: DATE:

From the article below, answer the following questions.

1. List two problems that can be caused by a leaking joint on a sewer or drain installed underground.

   a) _____

   b) _____

2. Why do we not just replace clogged sewer lines?

   _____

Leaked and Blocked Pipes

A leaking joint on a sewer or drain installed below the surface of the soil would allow sewage to enter the subsoil. This could contaminate the drinking water. A leaky joint of this kind might also allow soil to enter the drain and cause stoppage of the drain line. Leaky underground pipe joints in yard areas allow the entrance of fine, fibrous tree roots.

Once these roots have entered the pipe, they spread quickly. They can fill the entire inside of the pipe and block it. A drain blocked with tree roots usually requires mechanical cleaning of the drain line. Sometimes only digging up the drain and replacing it with a new drain can open the pipe.

NSCC, Assessments, 2008
FOG Index 6.9

NAME: _____ DATE: _____

From the article below, answer the following questions.

1. List the 3 conditions that control the amount of flow in piping.

   _____ _____

   _____

2. When can you use the formula $D^2 \div d^2$ for finding the ratio of pipe capacities?

   _____

Ratio of Pipe Capacities

The information given here is intended to help the plumber in case a flow problem occurs. However, most pipe is sized by the architect or the engineer.

Pressure, friction, and cross-sectional area of the pipes control the amount of flow in piping. Water pressure is beyond the control of the plumber in most installations. Friction is somewhat reduced by proper design of a piping system to run as directly as possible. The material used may also affect friction. Copper tubing and PVC pipe have smoother walls than steel or wrought iron pipe. The smoother surface has less frictional resistance.

The plumber can install a larger pipe size to provide adequate pipe flow to each faucet. Only in a fire sprinkler system must all outlets have full flow at the same time. In plumbing a percent of full use is expected. The architect sizes pipe for the expected use, using small size pipe whenever possible for the sake of economy.

There are two ways of computing the ratio of pipe capacities. The first, $D^2 \div d^2$, is a simplification of AREA ÷ area and makes no allowance for friction. This method is simple to use and gives a practical answer when the large diameter in not more than twice the small diameter. Also, pipe lengths should be short, which means 10 feet or less for pipe sizes 1" and smaller and up to 20 feet for larger sizes of pipe.

A more accurate comparison is obtained by $\sqrt[5]{\left(\frac{D}{5}\right)^5}$ which does allow for friction. Friction is greater in smaller pipes because a greater percentage of the total water drags against the pipe wall.

Mathematics for Plumbers and Pipefitters 7th Edition, Smith,L., Delmar Cengage Learning 2008
FOG Index 8.8

NAME: _____ DATE: _____

From the article below, answer the following questions.

1. What does "real time inventory management" mean?

   __ _____

2. List three ways you could use computers in your trade.

   _____

   _____

   _____

Computers Give Orders

It is safe to say that all trades use computers for some part of their work. Many business functions are performed by computers including scheduling, record keeping, accounting, inventory management, communications with suppliers and customers, diagrams, and blueprints, and project management.

One of the important benefits of computers is real time inventory management. When an item is taken out of an inventory, a computer program can immediately update all records based on that inventory, a manager can have a computer alert him when the supply is down to 500 fittings. The next step, already happening in some companies, is for the computer to automatically generate an order for more parts when the supply reaches a pre-set limit.

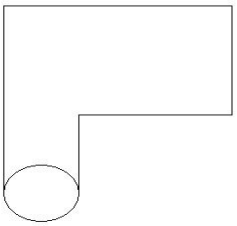
NWT Apprenticeship Support Materials, O'Connor,T,.Genesis Group Ltd.,2003
FOG Index 12.6

From the article below, answer the following questions.

1. To calculate the heat loss from buildings, which math formulas would you need to know?

__ _____

2. To calculate the area of the ceiling shown in the figure below, state the number and the types of shapes to be used.



_____

Geometry has a large absolutely essential role to play in all of the construction trades. The ability to visualize problems in geometric shapes and forms is vital in decision making. Piping length calculations always come down to one or another common plane figure: a square, a rectangle, a triangle, a circle, or even a simple line. Once a problem has been resolved to one or more of these, a corresponding formula may be easily applied and the solution is close at hand.

The problem may require the application of a number of geometric shapes before the solution can be deduced. When calculating heat loss from buildings, the areas and volumes of walls and rooms are often found by breaking the overall shape into geometric parts and then adding together the volumes of the individual parts. The same breakdowns must be made when calculating the volumes of tanks and excavations.

Mathematics for Plumbers and Pipefitters, 7th Edition, Smith, L., Delmar Cengage Learning, 2008
FOG Index 14.2

NAME: _____ DATE: _____

Refer to the table below to answer the questions.

1. When you are using 10" pipe and need to divide the pipe into 6 segments, how long is each segment?

   _____

2. 2 ½" pipe into 8 segments? _____

3. 1 ¼" pipe into 4 segments? _____

PIPE FABRICATIONS
Length of Equal Segments of a Pipe Circumference
(Schedule 40 Steel Pipe)

Nominal Pipe Size, Inches	Actual O.D., Inches	Actual Circum., Inches	Number of Segments				
			4	6	8	10	12
			Length of Segment, Inches				
1 ¼	1.660	5.215	1.3	.87	.65	.52	.43
1 ½	1.900	5.969	1.49	1.00	.75	.60	.50
2	2.375	7.461	1.87	1.24	.93	.75	.62
2 ½	2.875	9.032	2.26	1.51	1.13	.90	.75
3	3.500	10.996	2.75	1.67	1.37	1.10	.92
3 ½	4.000	12.566	3.14	2.10	1.57	1.26	1.05
4	4.500	14.137	3.54	2.36	1.75	1.41	1.18
5	5.563	17.477	4.37	2.92	2.18	1.75	1.46
6	6.625	20.813	5.20	3.47	2.60	2.08	1.73
8	8.625	27.096	6.77	4.52	3.39	2.71	2.26
10	10.750	33.772	8.45	5.60	4.23	3.38	2.82
12	12.750	40.055	10.00	6.67	5.00	4.01	3.34
14	14.000	44.000	11.00	7.35	5.51	4.40	3.66
16	16.000	40.375	12.60	8.40	6.30	5.04	4.19
18	18.000	56.549	14.13	9.41	7.06	5.65	4.70
20	20.000	62.832	15.70	10.48	7.85	6.28	5.22

Pipefitters Handbook, Lindsey, F.R., Industrial Press 1967

NAME: _____ DATE: _____

Refer to the material safety data sheet (MSDS) below to answer the questions.

1. You feel ill after being exposed to methanol at your work site. What should you do?

   ___ _____

2. What do you think the border around the MSDS means?

   ___ _____

Supplier Label

METHANOL

DANGER
POISON
FLAMMABLE
VAPOUR HARMFUL
MAY CAUSE BLINDNESS IF SWALLOWED

Keep away from heat, sparks and flame. No smoking. Container must be grounded when being emplied. Vapour may travel long discance. Avoid contact with eyes and skin. Do not inhale vapours or mist. Do not take internally. Harmful if absorbed through the skin.

FIRST AID: In case of contact, immediately, flush eyes and skin with plenty of water for at least 15 minutes.

If swallowed, induce vomiting by sticking finger down throat, or by giving soapy water to drink. Repeat until vomit is clear.

If affected by vapour, move to fresh air.

If breathing has stopped, apply artificial respiration.

GET MEDICAL ATTENTION IMMEDIATELY.

PRECAUTIONS: Wear chemical goggles and resistant gloves. Wash thoroughly after handling. Use with enough ventilation to keep below TLV. Keep container closed. Never use pressure to empty container.

METHANOL

DANGER
POISON
INFLAMMABLE
VAPEURS NOCIVES
PEUT PROVOQUER LA CÉCITÉ, SI AVALÉ

Garder loin de la chaleur, des àtincelles et de la flamme. Ne pas fumer. Brancher le contenant à une prise de terre avant de la vider de son contenu. Les vapeurs peuvent s'étendre sur de longues distances. Éviter tout contact avec les yeux et la peau. Ne pas respirer les vapeurs. Ne pas abosrber. Nocif, si absorbe par la peau.

PREMIERS SOINS: En cas de contact avec les yeux ou la peau, laver à grande eau pendant au moins 15 minutes.

Si avalé, provoquer le vomissement en introduisant un doigt dans la gorge ou en faisant absorber de l'eau savonneuse à la victime. Répéter jusqu'à cessation du vomissement.

Sortir au grand air, si indisposé par les vapeurs.

Si la respiration est interrompue, recourir à la respiration artificielle.

OBTENIR DES SOINS MÉDICAUX IMMÉDIATS.

PRÉCAUTIONS: Porter des lunettes protectrices (pour produits chimiques) et des gant résistants. Se laver minutieusement après usage. Utiliser dans un endroit bien aéré, afin de maintenir le niveau de vapeurs tolérable. Garder le contenant fermé. Ne jamais user de pression en vidant le récipient.

SEE MATERIAL SAFETY DATA SHEET FOR PRODUCT
VOIR FICHE SIGNALETIQUE

NAME: _____ DATE: _____

The pie chart below indicates the topics included in the Interprovincial (Red Seal) exam for your trade which consists of 130 multiple choice questions. Complete the table below.

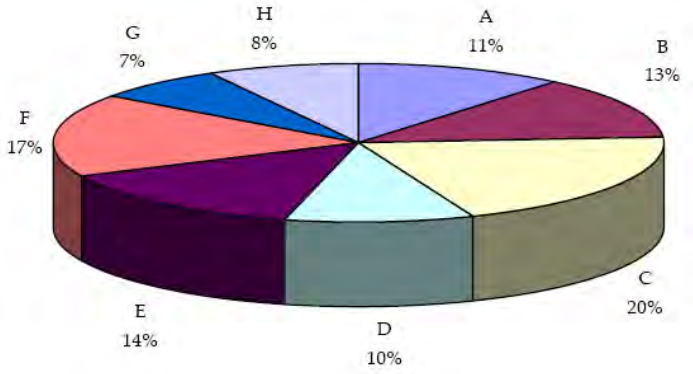
1.

Block	Title of Block	# of Questions
A	Occupational Skills	14
B	Drawings and Specifications	17
C		
D	Rigging and Hoisting	13
E	Steam System Installation	18
F		
G	Testing and Commissioning	9
H	Maintenance and Repair	11

2. Which two blocks have the greatest number of test questions?

___ _____

3. Which block has the least number of questions? _____



BLOCK A	Occupational Skills	BLOCK E	Steam System Installation
BLOCK B	Drawings and Specifications	BLOCK F	Heating, Cooling and Process System Installation
BLOCK C	Piping Layout and Common Installation	BLOCK G	Testing and Commissioning
BLOCK D	Rigging and Hoisting	BLOCK H	Maintenance and Repair

Occupational Analyses, Steamfitter. Pipefitter, 2007, Human Resources Partnership Directorate

NAME: DATE:

1. How many gallons of water can a 3–inch standard weight pipe hold if it is 18 feet long? (See the chart below).

__ _____

Nominal Dia (inches)	Actual I.D. (inches)	Actual O.D. (inches)	Outside Circum (inches)	Outside Circum (feet)	Inside Cross-Sectional Area (sq in)	Inside Cross-Sectional Area (sq ft)	Surface Area per Lin Ft (sq ft)	Capacity per Lin Ft (gal)	Weight of Water per Lin Ft (lb)	Weight Of Pipe Per Lin Ft (lb)
1/8	0.269	0.405	1.272	0.106	0.057	0.0004	0.106	0.003	0.024	0.246
¼	0.364	0.540	1.696	0.141	0.104	0.0007	0.141	0.005	0.045	0.426
3/8	0.493	0.675	2.121	0.177	0.191	0.0013	0.177	0.009	0.082	0.570
½	0.622	0.840	2.639	0.220	0.304	0.0021	0.220	0.015	0.131	0.855
¾	0.824	1.050	3.299	0.273	0.533	0.0037	0.273	0.027	0.230	1.140
1	1.049	1.315	4.131	0.343	0.864	0.006	0.343	0.044	0.374	1.690
1 ¼	1.388	1.660	5.215	0.433	1.496	0.0103	0.433	0.077	0.647	2.290
1 ½	1.610	1.900	5.969	0.497	2.036	0.0141	0.497	0.105	0.881	2.740
2	2.067	2.375	7.461	0.622	3.356	0.023	0.622	0.174	1.453	3.690
2 ½	2.469	2.875	9.032	0.751	4.778	0.033	0.751	0.248	2.073	5.85
3	3.068	3.500	11.00	0.843	7.393	0.051	0.843	0.384	3.201	7.66
3 ½	3.548	4.000	12.566	1.045	9.90	0.068	1.045	0.515	4.290	8.98
4	4.026	4.500	14.14	1.18	12.73	0.088	1.178	0.661	5.512	10.9
5	5.047	5.563	17.49	1.455	20.01	0.139	1.455	1.039	8.662	14.9
6	6.065	6.625	20.81	1.73	28.89	0.2	1.734	1.500	12.51	19.2
8	7.981	8.625	27.10	2.26	50.03	0.35	2.258	2.598	21.66	28.9
10	10.020	10.750	33.772	2.81	78.85	0.545	2.81	4.096	34.12	40.5
12	12.000	12.750	40.055	3.38	113.09	0.984	3.38	5.88	48.96	49.56

Mathematics for Plumbers and Pipefitters, Seventh Edition, Smith, L., Delmar Cengage Learning, 2008.

.

NAME: _____ DATE: _____

Calculate the following:

1.	138 ft. +164	2.	34 in. -18	3.	24 cm X 46	4.	10 024 mm ÷ 24
5.	.0067 in. + .2543	6.	26 $ft.^3$ -.03	7.	.034 l X.025	8.	13.25 gal. ÷ 25

9. You worked the following hours in one week: 8 hours, 12 hours, 9 hours, 10 hours and 7 hours. How many hours did you work in total? If you were paid $11.75 per hour for 40 hours and double time for any hours beyond 40, what was your gross pay for the week?

__ _____

10. The pipe running from the main sewer to each house in a new subdivision is 45 feet long. If there are 1305 feet of pipe available at the site, how many homes can you hook up to the main line before you need more pipe?

__ _____

11. You need 16 hours to install 2,000 feet of pipe. Approximately how much time would you need to install 1,500 feet of pipe with the same tools and under the same conditions?

__ _____

12. In January, the temperature at your work site fell from +3° to -15° C during the day. How many degrees in total did the temperature drop?

__ _____

13. If the water temperature of a boiler changed from 211° F to 104° F, how many degrees of heat have been lost?

__ _____

14. 6 2/5 yd. + 1/5

15. 2/3 ft. + ½

16. 7/9 ft. – 5/9

17. 9/5 mm X 7/8

18. 2/5 mm ÷ 4/6

19. 1 1/5 ft. ÷ 2 ½

Please give the mixed number equivalent or the improper fraction.

20. $\frac{10}{3}$ cm = _____

21. 5 7/8 in. = _____

Write an equivalent fraction.

22. 3/8" = ___"

23. 2/3 ft. = _____

24. If the inside diameter of a pipe is 6¼ cm and the outside diameter is 8 cm, how thick is the wall of the pipe?

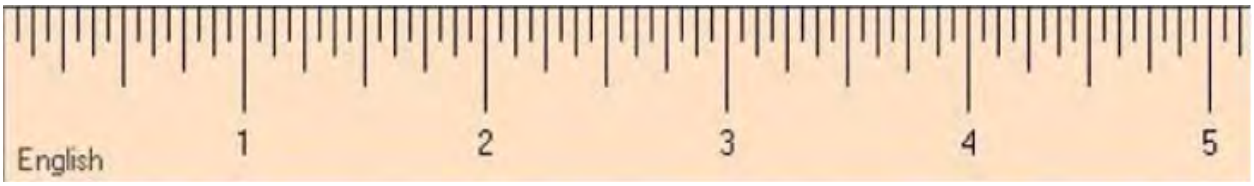
_____

25. You are an apprentice who worked 1¾ hours at one job, 2¾ at another and 1½ at a third. You had an hour for lunch and two 15 minute breaks. If you work 8 hours a day, how much time would you have left to work that day?

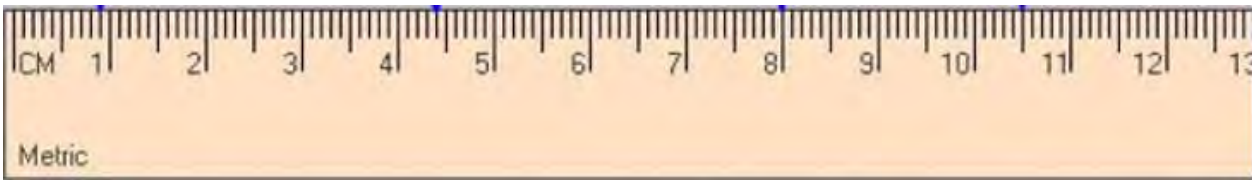
__ _____

NAME: _____ DATE: _____

1. Show 2 ¼ inches and 3 15/16 inches on the Imperial tape below:



2. Show 7 mm and 12.4 cm on the tape below:



3. There are measurements missing in the chart below. Complete the chart with the correct measurements.

Fraction	Decimal	Percent
½	.5	
	0.25	25
1/8		
	.9375	93.75

Convert the following measurements of length:

1 inch = 2.54 cm
1 ft = 30.48 cm
1 ft = 12 in.

4. 12 ft. = _____ in.
5. 8 ft. 6 in. = _____ in.
6. 10 in. = _____ yds.
7. 0.45 cm = _____ m
8. 65 cm = _____ mm
9. 6 in. = _____ cm
10. 91.44 cm = _____ ft.

What is the value of:

11. 5^2 in. = _____ 12. 6^3 mm = _____ 13. 3^4 mm = _____

14. 10^5 yd. = _____

15. Change 1 1/16 to decimal inches. _____

16. Change 1.78 feet so it can be measured on a rule. _____

17. Change 0.725 to the nearest 16^{th} inch. __ _____

Calculate the following:

18. 9 x 6 -24 + 40 ÷ 8 + 3 x 2 mm = _____ mm

19. 36 ÷ 6 + 3(5 x 5) in. = _____ in.

20. If a drain pipe falls 3 inches over a distance of 12 feet, what is the fall per foot? __ _____

21. If it takes you 70 minutes to travel 35 km to a work site, how long will it take you to travel 85 km at the same speed?

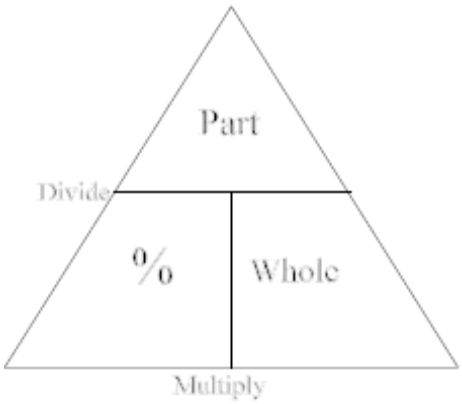
__ _____

22. Fill in the missing scales and ratios missing from the chart below.

Scale and Ratio

Imperial		Metric	
3/32 inch = 1 ft.	1:128 ratio	1 mm = 2 mm	1:2 ratio
1/8 inch = 1 ft.		1 mm = 5 mm	1:5 ratio
3/16 = 1 ft.	1:64 ratio	1 mm = 10 mm	
¼ inch = 1 ft.	1:48 ratio	1 mm = 20 mm	1:20 ratio
3/8 inch = 1 ft.			1:30 ratio
½ inch = 1 ft.		1 mm = 50 mm	1:50 ratio
¾ inch = 1 ft.	1:16 ratio	1 mm = 100 mm	
1 inch = 1 ft.	1:12 ratio	1 mm = 200 mm	1:200 ratio
			1:500 ratio
		1 mm = 1000 mm	1:1000 ratio

NAME: _____ DATE: _____



Calculate the following (you may use the above triangle formula).

1. What is 35% of $520.00? _____

2. 32 cm is 16% of what number? _____

3. What percent is 5 of $7.00? _____

4. A furnace has an input rating of 120,000 BTU and an output rating of 90,000 BTU. What is the efficiency rating of the furnace itself?

   ___ _____

5. If 30 fittings are bought at $4.90 each and discounts of 15%, 10% and 5% are given, what is the net invoice cost?

   ___ _____

6. A 25 m run of piping is to be graded down at 2 %. Calculate the amount of the drop over the entire length of the line.

   ___ _____

7. On the flange shown below, identify the labelled parts.

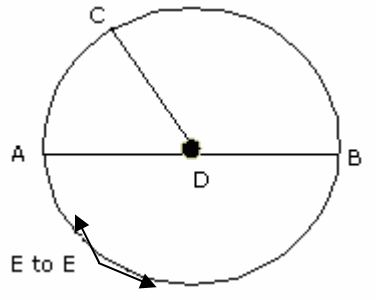
a) ADB _____

b) ADC _____

c) AD _____

d) AC _____

e) E _____



8. Estimate the size of the angles as indicated on the elbow in Figure 1.

a) _____

b) _____

c) _____

d) _____

e) _____

f) _____

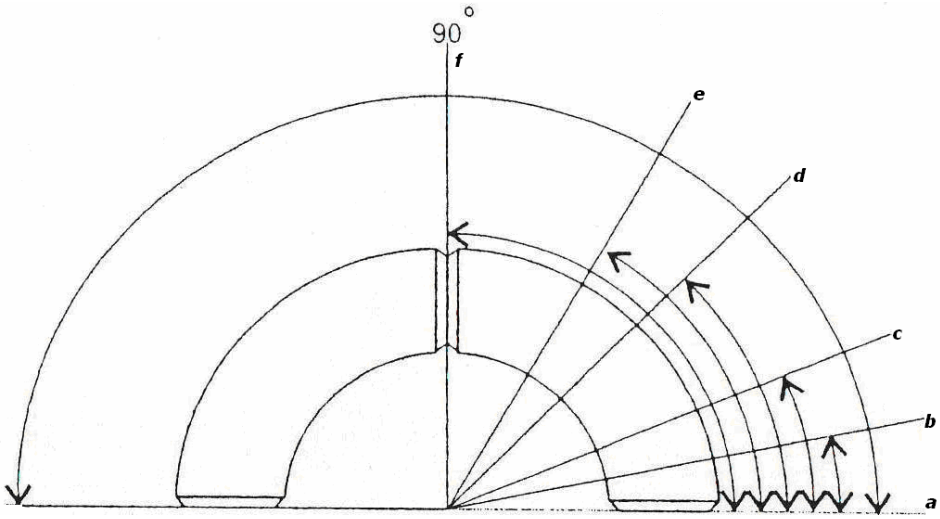
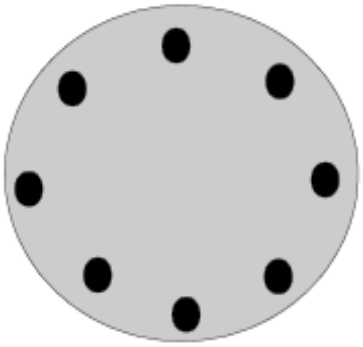


Figure 1

9. A bend is a fraction of a circle. The bend equals the fitting angle divided by 360°. Complete the figures missing from the following table:

Fitting Angle	Complementary Angle	Bend
90°	0°	1/4
72°		
60°	30°	1/6
45°		
22 ½°		
11 ¼°		

10. This is an 8-hole blind flange. How many degrees are between the centres of each hole?



_____

NAME: _____ DATE: _____

1. Identify each shape.

a) _____

b) _____

c) _____

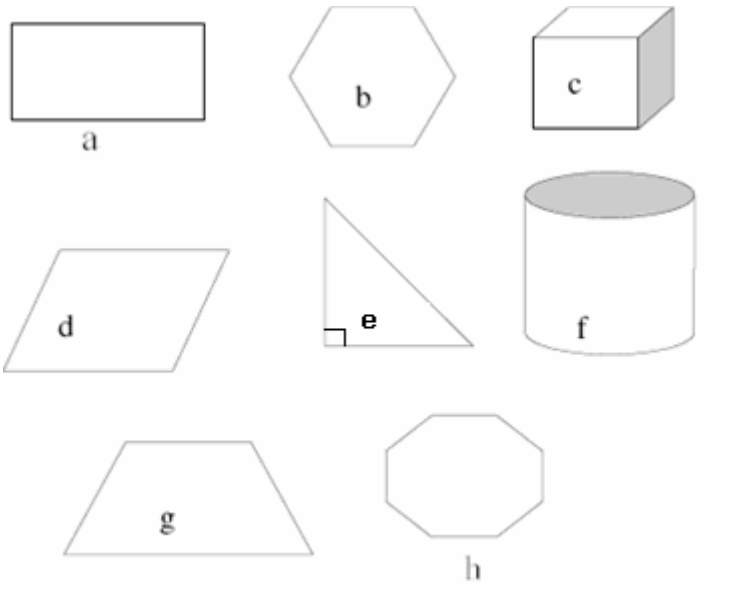
d) _____

e) _____

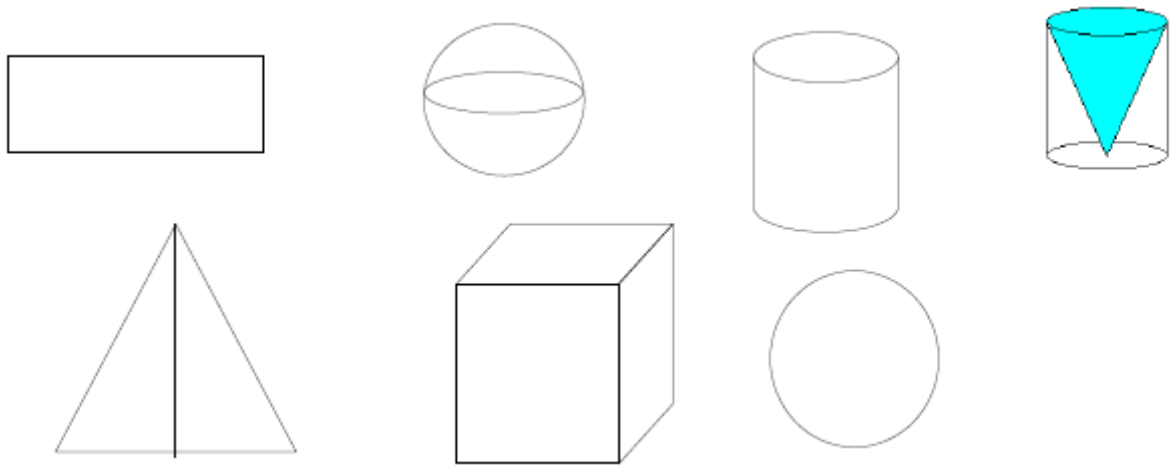
f) _____

g) _____

h) _____

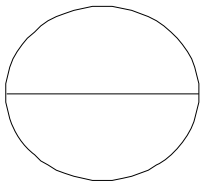


2. Using the diagrams as a guide, match the formula to the appropriate description by putting the correct letter on the lines on the following page.



1. p	$= 2l + 2w$	_____	a.	area of a triangle
2. V	$= s^3$	_____	b.	circumference of a circle
3. A	$= \pi r^2$	_____	c.	area of a circle
4. V	$= \pi r^2 h$	_____	d.	volume of a cube
5.	$A = \frac{1}{2}$ bh	_____	e.	area of a rectangle
6. V	$= 4/3 \pi r^3$	_____	f.	volume of a sphere
7. C	$= \pi$ d	_____	g.	volume of a cylinder
8. A	$= lw$	_____	h.	perimeter of a rectangle

3. a) Using the formula $C = \pi D$, what is the circumference of the pipe below, if $\pi = 3.14$ and D = 3 cm?



_____

b) If the circumference is 9, what is the diameter? _____

4. Your time card shows that you worked 9 hours each day for 5 days at $11.45 per hour.

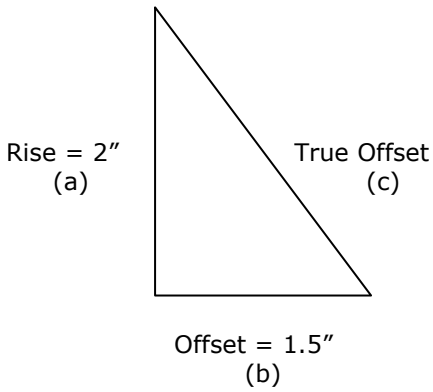
a) Write a formula that you can use to determine your gross pay.

__ _____

b) Calculate your pay for the week.

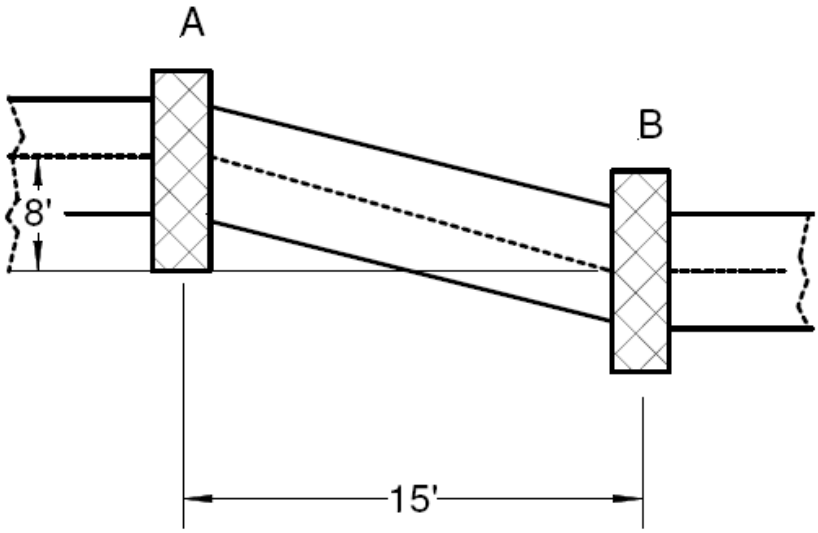
__ _____

5. Use the formula $a^2 + b^2 = c^2$ to determine the "true offset" of this piping layout.



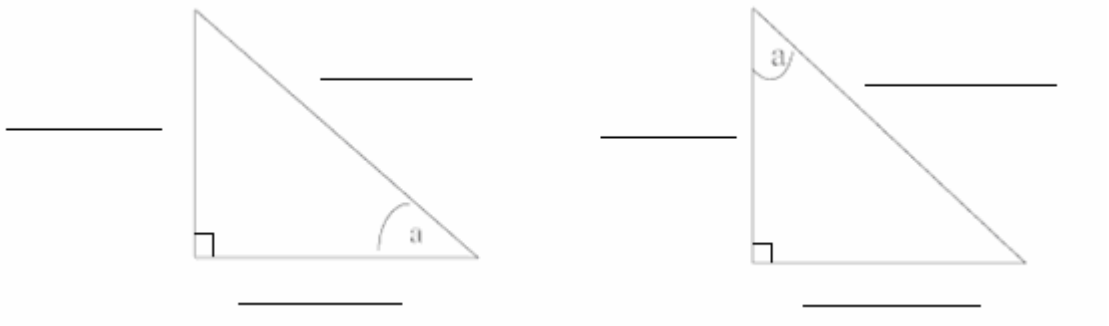
_____

6. The drawing below shows a length of sewer pipe. Find the length of the pipe from collar A to collar B. The horizontal distance is 15' and the vertical distance is 8'. (Use the formula $a^2 + b^2 = c^2$)



_____

7. In the diagrams below, **a** represents the angle of reference. Identify the opposite, adjacent and hypotenuse sides for each of the figures.



8. You are standing 70 feet from a tower. The angle of elevation to the top of the tower is 62°. You need to know the height of the tower. (Include a sketch of the problem with your answer).

__ _____

NAME: _____ DATE: _____

**** To be completed by the Assessor – not the Learner***

Speaking Skills Rating Scale

		Improvement Needed	Acceptable	Very good
1.	Is comfortable communicating orally (i.e., body posture and facial expressions are appropriate)	☐	☐	☐
2.	Maintains eye contact	☐	☐	☐
3.	Waits for his/her turn to speak	☐	☐	☐
4.	Willingly and confidently engages in conversation	☐	☐	☐
5.	Performs social courtesies, such as greeting others, using titles and making introductions	☐	☐	☐
6.	Speaks at an appropriate volume	☐	☐	☐
7.	Rate of speech is understandable	☐	☐	☐
8.	Adjusts voice inflection for statements, requests, directions, exclamations and questions	☐	☐	☐
9.	Pronounces words clearly	☐	☐	☐
10.	Does not use stalling devices such as "uh", "you know", etc.	☐	☐	☐
11.	Does not say the same thing twice	☐	☐	☐
12.	Uses words and phrases related to the subject	☐	☐	☐
13.	Has a good vocabulary	☐	☐	☐
14.	Speaks in complete sentences of appropriate length	☐	☐	☐
15.	Uses good grammar	☐	☐	☐
16.	Maintains focus on the subject	☐	☐	☐
17.	Gives appropriate responses to questions	☐	☐	☐
18.	Is aware of listener's reaction and responds appropriately	☐	☐	☐
19.	Talks "with" rather than "at" a person	☐	☐	☐

In your work as a Steamfitter/Pipefitter, you may have to deal with a noisy workplace. However, it is still very important to speak with and listen to those with whom you work.

Please rate yourself on your ability to do the following work tasks:

		Need help	Can do alone	Can help an apprentice
1.	Speak with coworkers and supervisors at project meetings.	☐	☐	☐
2.	Speak with other pipefitters to coordinate work on different systems.	☐	☐	☐
3.	Communicate with other tradespeople such as welders and plumbers to make requests or coordinate tasks.	☐	☐	☐
4.	Talk with an engineer to discuss a problem.	☐	☐	☐

COMPUTER USE

NAME: _____ DATE: _____

		YES	NO
1.	Do you use a computer at home?	☐	☐
	at work?	☐	☐
2.	Do you use any computerized equipment/ systems at work, for example, AutoCAD to make drawings for piping designs?	☐	☐
3.	Do you know the "language" used to describe computers, for example, monitor, software, hardware, word processing, data base, virus and spam?	☐	☐

4. Do you use a computer to:	Need help	Can do alone	Can help an apprentice
Search for information on the internet?	☐	☐	☐
Send and receive email, including attachments?	☐	☐	☐
Write a memo, letter or report (use word processing software)?	☐	☐	☐
Manage files and folders?	☐	☐	☐
Use a data base?	☐	☐	☐

NAME: _____ DATE: _____

As a Steamfitter/Pipefitter, you will be required to keep a written record of certain job tasks. Please rate yourself on your ability to accomplish the following:

		Need help	Can do alone	Can help an apprentice
1.	Write a list of all materials and fittings for a job.	☐	☐	☐
2.	Keep a daily log to record measurements and reminders.	☐	☐	☐
3.	Write an incident or an accident report of at least one paragraph.	☐	☐	☐
4.	Prepare a resumé.	☐	☐	☐

5. Please write 5-6 sentences about yourself.

_____

_____

_____

_____

_____

_____

http://srv108.services.gc.ca., Essential Skills Profile for Steamfitter-Pipefitter HRSDC)

Essential Skills Answer Key

Trade essentials

More skills … more opportunities

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STEAMFITTER/PIPEFITTER
NOC 7252

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ASSESSOR'S ANSWER KEY

STEAMFITTER/PIPEFITTER

Learning Styles

After the apprentice has completed the learning styles checklist, note the sections that contain **three or more** checkmarks. Those sections indicate the preferred learning style of that apprentice. The majority of apprentices will show preference for more than one learning style.

Learning Environment

Group and individual learning environments - If an apprentice indicates a strong preference for one environment over another, an instructor needs to be aware of the implications this has for a teaching environment.

NAME: _____ DATE: _____

LEARNING STYLES CHECKLIST

Learning by hearing (auditory)

- ☐ I remember the things I hear better than the things I see.
- ☐ I learn better when someone explains to me how to do something better than when I follow a diagram.
- ☐ I find it easier to remember a telephone number I have heard than one I have read.
- ☐ I prefer to listen to the news on the radio than to read the newspaper.
- ☐ I remember the times tables by saying them to myself.
- ☐ After I am introduced to someone, I'm good at remembering his/her name.

Learning by seeing (visual)

- ☐ I remember what I've seen, better than what I have heard.
- ☐ I remember what happened by seeing the incident in my head.
- ☐ I remember what I hear by picturing it in my head.
- ☐ I am good at remembering faces.
- ☐ When someone says a number, I don't understand it until I see it written down.
- ☐ I can add simple numbers which are written down better than numbers that are in my head (e.g.,16+24+10+98).
- ☐ To remember a car license number, I picture it in my head.

Learning by doing (kinesthetic)

- ☐ When I put something together, I remember how it works.
- ☐ I remember certain directions after I have done something once or twice.
- ☐ I like to do things like simple repairs where I can use my hands.
- ☐ I can learn best if the instructor uses models, experiments and other practical tools to show what he/she is talking about.
- ☐ Using concrete examples is a good way for me to improve my math or spelling skills.
- ☐ I remember telephone numbers if I've dialed them a few times.

Learning in a group

- ☐ I like learning in a group so I can discuss the work with others.
- ☐ I enjoy helping other people in the group with their work.
- ☐ If I need to do something, I don't mind asking the person next to me.

Learning Alone

- ☐ I can concentrate best if I work on my own.
- ☐ It's hard to work if people are talking around me.
- ☐ I'd be embarrassed to show my mistakes to anyone other than an instructor.
- ☐ I can't concentrate if people are moving around the room.

(Adapted from SGL Handbook, ALSO, Ottawa)

ASSESSOR'S ANSWER KEY

STEAMFITTER/PIPEFITTER

TECHNICAL LANGUAGE

1. Word Lists

Have the apprentice begin reading aloud a list with which he/she is comfortable. If an apprentice has difficulty with more than three words in list one, **stop** the Inventory. If the apprentice has 7/10 words correct in any list, move up to the next list. The lists have been written in a simple to more complex order and are words contextualized to each trade.

2. Pseudowords

The apprentice should not have major difficulty with the pronunciation of these pseudo words. The reason for inclusion of this list is that it tells the assessor if the apprentice has major difficulties with phonics which can affect learning to read technical language at the required level.

3. Reading Excerpts

The reading passages are *not* leveled by Essential Skill Complexity level but are arranged from simple to complex using a Readability Index. Apprentices should be able to answer both the recall questions as well as those questions requiring "reading between the lines". Apprentices need to be comfortable reading and answering questions at the highest level.

1	2	3	4
torque	sewer	collective	abbreviation
lathe	column	entitl ement	faci lities
ohm	hazard	decimal	capacities
caulk	caution	person al	exca vation
their	ingress	conve ction	insulation
gauge	offset	multip le	temperatu re
wye	constant	diameter	interpretation
flange	ratche t	conve rsion	oxy-ace tylene
zone	current	exponen t	indication
tee	egress	termina l	environme ntal

poy

meef

fesh

moyp

toof

koyth

hafe

tibe

hoysh

thoop

marp

theg

yome

zule

NAME: DATE:

From the article below, answer the following questions.

1. List two problems that can be caused by a leaking joint on a sewer or drain installed underground.

   a) It can contaminate the drinking water

   b) It can plug the drain line

2. Why do we not just replace clogged sewer lines?

   Answers will vary

Leaked and Blocked Pipes

A leaking joint on a sewer or drain installed below the surface of the soil would allow sewage to enter the subsoil. This could contaminate the drinking water. A leaky joint of this kind might also allow soil to enter the drain and cause stoppage of the drain line. Leaky underground pipe joints in yard areas allow the entrance of fine, fibrous tree roots.

Once these roots have entered the pipe, they spread quickly. They can fill the entire inside of the pipe and block it. A drain blocked with tree roots usually requires mechanical cleaning of the drain line. Sometimes only digging up the drain and replacing it with a new drain can open the pipe.

NSCC, Assessments, 2008
FOG Index 6.9

NAME: DATE:

From the article below, answer the following questions.

1. List the 3 conditions that control the amount of flow in piping.
    1. pressure
    2. friction
    3. inside diameter of the pipe
2. When can you use the formula $D^2 \div d^2$ for finding the ratio of pipe capacities?

    You can use it when the diameter of the larger pipe is not more than twice the size of the smaller pipe.

Ratio of Pipe Capacities

The information given here is intended to help the plumber in case a flow problem occurs. However, most pipe is sized by the architect or the engineer.

Pressure, friction, and cross-sectional area of the pipes control the amount of flow in piping. Water pressure is beyond the control of the plumber in most installations. Friction is somewhat reduced by proper design of a piping system to run as directly as possible. The material used may also affect friction. Copper tubing and PVC pipe have smoother walls than steel or wrought iron pipe. The smoother surface has less frictional resistance.

The plumber can install a larger pipe size to provide adequate pipe flow to each faucet. Only in a fire sprinkler system must all outlets have full flow at the same time. In plumbing a percent of full use is expected. The architect sizes pipe for the expected use, using small size pipe whenever possible for the sake of economy.

There are two ways of computing the ratio of pipe capacities. The first, $D^2 \div d^2$, is a simplification of AREA ÷ area and makes no allowance for friction. This method is simple to use and gives a practical answer when the large diameter in not more than twice the small diameter. Also, pipe lengths should be short, which means 10 feet or less for pipe sizes 1" and smaller and up to 20 feet for larger sizes of pipe.

A more accurate comparison is obtained by $\sqrt[5]{\left(\frac{D}{5}\right)^5}$ which does allow for friction. Friction is greater in smaller pipes because a greater percentage of the total water drags against the pipe wall.

Mathematics for Plumbers and Pipefitters 7th Edition, Smith,L., Delmar Cengage Learning 2008 FOG Index 8.8

NAME: _____ DATE: _____

From the article below, answer the following questions.

1. What does "real time inventory management" mean?

   It means that the inventory is constantly updated on a computer. (It may even order new parts as required)

2. List three ways you could use computers in your trade.

   Answers will vary

Computers Give Orders

It is safe to say that all trades use computers for some part of their work. Many business functions are performed by computers including scheduling, record keeping, accounting, inventory management, communications with suppliers and customers, diagrams, and blueprints, and project management.

One of the important benefits of computers is real time inventory management. When an item is taken out of an inventory, a computer program can immediately update all records based on that inventory, a manager can have a computer alert him when the supply is down to 500 fittings. The next step, already happening in some companies, is for the computer to automatically generate an order for more parts when the supply reaches a pre-set limit.

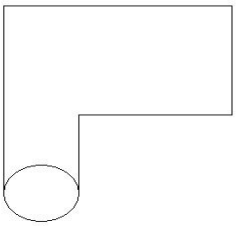
NWT Apprenticeship Support Materials, O'Connor, T, Genesis Group Ltd., 2003
FOG Index 12.6

From the article below, answer the following questions.

1. To calculate the heat loss from buildings, which math formulas would you need to know?

areas and volumes

2. To calculate the area of the ceiling shown in the figure below, state the number and the types of shapes to be used.



You would need to divide the area into two rectangular shapes and a circle.

Geometry has a large absolutely essential role to play in all of the construction trades. The ability to visualize problems in geometric shapes and forms is vital in decision making. Piping length calculations always come down to one or another common plane figure: a square, a rectangle, a triangle, a circle, or even a simple line. Once a problem has been resolved to one or more of these, a corresponding formula may be easily applied and the solution is close at hand.

The problem may require the application of a number of geometric shapes before the solution can be deduced. When calculating heat loss from buildings, the areas and volumes of walls and rooms are often found by breaking the overall shape into geometric parts and then adding together the volumes of the individual parts. The same breakdowns must be made when calculating the volumes of tanks and excavations.

Mathematics for Plumbers and Pipefitters, 7th Edition, Smith, L., Delmar Cengage Learning, 2008
FOG Index 14.2

NAME: _____ DATE: _____

Refer to the table below to answer the questions.

1. When you are using 10" pipe and need to divide the pipe into 6 segments, how long is each segment?

   5.6"

2. 2 ½" pipe into 8 segments? 1.13"

3. 1 ¼" pipe into 4 segments? 1.30"

PIPE FABRICATIONS
Length of Equal Segments of a Pipe Circumference
(Schedule 40 Steel Pipe)

Nominal Pipe Size, Inches	Actual O.D., Inches	Actual Circum., Inches	Number of Segments				
			4	6	8	10	12
			Length of Segment, Inches				
1 ¼	1.660	5.215	1.3	.87	.65	.52	.43
1 ½	1.900	5.969	1.49	1.00	.75	.60	.50
2	2.375	7.461	1.87	1.24	.93	.75	.62
2 ½	2.875	9.032	2.26	1.51	1.13	.90	.75
3	3.500	10.996	2.75	1.67	1.37	1.10	.92
3 ½	4.000	12.566	3.14	2.10	1.57	1.26	1.05
4	4.500	14.137	3.54	2.36	1.75	1.41	1.18
5	5.563	17.477	4.37	2.92	2.18	1.75	1.46
6	6.625	20.813	5.20	3.47	2.60	2.08	1.73
8	8.625	27.096	6.77	4.52	3.39	2.71	2.26
10	10.750	33.772	8.45	5.60	4.23	3.38	2.82
12	12.750	40.055	10.00	6.67	5.00	4.01	3.34
14	14.000	44.000	11.00	7.35	5.51	4.40	3.66
16	16.000	40.375	12.60	8.40	6.30	5.04	4.19
18	18.000	56.549	14.13	9.41	7.06	5.65	4.70
20	20.000	62.832	15.70	10.48	7.85	6.28	5.22

Pipefitters Handbook, Lindsey, F.R., Industrial Press 1967

NAME: _____ DATE: _____

Refer to the material safety data sheet (MSDS) below to answer the questions.

1. You feel ill after being exposed to methanol at your work site. What should you do?

   1. Flush your skin for 15 minutes, 2. Vomit, 3. Get fresh air

2. What do you think the border around the MSDS means?

   It means CAUTION or WARNING

Supplier Label

METHANOL

DANGER
POISON
FLAMMABLE
VAPOUR HARMFUL
MAY CAUSE BLINDNESS IF SWALLOWED

Keep away from heat, sparks and flame. No smoking. Container must be grounded when being emptied. Vapour may travel long discance. Avoid contact with eyes and skin. Do not inhale vapours or mist. Do not take internally. Harmful if absorbed through the skin.

FIRST AID: In case of contact, immediately, flush eyes and skin with plenty of water for at least 15 minutes.

If swallowed, induce vomiting by sticking finger down throat, or by giving soapy water to drink. Repeat until vomit is clear.

If affected by vapour, move to fresh air.

If breathing has stopped, apply artificial respiration.

GET MEDICAL ATTENTION IMMEDIATELY.

PRECAUTIONS: Wear chemical goggles and resistant gloves. Wash thoroughly after handling. Use with enough ventilation to keep below TLV. Keep container closed. Never use pressure to empty container.

METHANOL

DANGER
POISON
INFLAMMABLE
VAPEURS NOCIVES
PEUT PROVOQUER LA CÉCITÉ, SI AVALÉ

Garder loin de la chaleur, des àtincelles et de la flamme. Ne pas fumer. Brancher le contenant à une prise de terre avant de la vider de son contenu. Les vapeurs peuvent s'étendre sur de longues distances. Éviter tout contact avec les yeux et la peau. Ne pas respirer les vapeurs. Ne pas abosrber. Nocif, si absorbe par la peau.

PREMIERS SOINS: En cas de contact avec les yeux ou la peau, laver à grande eau pendant au moins 15 minutes.

Si avalé, provoquer le vomissement en introduisant un doigt dans la gorge ou en faisant absorber de l'eau savonneuse à la victime. Répéter jusqu'à cessation du vomissement.

Sortir au grand air, si indisposé par les vapeurs.

Si la respiration est interrompue, recourir à la respiration artificielle.

OBTENIR DES SOINS MÉDICAUX IMMÉDIATS.

PRÉCAUTIONS: Porter des lunettes protectrices (pour produits chimiques) et des gant résistants. Se laver minutieusement après usage. Utiliser dans un endroit bien aéré, afin de maintenir le niveau de vapeurs tolérable. Garder le contenant fermé. Ne jamais user de pression en vidant le récipient.

SEE MATERIAL SAFETY DATA SHEET FOR PRODUCT
VOIR FICHE SIGNALETIQUE

NAME: DATE:

The pie chart below indicates the topics included in the Interprovincial (Red Seal) exam for your trade which consists of 130 multiple choice questions. Complete the table below.

1.

Block	Title of Block	# of Questions
A	Occupational Skills	14
B	Drawings and Specifications	17
C	***Piping Layout and Common Installation***	***26***
D	Rigging and Hoisting	13
E	Steam System Installation	18
F	***Heating, Cooling and Process System Installation***	***22***
G	Testing and Commissioning	9
H	Maintenance and Repair	11

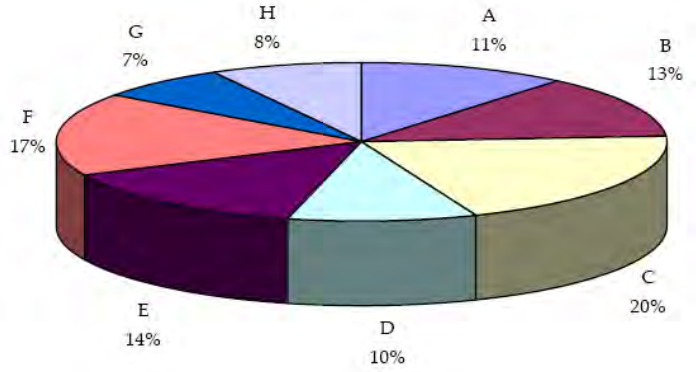
2. Which two blocks have the greatest number of test questions?

C. Piping Layout and Common Installation

F. Steam System Installation

3. Which block has the least number of questions?

G. Testing and Commissioning



BLOCK A	Occupational Skills	BLOCK E	Steam System Installation
BLOCK B	Drawings and Specifications	BLOCK F	Heating, Cooling and Process System Installation
BLOCK C	Piping Layout and Common Installation	BLOCK G	Testing and Commissioning
BLOCK D	Rigging and Hoisting	BLOCK H	Maintenance and Repair

Occupational Analyses, Steamfitter. Pipefitter, 2007, Human Resources Partnership Directorate

NAME: _____ DATE: _____

1. How many gallons of water can a 3–inch standard weight pipe hold if it is 18 feet long? (See the chart below).
   6.9 gallons

Nominal Dia (inches)	Actual I.D. (inches)	Actual O.D. (inches)	Outside Circum (inches)	Outside Circum (feet)	Inside Cross-Sectional Area (sq in)	Inside Cross-Sectional Area (sq ft)	Surface Area per Lin Ft (sq ft)	Capacity per Lin Ft (gal)	Weight of Water per Lin Ft (lb)	Weight Of Pipe Per Lin Ft (lb)
1/8	0.269	0.405	1.272	0.106	0.057	0.0004	0.106	0.003	0.024	0.246
¼	0.364	0.540	1.696	0.141	0.104	0.0007	0.141	0.005	0.045	0.426
3/8	0.493	0.675	2.121	0.177	0.191	0.0013	0.177	0.009	0.082	0.570
½	0.622	0.840	2.639	0.220	0.304	0.0021	0.220	0.015	0.131	0.855
¾	0.824	1.050	3.299	0.273	0.533	0.0037	0.273	0.027	0.230	1.140
1	1.049	1.315	4.131	0.343	0.864	0.006	0.343	0.044	0.374	1.690
1 ¼	1.388	1.660	5.215	0.433	1.496	0.0103	0.433	0.077	0.647	2.290
1 ½	1.610	1.900	5.969	0.497	2.036	0.0141	0.497	0.105	0.881	2.740
2	2.067	2.375	7.461	0.622	3.356	0.023	0.622	0.174	1.453	3.690
2 ½	2.469	2.875	9.032	0.751	4.778	0.033	0.751	0.248	2.073	5.85
3	3.068	3.500	11.00	0.843	7.393	0.051	0.843	0.384	3.201	7.66
3 ½	3.548	4.000	12.566	1.045	9.90	0.068	1.045	0.515	4.290	8.98
4	4.026	4.500	14.14	1.18	12.73	0.088	1.178	0.661	5.512	10.9
5	5.047	5.563	17.49	1.455	20.01	0.139	1.455	1.039	8.662	14.9
6	6.065	6.625	20.81	1.73	28.89	0.2	1.734	1.500	12.51	19.2
8	7.981	8.625	27.10	2.26	50.03	0.35	2.258	2.598	21.66	28.9
10	10.020	10.750	33.772	2.81	78.85	0.545	2.81	4.096	34.12	40.5
12	12.000	12.750	40.055	3.38	113.09	0.984	3.38	5.88	48.96	49.56

Mathematics for Plumbers and Pipefitters, Seventh Edition, Smith, L., Delmar Cengage Learning, 2008.

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SECTION	CONCEPT	QUESTION NUMBERS
1	Whole numbers	1-4, 10
	Decimals	5-9
	Ratio and proportion	11
	Positive and negative numbers	12-13
	Fractions	14-25
2	Metric and Imperial measures	1-2, 4-9
	Conversions (fractions, decimals, percents)	3, 15-17
	Exponents, scientific notation	11-14
	Order of operations	18-19
	Ratio and proportion	20-22
3	Percents	1-6
	Geometry (circles)	7
	Geometric (angles)	8-10
4	Geometric figures	1
	Formulae	2-4
	Geometry (Pythagorean Theorem 6-8-10 method)	5-6
	Trigonometry (angles and laws)	7-8

NAME: DATE:

Calculate the following:

1. 138 ft. + 164 = *302 ft.*

2. 34 in. - 18 = *16 in.*

3. 24 cm x 46 = *1104 cm*

4. 10.024 mm ÷ 24 = *417.6 mm*

5. .0067 in. + .2543 = *0.2610 in.*

6. 26 $ft.^3$ - .03 = *25.97* $ft.^3$

7. .034 L x.025 = 0*.0085 L*

8. 13.25 gal ÷ 25 = 0*.53 gal.*

9. You worked the following hours in one week: 8 hours, 12 hours, 9 hours, 10 hours and 7 hours. How many hours did you work in total? If you were paid $11.75 per hour for 40 hours and double time for any hours beyond 40, what was your gross pay for the week?

46 hours total *11.75 X 40 = $470.00* *= $611.00*

11.75 X 2 = $23.50 X 6 = 141.00

10. The pipe running from the main sewer to each house in a new subdivision is 45 feet long. If there are 1305 feet of pipe available at the site, how many homes can you hook up to the main line before you need more pipe?

1305 ÷ 45 = 29 homes

11. You need 16 hours to install 2,000 feet of pipe. Approximately how much time would you need to install 1,500 feet of pipe with the same tools and under the same conditions?

2000/16 = 125 ft./hr. *1500 x 125 = 12 hours*

12. In January, the temperature at your work site fell from +3° to -15° C during the day. How many degrees in total did the temperature drop?

18°C

13. If the water temperature of a boiler changed from 211° F to 104° F, how many degrees of heat have been lost?

107°F

14. 6 2/5 yd.
+ 1/5
6 3/5 yd.

15. $^{2}/_{3}$ ft.
+ ½
7/6 or
1 1/6 ft.

16. $^{7}/_{9}$ ft.
– $^{5}/_{9}$
2/9 ft.

17. 9/5 mm
X 7/8
63/40 or
1 23/40 mm

18. 2/5 mm
÷ 4/6
12/20 or
3/5 mm

19. 1 1/5 ft.
÷ 2 ½
12/25 ft.

Please give the mixed number equivalent or the improper fraction.

20. $\frac{10}{3}$ cm = *3 1/3 cm*

21. 5 7/8 in. = *47/8 in.*

Write an equivalent fraction. *Answers may vary*

22. 3/8" = *6/16"*

23. 2/3 ft. = *4/6 ft.*

24. If the inside diameter of a pipe is 6¼ cm and the outside diameter is 8 cm, how thick is the wall of the pipe?
.875 cm

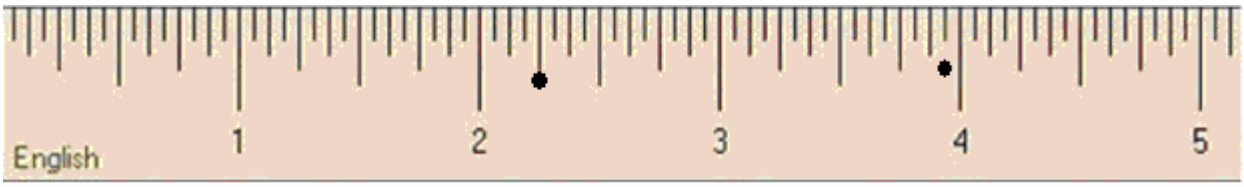
25. You are an apprentice who worked 1¾ hours at one job, 2 ¾ at another and 1 ½ at a third. You had an hour for lunch and two 15 minute breaks. If you work 8 hours a day, how much time would you have left to work that day?

1/2 hour

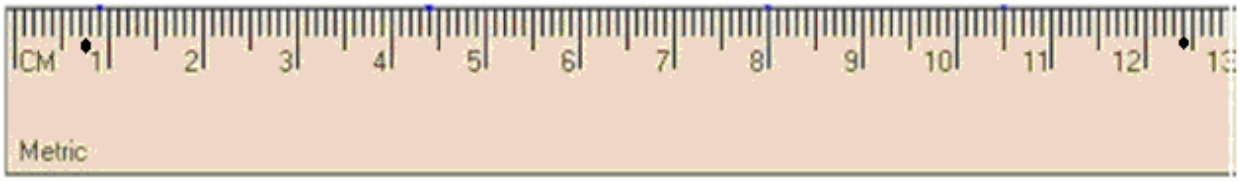
1 ¾
2 ¾
1 ½
1 ½
7 ½ hours

NAME: _____ DATE: _____

1. Show 2¼ inches and 3 15/16 inches on the Imperial tape below:



2. Show 7 mm and 12.4 cm on the tape below:



3. There are measurements missing in the chart below. Complete the chart with the correct measurements.

Fraction	Decimal	Percent
½	.5	*50%*
¼	0.25	25%
1/8	*0.125*	*12.5%*
15/16	.9375	93.75%

Convert the following measurements of length:

1 inch = 2.54 cm
1 ft. = 30.48 cm
1 ft. = 12 in.

4. 12 ft. = _*144*_ in.
5. 8 ft. 6 in. = _*102*_ in.
6. 10 in. = _*25.4*_ cm
7. 0.45 cm = _*.0045*_ m
8. 65 cm = _*650*_ mm
9. 6 in. = _*15.24*_ cm
10. 91.44 cm = _*3*_ ft.

What is the value of:

11. 5^2 in. = *25* in. 12. 6^3 mm = *216* mm 13. 3^4 mm = *81 mm*

14. 10^5 yd. = *100,000* yd.

15. Change 1 1/16 to decimal inches. *1.0625"*

16. Change 1.78 feet so it can be measured on a rule. *1 ft. 9 in.*
.78 X 12 – (round up)

17. Change 0.725 to the nearest 16th inch. __ *12/16*
.725 x 16 (round up)

Calculate the following:

18. 9 x 6 -24 + 40 ÷ 8 + 3 x 2 mm = *41* mm

19. 36 ÷ 6 + 3(5 x 5) in. = *81* in.

20. If a drain pipe falls 3 inches over a distance of 12 feet, what is the fall per foot? *1/4" per foot*

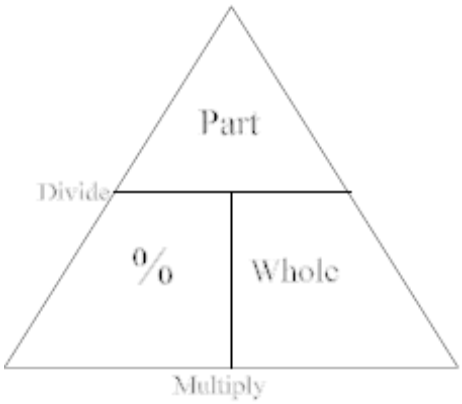
21. If it takes you 70 minutes to travel 35 km to a work site, how long will it take you to travel 85 km at the same speed?
170 mins. (2 hrs., 50 min.)

22. Fill in the missing scales and ratios missing from the chart below.

Scale and Ratio

Imperial		**Metric**	
3/32 inch = 1 ft.	1:128 ratio	1 mm = 2 mm	1:2 ratio
1/8 inch = 1 ft.	***1:96***	1 mm = 5 mm	1:5 ratio
3/16 = 1 ft.	1:64 ratio	1 mm = 10 mm	***1:10***
¼ inch = 1 ft.	1:48 ratio	1 mm = 20 mm	1:20 ratio
3/8 inch = 1 ft.	***1:32***	***1 mm = 30 mm***	1:30 ratio
½ inch = 1 ft.	***1:24***	1 mm = 50 mm	1:50 ratio
¾ inch = 1 ft.	1:16 ratio	1 mm = 100 mm	***1:100***
1 inch = 1 ft.	1:12 ratio	1 mm = 200 mm	1:200 ratio
		1 mm = 500 mm	1:500 ratio
		1 mm = 1000 mm	1:1000 ratio

NAME: _____ DATE: _____



Calculate the following (you may use the above triangle formula).

1. What is 35% of $520.00? *$182.00*

2. 32 cm is 16% of what number? *200*

3. What percent is 5 of $7.00? *71.4%*

4. A furnace has an input rating of 120,000 BTU and an output rating of 90,000 BTU. What is the efficiency rating of the furnace itself?

   75%

5. If 30 fittings are bought at $4.90 each and discounts of 15%, 10% and 5% are given, what is the net invoice cost?

   $106.83

   4.90 X 30 = 147.00
   Less 15% 22.05
   124.95
   Less 10% 12.50
   112.45
   Less 5% 5.62
   $1 06.83

6. A 25 m run of piping is to be graded down at 2 %. Calculate the amount of the drop over the entire length of the line.

   0.5 m

7. On the flange shown below, identify the labelled parts.

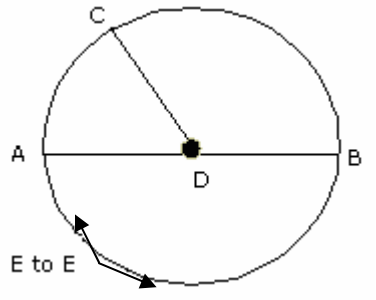
a) ADB *diameter*

b) ADC *section*

c) AD *radius*

d) AC *arc*

e) E to E *circumference*



8. Estimate the size of the angles as indicated on the elbow in Figure 1.

a) 180°

b) 11 ¼°

c) 22 ½°

d) 45°

e) 60°

f) 90°

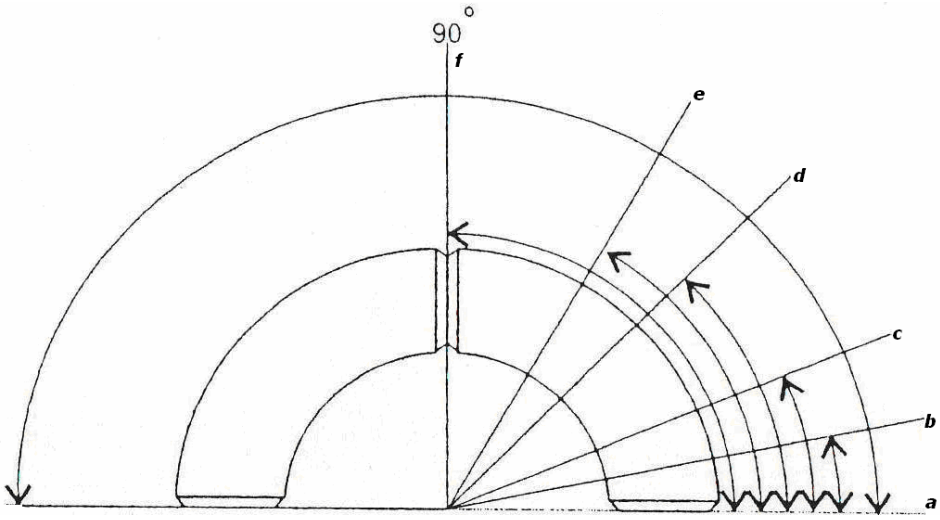
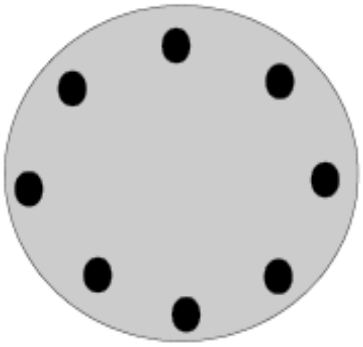


Figure 1

9. A bend is a fraction of a circle. The bend equals the fitting angle divided by 360°. Complete the figures missing from the following table:

Fitting Angle	Complementary Angle	Bend
90°	0°	1/4
72°	***18°***	***1/5***
60°	30°	1/6
45°	***45°***	***1/8***
22 ½°	***67 ½°***	***1/16***
11 ¼°	***78 ¾°***	***1/32***

10. This is an 8-hole blind flange. How many degrees are between the centres of each hole?



45°

NAME: _____ DATE: _____

1. Identify each shape.

a) ___*rectangle*

b) ___*hexagon*

c) ___*cube*___

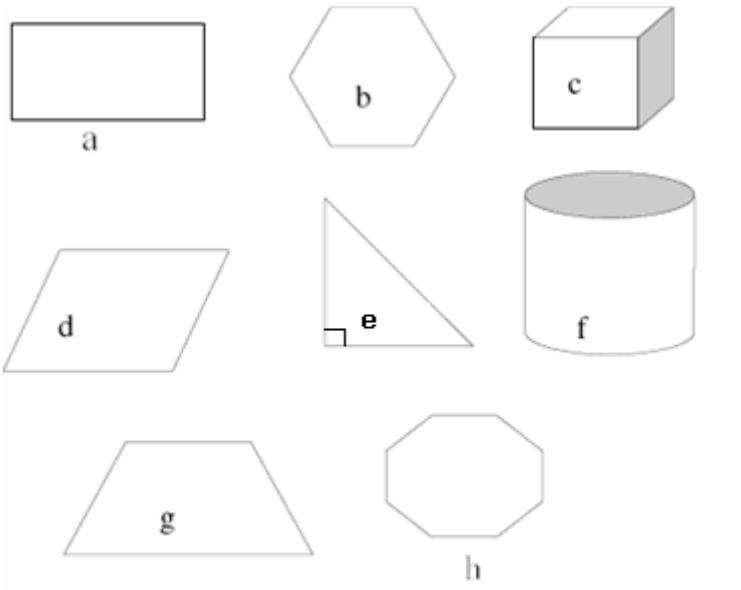
d) ___*parallelogram*

e) ___*right angle triangle*

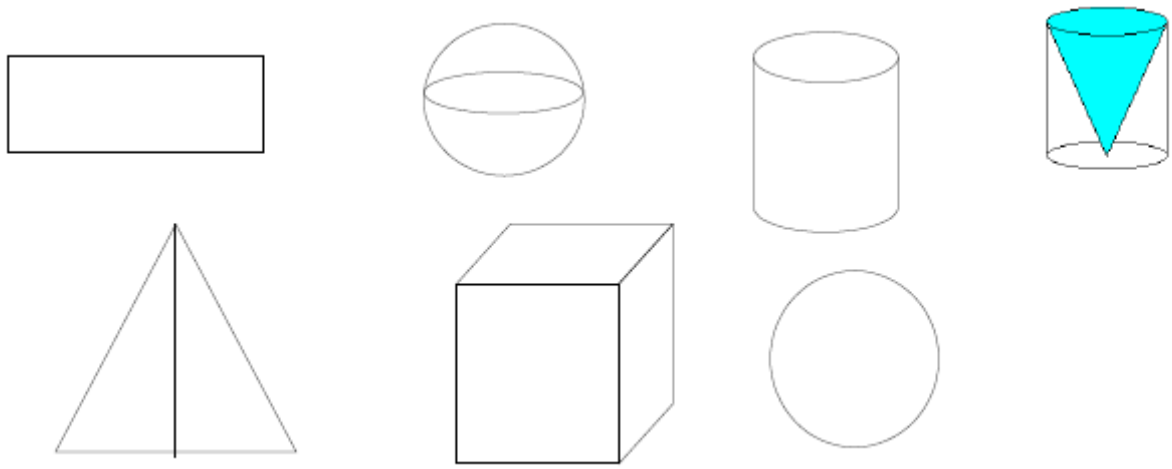
f) ___*cylinder*

g) ___*trapezoid*

h) ___*octagon*

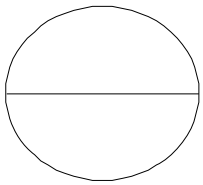


2. Using the diagrams as a guide, match the formula to the appropriate description by putting the correct letter on the lines on the following page.



1. p	$= 2l + 2w$	*h*	a.	area of a triangle
2. V	$= s^3$	*d*	b.	circumference of a circle
3. A	$= \pi r^2$	*c*	c.	area of a circle
4. V	$= \pi r^2 h$	*g*	d.	volume of a cube
5.	$A = \frac{1}{2}$ bh	*a*	e.	area of a rectangle
6. V	$= 4/3 \pi r^3$	*f*	f.	volume of a sphere
7. C	$= \pi$ d	*b*	g.	volume of a cylinder
8. A	$= lw$	*e*	h.	perimeter of a rectangle

3. a) Using the formula $C = \pi D$, what is the circumference of the pipe below, if $\pi = 3.14$ and D = 3 cm?



9.42 cm

b) If the circumference is 9, what is the diameter? *2.86 cm*

4. Your time card shows that you worked 9 hours each day for 5 days at $11.45 per hour.

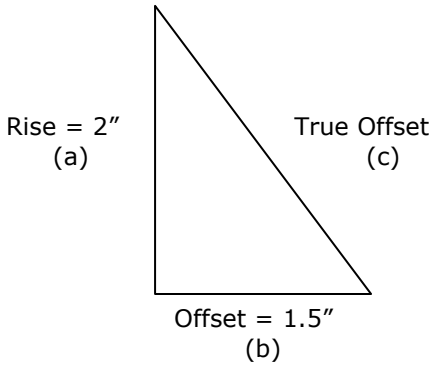
a) Write a formula that you can use to determine your gross pay.

P = hrd

b) Calculate your pay for the week.

$515.25

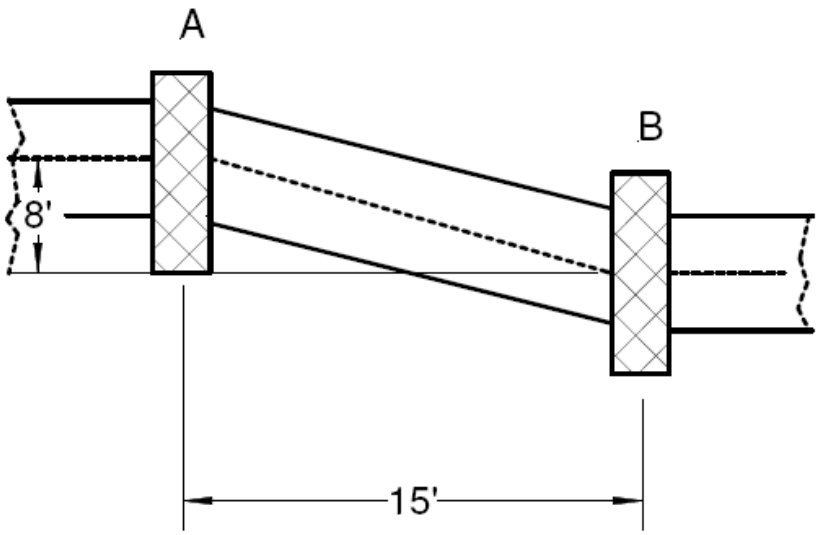
5. Use the formula $a^2 + b^2 = c^2$ to determine the "true offset" of this piping layout.



2.5"

$a^2 + b^2 = c^2$
$(2)^2 + (1.5)^2 = c^2$
$4 + 2.25 = c^2$
$c = \sqrt{6.25}$
$c = 2.5"$

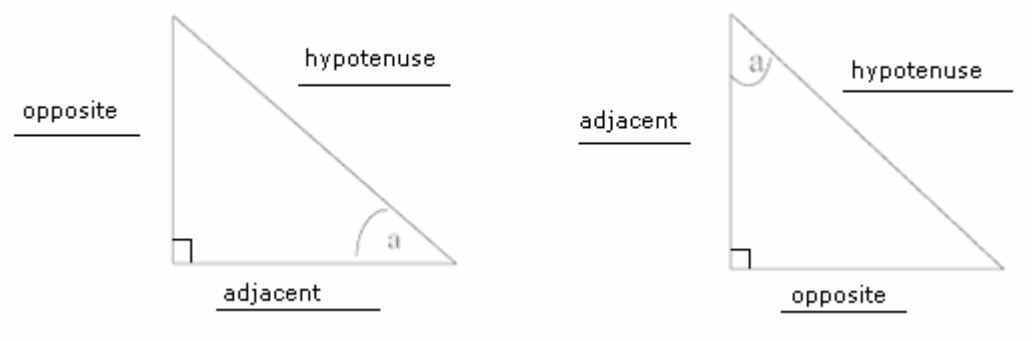
6. The drawing below shows a length of sewer pipe. Find the length of the pipe from collar A to collar B. The horizontal distance is 15' and the vertical distance is 8'. (Use the formula $a^2 + b^2 = c^2$)



17'

$AB^2 = (8)^2 + (15)^2$
$= 64 + 225 = 289$
$AB = \sqrt{289}$
$AB = 17'$

7. In the diagrams below, **a** represents the angle of reference. Identify the opposite, adjacent and hypotenuse sides for each of the figures.



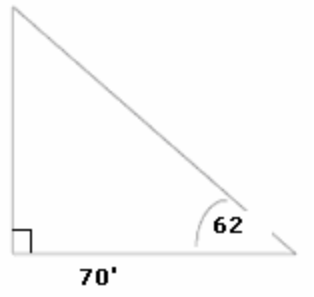
8. You are standing 70 feet from a tower. The angle of elevation to the top of the tower is 62°. You need to know the height of the tower. (Include a sketch of the problem with your answer).

135.5 ft. high

Tan = $\frac{\text{opposite}}{\text{Adjacent}}$ = 1.88 = $\frac{x}{70}$

X = 70 X 1.88

= 135.5 ft. high



ASSESSOR'S ANSWER KEY

STEAMFITTER/PIPEFITTER

Oral Communication

Speaking scale

This scale is to be completed by you, the assessor, during the course of the Essential Skills Inventory. While you may not have the opportunity to assess all the skills, you will be able to rate most of them. This scale may also be particularly helpful with those for whom English is not their first language and may be used to different cultural norms.

Examples of oral communication tasks

These are examples taken directly from the Essential Skill Profiles and range in complexity from simple to complex. The self–rating scale mirrors the stages of learning or skill building.

NAME: _____ DATE: _____

**** To be completed by the Assessor – not the Learner***

Speaking Skills Rating Scale

		Improvement Needed	Acceptable	Very good
1.	Is comfortable communicating orally (i.e., body posture and facial expressions are appropriate)	☐	☐	☐
2.	Maintains eye contact	☐	☐	☐
3.	Waits for his/her turn to speak	☐	☐	☐
4.	Willingly and confidently engages in conversation	☐	☐	☐
5.	Performs social courtesies, such as greeting others, using titles and making introductions	☐	☐	☐
6.	Speaks at an appropriate volume	☐	☐	☐
7.	Rate of speech is understandable	☐	☐	☐
8.	Adjusts voice inflection for statements, requests, directions, exclamations and questions	☐	☐	☐
9.	Pronounces words clearly	☐	☐	☐
10.	Does not use stalling devices such as "uh", "you know", etc.	☐	☐	☐
11.	Does not say the same thing twice	☐	☐	☐
12.	Uses words and phrases related to the subject	☐	☐	☐
13.	Has a good vocabulary	☐	☐	☐
14.	Speaks in complete sentences of appropriate length	☐	☐	☐
15.	Uses good grammar	☐	☐	☐
16.	Maintains focus on the subject	☐	☐	☐
17.	Gives appropriate responses to questions	☐	☐	☐
18.	Is aware of listener's reaction and responds appropriately	☐	☐	☐
19.	Talks "with" rather than "at" a person	☐	☐	☐

In your work as a Steamfitter/Pipefitter, you may have to deal with a noisy workplace. However, it is still very important to speak with and listen to those with whom you work.

Please rate yourself on your ability to do the following work tasks:

		Need help	Can do alone	Can help an apprentice
1.	Speak with coworkers and supervisors at project meetings.	☐	☐	☐
2.	Speak with other pipefitters to coordinate work on different systems.	☐	☐	☐
3.	Communicate with other tradespeople such as welders and plumbers to make requests or coordinate tasks.	☐	☐	☐
4.	Talk with an engineer to discuss a problem.	☐	☐	☐

http://srv108.services.gc.ca., Essential Skills Profile for Steamfitter-Pipefitter HRSDC)

ASSESSOR'S ANSWER KEY

STEAMFITTER/PIPEFITTER

Computer use

The computer use scale is not reflective of the computer use referenced in the Essential Skills Profile, however, there are basic computer skills required for survival in today's economy.

The scale used in this Inventory reflects those very basic skills.

COMPUTER USE

NAME: _____ DATE: _____

		YES	NO
1.	Do you use a computer at home?	☐	☐
	at work?	☐	☐
2.	Do you use any computerized equipment/ systems at work, for example, AutoCAD to make drawings for piping designs?	☐	☐
3.	Do you know the "language" used to describe computers, for example, monitor, software, hardware, word processing, data base, virus and SPAM?	☐	☐

4. Do you use a computer to:	Need help	Can do alone	Can help an apprentice
Search for information on the internet?	☐	☐	☐
Send and receive email, including attachments?	☐	☐	☐
Write a memo, letter or report (use word processing software)?	☐	☐	☐
Manage files and folders?	☐	☐	☐
Use a data base?	☐	☐	☐

ASSESSOR'S ANSWER KEY

STEAMFITTER/PIPEFITTER

Writing

The first questions in the writing section are examples taken directly from the Essential Skills Profile for the trade and range in difficulty from simple to more complex. The scale used for self assessment of these skills reflects the stages of learning: "need help, can do alone and can help an apprentice."

The second part requires the apprentice to provide a brief personal writing sample by composing 5-6 sentences.
Criteria for evaluating the sample are:

- Does the apprentice use print or cursive writing?
- Is the writing legible?
- Can the apprentice do the activity easily or does he/she struggle to write a sentence or two?
- Can the apprentice put his/her thoughts on paper in a logical order?
- Can the apprentice use punctuation correctly?
- Can the apprentice spell correctly?
- Can the apprentice use correct grammar?

NAME: _____ DATE: _____

As a Steamfitter/Pipefitter, you will be required to keep a written record of certain job tasks. Please rate yourself on your ability to accomplish the following:

		Need help	Can do alone	Can help an apprentice
1.	Write a list of all materials and fittings for a job.	☐	☐	☐
2.	Keep a daily log to record measurements and reminders.	☐	☐	☐
3.	Write an incident or an accident report of at least one paragraph.	☐	☐	☐
4.	Prepare a resumé.	☐	☐	☐

5. Please write 5-6 sentences about yourself.

_____

_____

_____

_____

_____

_____

http://srv108.services.gc.ca., Essential Skills Profile for Steamfitter-Pipefitter HRSDC)

Essential Skills Curriculum Instructor Guide

Trade essentials

More skills … more opportunities

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Appendix A - Lesson Plan Template

Appendix B – Essentials Skills for All Apprentices

1. Introduction

The Curriculum Guidebook is designed to provide support and practical advice to instructors who are delivering Essential Skills training, as well as to those who wish to incorporate Essential Skills into technical training. Currently, this Guidebook has been prepared for thirteen trades; however, the template can be adapted for use in any trade.

The thirteen trades include:

- Automotive Service Technician
- Cabinetmaker
- Carpenter
- Cook
- Construction Electrician
- Industrial Electrician
- Machinist
- Metal Fabricator
- Oil Burner Mechanic
- Plumber
- Refrigeration and Air Conditioning Mechanic
- Steamfitter-Pipefitter
- Welder

2. Why Essential Skills?

Essential Skills are needed for work, learning and life. They provide the foundation for learning all other skills and enable people to evolve with their jobs and adapt to workplace change.

Through extensive research, the Government of Canada and other national and international agencies have identified and validated nine essential skills. These skills are used in every occupation and throughout daily life in different ways.

- Reading Text
- Document Use
- Numeracy
- Oral Communication
- Writing
- Computer Use
- Thinking Skills
- Working with Others
- Continuous Learning

*The Trade Essentials curriculum materials currently uses **six** of these Essential Skills:* ***Reading, Document Use, Numeracy, Oral Communication, Writing and Computer Use***

For more information on Essential Skills, visit the website at www.hrsdc.gc.ca/essentialskills

Trade essentials
More skills ... more opportunities

Although the term 'Essential Skills' has been around for a number of years, there is growing recognition of the link between Essential Skills and success in the trades. Essential Skills are used in every occupation and more specifically, in every trade, but they are used in different ways and at varying degrees of difficulty.

These skills are not technical skills though they may be taught using materials or examples from a particular trade. Rather, they are the foundational skills that exist in all occupations. The six Essential skills outlined above were used in the creation of materials for the Trade Essentials project.

The Curriculum Frameworks identify the Essential Skills requirements for thirteen trades and provide concrete examples of how these skills are utilized in each trade.

The Essential Skill requirements are based primarily on HRSDC's Essential Skills profiles www.hrsdc.gc.ca/essentialskills and the National Occupational Analyses. (http://www.red-seal.ca/tr.1d.2n.4adeta.3l@-eng.jsp?tid=230
They have been reviewed and validated by certified tradespeople and supplemented by additional research gathered from the Trade Essentials project.

3. Instructor Requirements

To be effective, curriculum development and delivery must be guided by the principles of adult education. Learners in the Essential Skills programs will have a wide variety of backgrounds, work experience, education and work-related credentials. Many of these learners will be employed in full time positions with additional responsibilities outside of work. It is critical for the instructor to understand the unique requirements of adult learners and be prepared with challenging, relevant and engaging learning activities.

- Instructors must have knowledge and experience in the area of adult education.
- Instructors should have experience in working in a multi-level classroom environment.
- Instructors must be familiar with Essential Skills, how Essential Skills are used in the trades, and with the trade itself. Red Seal certification is encouraged.
- Instructors must be able to provide the link between Essential Skills and the trade and will provide a trade context from their own experience and expertise. In some instances a team approach with both an Essential Skills and a trades instructor may be preferable.
- It is important that those who presently provide technical training also receive training to increase their understanding of Essential Skills.

4. Curriculum Development

The curriculum frameworks are derived from an outcomes-based approach to learning focusing on the *outcome* of the intervention or course of study-what the learner will be able to do or will know at the end of the intervention. They have been developed to

support individual learning needs in each of the six Essential Skills and are the generic **Essential Skills Maps** for all thirteen trades included in the Trade Essentials project.

The following describes the structure and components of the curriculum frameworks developed for apprentices at the Trade Essentials Centre.

Learning Category

A Learning Category (as defined by Trade Essentials) is a general curriculum outcome and is one of the six Essential Skills identified for development in the Trade Essentials project: Reading Text, Document Use, Numeracy, Oral Communication, Computer Use and Writing. It appears in the top band across each of the six frameworks as shown in the example below.

Note: Reading Text will be referred to as Technical Reading in all frameworks

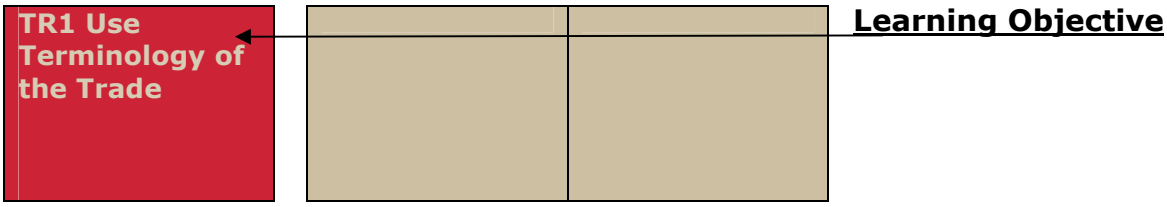
Learning Outcome

A Learning Outcome is a specific curriculum outcome and describes what a learner should know or be able to do as the result of a course of study. Trade Essentials has identified one Learning Outcome for each Learning Category. The learning outcome statement appears below the Learning Category. For example, the learning outcome in the Trade Essentials Technical Reading Framework is:

Learners will locate, recall, understand and interpret information in written text

Learning Objective

Learning objectives are the standards or benchmarks that identify what learners will know or will be able to do as the result of the completion of a number of related competencies in a particular "band". In the example below, the objective for the band is: *TR1 – Use Terminology of the Trade (Burgundy Box)*.



Competency

While an objective describes 'what' we expect learners to achieve, competencies identify 'how' learners can achieve that objective. Competencies are specific activities used to measure whether or not learners have mastered the objective. In Table 1 below, the learner must master competencies 2.1 and 2.2 (taupe boxes) to demonstrate mastery of the objective. Where objectives demonstrate the end result, competencies are a means to that end.

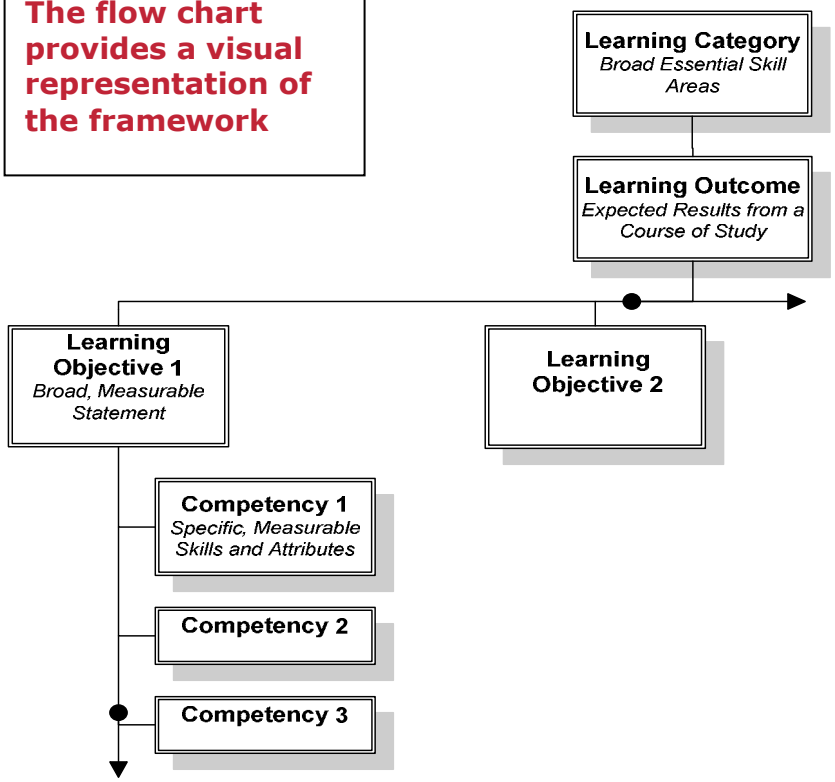
Competencies provide a framework for selecting instructional materials and techniques and provide a basis for determining when instruction has been successful.

Table 1

TR2 Use Strategies to Improve Understanding and Recall	**2.1 Identify strategies to improve understanding and recall of written information**	**2.2 Implement strategies to improve understanding and recall of written information**	**Competency**

Curriculum Overview

The flow chart provides a visual representation of the framework



One of Six Essential Skills areas as defined in the curriculum frameworks: Numeracy, Reading Text, Document Use, Computer Use, Writing, and Oral Communication

Describes what a learner should know or be able to do as the result of a course of study. One Learning Outcome describes one Learning Category

Learning Objectives identify what a learner will know or will be able to do as a result of a learning activity. There will be several Learning Objectives for each Learning Outcome.

Competencies are specific activities that are used to measure whether or not learners have mastered the objectives described in a course of study. They outline what a learner must master in order to achieve the Objective. There are several Competencies associated with each Learning Objective.

5. Curriculum Resources

Three types of resources are identified in the curriculum guidelines: *non-contextualized, contextualized, and technical.* These resources have been listed throughout the guidelines. It is not intended that instructors use all of the resources outlined but, instead, choose material and deliver its content as it best suits individual learner needs.

Non-contextualized resources are not related to any trade or occupation. These resources may be used to review the competencies in a stand-alone manner before transferring the skill to trade-related materials. They can be useful when learners have identified literacy challenges or when basic strategies need to be understood before applying them to higher order learning.

Contextualized resources provide Essential Skills applications in the context of a specific trade or occupation and are generally written at a more basic level than technical materials. They are particularly useful when learners have identified Essential Skills gaps but can only identify relevance/motivation to the task if it is related to their specific trade.

Technical resources are trades training materials from which Essential Skills can be extracted. These resources are written at a higher reading level than non-contextualized and contextualized resources and can often be found in block release training and college trade programs. Generally, learners who would benefit from these materials have few Essential Skills gaps in their learning.

6. Preparation and Delivery

Instructors will be provided with a complete copy of the Essential Skills Frameworks associated with the trades/courses for which they are responsible. Instructors will use essential skills assessment information to build a learning session for one client or a group of clients.

The instructor will be required to prepare lesson plans as a tool to organize and plan the delivery of training. A lesson plan template in included in Appendix A. A brief description of each section of the lesson plan is included in the attached template to serve as a guide. The instructor may add additional notes and documents as required. Completed lesson plans should be kept on file to provide continuity in subsequent sessions.

It is important to note that, even though objectives and competencies progress from least to most difficult, instruction need not move in a linear fashion. In recognition of their prior knowledge, learners may begin their study at any objective in the curriculum frameworks, may not require instruction in all of the competencies in each band, and/or may simultaneously complete competencies in all six Essential Skill curriculum frameworks.

Learners who have extensive Essential Skills gaps may require that the curriculum framework be followed using a linear approach beginning with the least complex objectives.

The curriculum frameworks are applicable to all thirteen trades identified for the project. For instance, though "U*sing Documents"* is identified as important to both cooks and carpenters; however, the way documents are used in the trade is what makes them relevant to that specific trade.

The exception is "Numeracy" where not all objectives listed are required in all thirteen trades. For example, a cook may not be required to master all of the learning objectives outlined in the framework whereas a machinist requires mastery of all. Appendix B includes a checklist of the skills required for each particular trade.

The guidelines define objectives and competencies and identify matching resources. The instructor can then use these resources to develop lesson plans that best suit the needs of their particular audience.

Though frameworks are written in academic language (at an academic level), the intent is that the objectives and competencies be taught using **trade specific examples**. Curriculum frameworks may be delivered one-on-one or in a group learning environment.

6.1 Approaches to Delivery

The delivery approach can be **stand alone** or **cross curricular**, depending on the needs of the client or client group.

A **stand alone approach** involves using any one of the curriculum frameworks in its entirety as a stand alone course. For example, carpenters who have been away from the classroom for a long time may benefit from a review of the complete Numeracy framework and focus solely on that Essential Skill.

Others, including those who have achieved journey person status, may require a Computer Course or a course in Oral Communication to improve their skills in dealing with customers or in mentoring new apprentices.

It is assumed that in many classroom situations instructors will use a **cross-curricular approach** to develop a number of skills at the same time.

All students will benefit from instruction in how to understand and retain information from trade-related materials. For example, using the codebook for locating information can address both technical reading and document use. An activity which requires the learner to complete an invoice may provide the opportunity to incorporate technical reading, writing, document use and numeracy in one exercise.

It is intended that Essential Skills can be embedded in the curriculum wherever possible and that instruction in many of the skill areas will not be time-tabled as such. It has

been proven that a learning environment that provides opportunity for discussion and interaction among learners will improve comprehension and long-term memory.

7. Measuring Learning: Instructor's Role in Evaluation

There are a number of informal methods that could be used periodically by the instructor to ensure progress. It is important to note that measurement is not based on a "Pass-Fail;" it is understood that the learner sees the value in improving their skill level and will continue to develop their skills until they are comfortable and confident in performing the required tasks.

Informal Evaluation Methods:

- Provide opportunities and simple recording forms for the learner to assess their progress.
- Review individual assessments on a regular basis against the curricula framework
- Pay particular attention to those identified as potential "early leavers" to ensure they are moving forward as anticipated.
- Pay attention to those who experience unanticipated difficulties in the group environment.
- Document observations of performance in class
- Develop a rubrics for a particular objective that can be shared with students

Formal Evaluation:

- Where a more formal evaluation approach is desired, the instructors or learners could design and complete a structured checklist (see sample checklist in Appendices). Mastery of skills at the highest level using the application to the trade would demonstrate that the learner meets trade requirements.

8. Intervention Timeframe

The Trade Essentials interventions have been developed for individualized learning; therefore, no set time period has been determined for the delivery of the material. Learners' prior knowledge and time necessary to learn or relearn skills should determine the length of time spent in the intervention. For that purpose, a continuous exit policy should be implemented into all programs. There may be a mixture of "early leavers" (those identified as having few or isolated essential skills gaps), with those who have broader range of needs.

Appendix A

Trade Essentials
Lesson Plan Template

Course Title:		**Dates:**	
Instructor:		**Location:**	

Session Topic(s):		**Duration:**	

Session Description:
Describe what you plan to accomplish during the session or group of sessions. Why is this learning important? What is the context for the learning?

Learning Outcomes, Objectives, and Competencies:
List or attach the specific or related Learning Outcomes, Objectives, and Competency statements (from the framework) here.

Assessment and Evaluation Strategies:
Outline or attach learner evaluation strategies that align with specific Learning Outcome, Objectives, and Competencies. Pre- or post-tests; in-class exercises; individual skill inventories; etc.

Teaching Points and Organization:	
Time	Content and Delivery Method
7:00-7:15 7:15-8:00 8:00-8:15 8:15-8:20	Use this section to prepare a schedule of learning activities and events. For example: Use bridge-in activity (describe activity) to gain student interest and prepare them to learn Using carpentry estimating handout, have students work on assignment in groups of 2 then debrief assignment Break Energizer activity (describe activity) to refocus students on learning …..

Resources and Materials Required:
List resources and materials you will use during this session. If applicable, attach copies, descriptions or links to items such as handouts, assignments, demonstration equipment, websites, readings, activities or other specific resources for instructor and/or student use.

Accommodations:
Describe any teaching/learning accommodations that may be implemented in this session to support learner diversity.

Reflective Notes:
How did the session go? What worked well and what work not so well? Outline any ideas for improvement that can be made for the next session.

Appendix B – Essential Skills for All Apprentices

	Automotive Service Tech	Carpenter	Cabinet Maker	Construction Electrician	Cook	Industrial Electrician	Machinist
PM1 Use Calculators	✓	✓	✓	✓	✓	✓	✓
PM2 Use Positive and Negative Numbers	✓	✓	Whole numbers only	✓	✓	✓	✓
PM3 Use Order of Operations	✓	✓	✓	✓	✓	✓	✓
PM4 Use Fractions	✓	✓	✓	✓	✓	✓	✓
PM5 Use Mixed Numbers	✓	✓	✓	✓	✓	✓	✓
PM6 Use Decimals	✓	✓	✓	✓	✓	✓	✓
PM7 Use Percent	✓	✓	✓	✓	✓	✓	✓
PM8 Use Conversion	✓	✓	✓	✓	✓	✓	✓
PM9 Use Measurement Systems	✓	✓	✓	✓	✓	✓	✓
PM10 Use Rate, Ratio and Proportion	✓	✓	✓	✓	✓	✓	✓
PM11 Use Square Root and Exponents	✓	✓	-	✓	-	✓	✓
PM12 Solve Equations	✓	✓	✓	✓	✓	✓	✓
PM13 Use Trade-Related Formulae	✓	✓	✓	✓	✓	✓	✓
PM14 Use Estimation	✓	✓	✓	✓	✓	✓	✓
PM15 Use Angles	✓	✓	✓	✓	✓	✓	✓
PM16 Use Geometric Shapes	✓	✓	✓	✓	-	✓	✓
PM17 Use Trigonometry	✓	✓	✓	✓	-	✓	✓
PM18 Analyze Numerical Data	✓	-	-	-	✓	-	✓

	Metal Fabricator	Plumber	Refrigeration & Air Conditioning Mechanic	Oil Burner Mechanic	Steamfitter / Pipefitter	Welder
PM1 Use Calculators	✓	✓	✓	✓	✓	✓
PM2 Use Positive and Negative Numbers	✓	✓	✓	✓	✓	✓
PM3 Use Order of Operations	✓	✓	✓	✓	✓	✓
PM4 Use Fractions	✓	✓	✓	✓	✓	✓
PM5 Use Mixed Numbers	✓	✓	✓	✓	✓	✓
PM6 Use Decimals	✓	✓	✓	✓	✓	✓
PM7 Use Percent	-	-	✓	✓	✓	✓
PM8 Use Conversion	-	✓	✓	✓	✓	✓
PM9 Use Measurement Systems	✓	✓	✓	✓	✓	✓
PM10 Use Rate, Ratio and Proportion	-	No proportion	✓	✓	✓	No proportion
PM11 Use Square Root and Exponents	-	-	✓	✓	✓	✓
PM12 Solve Equations	-	Plus quadratic equations	✓	✓	✓	✓
PM13 Use Trade-Related Formulae	✓	✓	✓	✓	✓	✓
PM14 Use Estimation	✓	✓	✓	✓	✓	✓
PM15 Use Angles	✓	✓	✓	✓	✓	✓
PM16 Use Geometric Shapes	✓	✓	✓	✓	✓	✓
PM17 Use Trigonometry	✓	✓	✓	✓	✓	✓
PM18 Analyze Numerical Data	-	-	✓	✓	-	-

Curriculum Frameworks and Guidelines

Trade essentials
More skills … more opportunities

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NOC 7251/7252

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Technical Reading (TR) Learning Outcome: Learners will locate, recall, understand and interpret information in written text

TR1 Use Terminology of the Trade	**1.1 Identify strategies to organize and remember new terminology**	**1.2 Implement strategies to organize and remember new terminology**				
TR2 Use Strategies to Improve Understanding and Recall	**2.1 Identify strategies to improve understanding and recall of written information**	**2.2 Implement strategies to improve understanding and recall of written information**				
TR3 Read to Perform Job Tasks	**3.1 Identify purpose of reading information to perform job tasks**	**3.2 Locate specific information**	**3.3 Skim for overall meaning**	**3.4 Read to understand and learn**	**3.5 Read to critique**	**3.6 Read to evaluate**
TR4 Improve Examination Performance	**4.1 Identify barriers to successful examination performance**	**4.2 Identify strategies to improve examination performance**	**4.3 Implement strategies to improve examination performance**			

Learners will locate, recall, understand and interpret information in written text

Introduction

Readers of all abilities can benefit from practice in the use of comprehension strategies proven to be habits of effective readers. Success in technical training and in the trades requires that apprentices understand, connect with and recall important information. Knowing the language of the trade and developing strategies to quickly locate specific information in reading materials such as code books, manuals and texts will not only increase reader comprehension but also productivity on the job.

Just as it is important to think about reading and study habits, it is important to think about strategies to be used during the exam writing. Whether writing tests that are required during technical training or getting ready to write the Red Seal certification exam, adequate test preparation is essential. As multiple choice testing is the most common form of assessment for certification, knowing how multiple choice questions are constructed and applying strategies for responding can significantly improve test scores.

Technical Reading in the Steamfitting-Pipefitting and Plumbing Trades

Steamfitters-pipefitters and plumbers use technical reading on a daily basis to complete job tasks. The complexity of these reading tasks, according to Human Resources and Skills Development Canada's Essential Skills profiles (http://srv108.services.gc.ca/) varies slightly between steamfitters-pipefitters and plumbers. The complexity of tasks performed by steamfitters-pipefitters ranges from reading short texts to locating a single piece of information (i.e., read minutes of project meetings or memos to stay current on project decisions) to integrating and synthesizing information from multiple sources or from complex and lengthy text (i.e., refer to and read multiple professional codes to ensure that the process followed meets industry requirements.)

The complexity of tasks performed by plumbers ranges from reading short texts to locate a single piece of information (i.e., read brochures from suppliers to obtain information on materials) to choosing and integrating information from various sources or from several parts of a single text (i.e., read project specifications at the outset of a job to plan work and to identify potential problems and risks).

Steamfitter-pipefitters read manufacturers' manuals for instructions on using, installing, maintaining and troubleshooting equipment. They read pipefitting textbooks to understand when a specific system is appropriate and also to review

technical procedures. They must be able to identify the sequence of tasks in order to follow procedures such as flushing or cleaning.

Plumbers read manuals to install, repair and maintain plumbing fixtures and systems. They read textbooks to understand the science of the trade and to interpret laws and regulations on workplace health and safety. They refer to and read the Canadian Plumbing Code to ensure that the process they follow meets industry requirements and complies with municipal bylaws and other codes. In many cases, the text used by both steamfitters-pipefitters and plumbers is complex, lengthy and technical.

Introduction to the Curriculum Guide

Success in technical training and performance on the job requires that apprentices have strong Essential Skills. Although all Essential Skills contribute to success, this guide is intended to help apprentices in the steamfitter-pipefitter and plumber trades develop the reading strategies necessary to locate, understand, interpret and recall information presented in a variety of text formats common to the trade.

It is assumed that the instruction for the Technical Reading course will not be time-tabled as such, but instructors will use a cross-curricular approach to incorporate reading strategies using the materials of the trade.

The following guide outlines a list of recommended resources (See Appendix A) for each objective in the Technical Reading curriculum framework and, where possible, includes online website materials that complement these resources. Three formats are provided to allow learners the opportunity to review competencies in a way that best suit their needs. These resources are categorized as follows:

- **Non-contextualized** - Curriculum resources that are **not** related to any trade or occupation. These resources may be used to review the competencies in a stand-alone manner before transferring the skill to trade-related materials.

- **Contextualized** - Curriculum resources that provide Essential Skills applications in the context of a specific trade or occupation.

- **Technical** - Trade training materials from which Essential Skills are extracted. For the purpose of the Trade Essentials project, ***Individual Learning Modules*** from Alberta Advanced Education were used as the primary technical resource.

Note: *Though only some modules are outlined as resources for specific objectives, all Individual Learning Modules can be used for the instruction of Essential Skills.*

The list of resources has been designed to act only as a guide and may, therefore, need to be adapted to meet the needs of individuals or groups. It is the role of you, the instructor, to choose materials and deliver its content as it best suits individual learner needs. A variety of materials are listed under each set of competencies for this purpose.

The following websites contain plumbing- and fitting-related as well as generic content which may be used as an additional reading forum.

Plumbing- and Fitting-Related Online Websites:

- www.heatinghelp.com/steam_problems.cfm (Heating Help)
- www.pipingdesign.com/ (Piping Design)
- www.ipexinc.com/Content/EN_CA/ (IPEX)
- www.allbusiness.com/construction/building-fixtures-mechanical-systems-hvac/6229374-1.html Steamfitter-Pipefitter information on various topics)
- www.process-heating.com/CDA/Archives/2bf9456e42368010VgnVCM100000f932a8c0 (Process heating)
- www.pmmag.com/ (Piping-related information)
- www.plumbingandhvac.ca/ (Plumbing and HVAC information)
- www.pipefitter.co.uk/home.htm (Piping-related information)
- www2.worksafebc.com/Portals/Construction/Home.asp?_from=construction.healthandsafetycentre.org (Preventing injuries and illnesses in construction trades)
- www.ua.org/ (United Association of Journeymen and Apprentices of the Plumbing, Pipefitting and Sprinkler Fitting Industry of the United States and Canada)
- http://www.acornpipe.com/information_links/Importing%20IDF%20Files.htm (Acorn Pipe Systems Inc.)
- http://www10.hrsdc.gc.ca/ES/English/ShowProfile.aspx?v=221 (HRSDC Essential Skills Profile – Steamfitter/Pipefitter)
- http://www10.hrsdc.gc.ca/ES/English/ShowProfile.aspx?v=223 (HRSDC Essential Skills Profile - Plumber)
- www.plumbingweb.com/pub.html (Plumbing-related publications)
- www.theplumber.com/ (Plumbing information on various topics)
- www.allplumbingweb.com/ (Waterproofing and Plumbing)
- www.pmmag.com/ (Piping-related information)
- www.plumbingmart.com/ (Plumbing information on various topics)
- www.ciph.com/ (Canadian Institute of Plumbing and Heating)
- www.plumbingandhvac.ca/ (Plumbing and HVAC information)
- www.plumbing.ca/ (Plumbing information on various topics)
- www.b4ubuild.com/links/plumbing.shtml (Plumbing information on various topics)
- www2.worksafebc.com/Portals/Construction/Home.asp?_from=construction.healthandsafetycentre.org (Preventing injuries and illnesses in construction trades)
- www.advancedbuildings.org/ (Advanced buildings)

- www.ccbda.org/ (Canadian Copper and Brass Development Association)
- www.cwwa.ca/home_e.asp (Canadian Water and Wastewater Association)
- www.mcac.ca/ (Mechanical Contractors Association of Canada)
- www.phccweb.org/ (Plumbing Heating Cooling Contractors Association)
- www.pmihome.org/ (Plumbing Manufacturers Institute)
- www.diydata.com/plumbing/index.php (Plumbing-related information on various topics)
- www.ua.org/ (United Association of Journeymen and Apprentices of the Plumbing, Pipefitting and Sprinkler Fitting Industry of the United States and Canada)
- www.worldplumbing.org/ (World Plumbing Council)
- www.ciph.com/Your_Industry_Trade_Section/About_Us/ (Canadian Institute of Plumbing and Heating)

Generic Resources:

- http://www.hc-sc.gc.ca/ewh-semt/occup-travail/whmis-simdut/index-eng.php (WHMIS)
- www.wcb.pe.ca/index.php3?number=60189 (Worker's Compensation Board of PEI)
- www.gov.pe.ca/educ/index.php3?number=74951 (PEI Apprenticeship Training)
- www.nationalcodes.ca/ (National Code Documents)
- www.canoshweb.org/ (Canada's National Occupational Health and Safety Website)
- http://www2.worksafebc.com/Portals/Construction/Home.asp (Work Safe BC)
- http://employment.alberta.ca/cps/rde/xchg/hre/hs.xsl/364.html#1 (Alberta Employment and Immigration; Health and Safety Publications with links to other Associations)
- www.hrsdc.gc.ca/en/hip/hrp/essential_skills/essential_skills_index.shtml (Human Resources and Social Development Canada-Essential Skills Website)
- www.nationalcodes.ca (National Research Center)
- www.red-seal.ca/Site/index_e.htm (The Interprovincial Standards Red Seal Program)
- http://trades.exambank.com/carpentry.html (Trades Exam Bank)
- http://www.hrsdc.gc.ca/en/labour/workplace_health/index.shtml (Workplace Health and Safety)

TR1 Use Terminology

Upon completion of this objective, learners will be able to:

1.1 Identify strategies to organize and remember new terminology
- use context clues to find the meaning of new terms
- use word parts to create meaning
- use trades glossary to find meaning of technical terms
- use standard dictionary to find meaning of non-technical terms

1.2 Implement strategies to organize and remember new terminology
- define terms
- use terminology in context

Suggested Strategies and Activities:

- identify and define terms unique to the trade
- highlight unfamiliar terms in trade-related reading
- choose appropriate strategy to find meaning of unfamiliar terms
- demonstrate understanding of new terms by using in sentences, providing examples or providing illustrations
- create a personal dictionary
- use graphic organizers to remember terms of the trade
- interpret acronyms and abbreviations of the steamfitter-pipefitter and plumber trades
- use terminology as it applies to materials, schedules and piping systems

Non-contextualized Resources:

- Shape Up Your Reading
- Cross Curricular Reading Tools (Vocabulary Study)
- Navigating Texts and Documents in Technical Training

Contextualized Resources:

- EARAT (Communications for Plumber Apprentices: Skill #2)

Technical Resources:

- IPT's Metal Trades and Welding Handbook
- Glossary of Housing Terms
- Building Trades Dictionary
- National Occupational Analysis (NOA) for Steamfitter-Pipefitters and Plumbers
- Blueprint Reading and Drafting for Plumbers, 2nd Edition
- Individual Learning Module 060104a - Plumber- Introduction and Definitions – Heating - First Period

- Individual Learning Module 060403c – Plumber - DWV, Water Distribution and Fixtures for Residential Installation -Drain Waste and Venting- Fourth Period
- Individual Learning Module 060401a – Plumber - Introduction to Private Water Supply Systems - Private Water Supply Systems and Water Treatment - Fourth Period
- Individual Learning Module 060401e – Plumber - Introduction to Water Treatment - Private Water Supply Systems and Water Treatment - Fourth Period
- Individual Learning Module 060402a – Plumber - Cross-Connection Control Awareness-Special Applications - Fourth Period
- Individual Learning Module 070103a- Steamfitter-Pipefitter – Definitions – Heating - First Period
- Individual Learning Module 070101d - Steamfitter-Pipefitter - Glossary of Terms and Definitions-Low-Temperature Heating Systems- Second Period
- Individual Learning Module 070408b - Steamfitter-Pipefitter - Schematics-Blueprint Reading, Sketching and Drawing - Fourth Period
- Individual Learning Module 070405d - Steamfitter-Pipefitter - GTAW Welds on Mild Steel-Welding - Fourth Period
- Individual Learning Module 070408a - Steamfitter-Pipefitter – Orthographics - Blueprint Reading, Sketching and Drawing - Fourth Period
- Individual Learning Module 070403e - Steamfitter-Pipefitter - Basic Requirements of Specialty Systems-Process Piping and Specialty Systems - Fourth Period

Online Resources:

- http://www.edu.gov.on.ca/eng/tcu/adultlearning/ Reading Strategies for using context clues)

Online Glossaries:

- http://www.tradesecrets.gov.ab.ca/trades/pdf/trade_glossaries/007_glossary.pdf (Steamfitter-Pipefitter Glossary)
- http://www.red-seal.ca/Site/english/pdf/Steamfitter_Pipefitter_2007.pdf (NOA-Steamfitter-Pipefitter)
- http://www.tradesecrets.gov.ab.ca/trades/pdf/trade_glossaries/006_glossary.pdf (Plumbing Glossary)
- http://www.red-seal.ca/Site/english/pdf/Plumber_2003.pdf (NOA-Plumber)
- http://construction1.wordpress.com/2008/03/21/glossary-of-plumbing-terms/ (Plumbing Glossary)
- http://www.allplumbing.com/id63.html (Plumbing Glossary)
- http://www.tradesinfo.ca/en/trade-information/steamfitter-pipefitter/terminology (Steamfitter-Pipefitter Terminology)
- http://www.maintenanceresources.com/referencelibrary/pipefitting/pgot.htm (Pipefitting Reference Library)

TR2 Use Strategies to Improve Understanding and Recall

Upon completion of this learning objective, learners will be able to:

2.1 identify strategies to improve understanding and recall of written information
- use prior knowledge to make sense of new information
- use SQ3R
- use KWL
- use note-taking strategies
- use memory strategies

2.2 implement strategies to improve understanding and recall of written information

Suggested Strategies and Activities:

- identify individual learning style
- incorporate learning strategies for their learning style for study and class participation
- explain the steps to the SQ3R strategy
- explain and the steps to the KWL strategy
- model strategies and encourage learners to incorporate SQ3R and KWL into reading activities
- create and use charts for SQ3R and KWL
- use KWL in group settings to introduce new concepts
- apply techniques for note-taking and marking text
- assess and modify personal study habits/environment to incorporate new strategies

Non-contextualized Resources:

- Navigating Texts and Documents in Technical Training
- Shape Up Your Reading
- Cross Curricular Reading Tools

Technical Resources:

- All Individual Learning Modules

Online Resources:

- http://www.bucks.edu/~specpop/Lrnprfil.htm (Learning Styles and Study Skills)
- http://www.ldpride.net/learningstyles.MI.htm#Learning%20Styles%20Explained (Learning Styles)
- http://www.learning-styles-online.com/ (Learning Styles)
- http://www.support4learning.org.uk/education/learning_styles.cfm (Learning Styles)
- http://www.studygs.net/ (Reading and Study Strategies)
- http://www.khake.com/page3.html (Study Skills)
- http://www.mindtools.com/pages/article/newISS_02.htm (SQ3R)
- http://www.mindtools.com/pages/main/newMN_ISS.htm (Reading and Study Skills)
- http://www.edu.gov.on.ca/eng/studentsuccess/thinkliteracy/files/Reading.pdf (Reading Strategies)

TR3 Read to Perform Job Tasks

Upon completion of this objective, learners will be able to:

3.1 identify purpose of reading information to perform job tasks
3.2 locate specific information
- scan to locate specific information
- locate information using organizational features of text

3.3 skim for overall meaning
3.4 read to understand and learn
3.5 read to critique
3.6 read to evaluate

Suggested Strategies and Activities:

- Use organizational features to predict content and relevance of text
- Locate information using key words
- Scan for information in trade-related material (i.e., texts, memos, newsletters, safety information, equipment manuals, codes and regulations)
- Practice skimming to get the main idea in reading material of the trade (i.e., texts, memos, newsletters, safety information, equipment manuals, codes, specifications and regulations)
- Use Table of Contents, Indices, Appendices, Headings and Sub-headings to locate information in material of the trade (i.e., texts, collective agreements, manuals, codes, specifications and regulations)
- Introduce structure and layout of the National Building Code and Plumbing Code
- Use numbering system to identify exact location of information in National Building Code and Plumbing Code
- Read selections of text and provide a verbal or written summary
- Read specification sheets to determine project requirements
- Read installation manuals to follow procedures
- Compare the advantages and disadvantages of various tools or materials for a particular situation
- Use organizational features to predict content and relevance of text
- Interpret written procedures (i.e., housekeeping, first aid, handling toxic materials, lock-out, isolation, excavation, site safety, confined space and rigging)
- Read Occupational Health and Safety regulations to determine safe work practices
- Read and interpret codes, regulations and standards for compliance with regard to personal protective equipment, hoisting, fire codes, electrical codes, American Society of Mechanical Engineers (ASME), Canadian Standards Association (CSA)

Non-contextualized Resources:

- Shape Up Your Reading
- Navigating Texts and Documents in Technical Training
- Cross Curricular Reading Tools
- Study Smarter, Not Harder

Contextualized Resources:

- EARAT (Communications for Plumber Apprentices: Skill #1, 3, 4, 5, 7, 9-12)
- Applied Communication Skills for the Construction Trades

Technical Resources:

- IPT's Metal Trades and Welding Handbook
  - National Building Code of Canada 2005, Volume 2 (12th edition)
  - National Housing Code of Canada 1998 and Illustrated Guide
  - National Plumbing Code of Canada 2005
- Individual Learning Module 060104a - Plumber- Introduction and Definitions – Heating - First Period
- Individual Learning Module 060403a – Plumber - Interceptors and Indirect Waste - Drain Waste and Venting - Fourth Period
- Individual Learning Module 060403c – Plumber - DWV, Water Distribution and Fixtures for Residential Installation - Drain Waste and Venting - Fourth Period
- Individual Learning Module 060403d – Plumber - Specialty Plumbing Fixtures - Drain Waste and Venting - Fourth Period
- Individual Learning Module 060403e – Plumber - Commercial Equipment Installation-Drain Waste and Venting - Fourth Period
- Individual Learning Module 060405a – Plumber - Low-Pressure Gas Line Layout Including Venting and Air Supply - Gasfitting Theory and Lab - Fourth Period
- Individual Learning Module 060402a – Plumber - Cross-Connection Control Awareness - Special Applications - Fourth Period
- Individual Learning Module 060405c – Plumber - Customer Bulk Storage Tank Installation and Vaporizers - Gasfitting Theory and Lab - Fourth Period
- Individual Learning Module 060405d – Plumber - Additional Flues and Vents - Gasfitting Theory and Lab - Fourth Period
- Individual Learning Module 070201a - Steamfitter-Pipefitter - Code Requirements – Low - Temperature Heating Systems - Second Period
- Individual Learning Module 070403d - Steamfitter-Pipefitter - Basic Requirements of Specialty Piping Systems - Part B-Process Piping and Specialty Systems - Fourth Period
- Individual Learning Module 070403f - Steamfitter-Pipefitter - Industrial Fire Protection Systems - Process Piping and Specialty Systems - Fourth Period

Online Resources:

- http://www.edu.gov.on.ca/eng/studentsuccess/thinkliteracy/files/Reading.pdf (Reading Strategies)
- http://www.keyskillssupport.net/teacandlearresoa/ (Learning Resources-see Construction Sector)
- http://www.42explore.com/skim.htm (Skimming and Scanning)
- http://www.edu.gov.on.ca/eng/studentsuccess/thinkliteracy/files/Reading.pdf (Strategies for Reading Graphical Text)
- www.open.ac.uk/skillsforstudy/active-reading.php (Active Reading)

TR4 Improve Examination Performance

Upon completion of this objective, learners will be able to:

4.1 identify barriers to successful examination performance
4.2 identify strategies to improve examination performance
- identify ways to prepare for exams
- identify test taking strategies
- identify strategies to reduce test anxiety

4.3 implement strategies to improve examination performance

Note: Learners preparing for the Interprovincial Red Seal exam should review the National Occupational Analysis for steamfitter-pipefitters and plumbers.

Suggested Strategies and Activities:

- Analyze past tests
- Provide opportunity to complete practice questions
- Provide information on testing locations and procedures for your province
- Refer to Appendices in NOA for block and task weighting
- Discuss test-taking strategies
- Discuss strategies to reduce test anxiety
- Discuss steps in test preparation

Non-contextualized Resources:

- Shape Up Your Reading
- Study Smarter, Not Harder
- National Electrical Trade Council (NETCO) Instructor's Guide: Test-taking Strategies for Interprovincial Red Seal Exams (Generic Version)

Contextualized Resources:

- Tools for the Trade: A Guide to Success in Apprenticeship

Technical Resources:

- All Individual Learning Modules
- National Occupational Analysis for Steamfitter-Pipefitter and Plumber

Online Resources:

- http://www.red-seal.ca/Site/english/pdf/Steamfitter_Pipefitter_2007.pdf (NOA for Steamfitter-Pipefitter)
- http://www.red-seal.ca/Site/english/pdf/Plumber_2008.pdf (NOA Plumber)
- www.ceca.org/netco (Preparing for Red Seal: Instructor Guide and PowerPoint Presentation)
- http://www.itabc.ca/site3.aspx (Preparing for the Red Seal Exam, BC Industry Training Authority)
- http://trades.exambank.com/index.html (Trades Exam Bank)
- www.testtakingtips.com (Test-taking Skills)
- www.studygs.net/tsttak3.htm (Study and Test-taking strategies)
- www.d.umn.edu/kmc/student/loon/acad/strat/testcheck.html (Test-taking Checklist)
- www.uic.edu/depts/counselctr/ace/multiple.htm (Multiple Choice Test Strategies)
- www.collegeboard.com/student/testing/clep/prep_hint_mc.html (Multiple Choice Tips)

Appendix A

Resource Materials:

Alberta Individual Learning Modules for Plumber
Alberta Apprenticeship and Industry Training, 1998
Tel: 1-800-232-7215
http://www.tradesecrets.gov.ab.ca/

Alberta Individual Learning Modules for Steamfitter-Pipefitter
Alberta Apprenticeship and Industry Training, 1998
Tel: 1-800-232-7215
http://www.tradesecrets.gov.ab.ca/

Applied Communications Skills for the Construction Trades
Steven A. Rigolosi
Pearson Education Inc., 2002
ISBN 0-13-093355-4

Blueprint Reading and Drafting for Plumbers 2nd Edition
Michael A. Joyce
Delmar, Cengage Learning, 2004
ISBN 13:978-1-4283-3513-4

Building Trades Dictionary
American Technical Publishers
ISBN 0-8269-0405-X

Cross Curricular Reading Tools
CAMET
P.O. Box 2044
Halifax, NS B3J 1M7
ISBN 1-895660-77-4

Evaluating Academic Readiness for Apprenticeship Training (EARAT)
Communications for Plumber Apprentices
Workplace Support Services Branch
Ontario Ministry of Training, Colleges and Universities, October 2000
Tel 416-325-2929 or 1-800-387-5514
Email: info@edu.gov.on.ca

Glossary of Housing Terms
Canadian Mortgage and Housing Corporation
Tel 1-800-668-2642; Fax: 1-800-245-9274
ISBN 0-660-18603-9
www.cmhc.ca

Instructor's Guide: Test-Taking Strategies for Interprovincial Red Seal Exams (Generic Version: Applicable to all Red Seal Trades)
National Electrical Trade Council (NETCO), 2008
www.ceca.org/netco

IPT's Metal Trades and Welding Handbook
Ronald G. Garby and Bruce J. Ashton
IPT Publishing and Training Ltd., 1993
ISBN: 978-0-92855-19-5

National Building Code of Canada 2005, Volume 2 (12th edition)
National Research Council Canada, 2005
ISBN: 0-660-19425-2

National Housing Code of Canada 1998 and Illustrated Guide
Institute for Research in Construction
National Research Council Canada, 1998
ISBN: 0-660-17653-X

National Plumbing Code of Canada 2005
Institute for Research in Construction
Client Services
1200 Montreal Rd.
Ottawa ON K1A 9Z9

Navigating Texts and Documents in Technical Training
Manitoba Competitiveness Training and Trade
Toll-Free: 1-877-978-7233 (1-877-97-TRADE)
Email: apprenticeship@gov.mb.ca

Shape Up Your Reading
Sheila Trant
Harcourt Brace & Company, Canada,1997
ISBN 0-7747-3296-2

Study Smarter, Not Harder
Kevin Paul
Self-Counsel Press 1996
ISBN 1-555180-059-4

Tools for the Trade: A Guide to Success in Apprenticeship
Sue Grecki
Skillplan-BC Construction
Industry Skills Improvement Council
Burnaby, BC, 2000

All online resources listed in this document were operational at time of publication.

Document Use (DU) Learning Outcome: Learners will use strategies for locating, retrieving, interpreting, and entering information in/from documents and will create trade documents

DU 1 Use Lists	**1.1 Define lists**	**1.2 Identify purpose**	**1.3 Locate information in lists**	**1.4 Interpret information in lists**	**1.5 Create lists**	**1.6 Evaluate lists for effectiveness**
DU 2 Use Tables	**2.1 Define tables**	**2.2 Identify purpose**	**2.3 Locate information in tables**	**2.4 Interpret information in tables**	**2.5 Create tables**	**2.6 Evaluate tables for effectiveness**
DU 3 Use Forms	**3.1 Define forms**	**3.2 Identify purpose**	**3.3 Locate information in forms**	**3.4 Interpret information in forms**	**3.5 Enter information into forms**	**3.6 Create forms**
	3.7 Evaluate forms for effectiveness					
DU 4 Use Charts	**4.1 Define charts**	**4.2 Identify purpose**	**4.3 Locate information in charts**	**4.4 Interpret information in charts**	**4.5 Create charts**	**4.6 Evaluate charts for effectiveness**
DU 5 Use Graphic Documents	**5.1 Define graphic documents**	**5.2 Identify purpose**	**5.3 Locate information in graphic documents**	**5.4 Interpret information in graphic documents**	**5.5 Create graphic documents**	**5.6 Evaluate graphic documents for effectiveness**

Learners will use strategies for locating, retrieving, interpreting and entering information in/from documents and for creating trade documents

Introduction

Document Use (DU) tasks involve the process of locating, organizing and using information in different visual displays that include words, numbers and diagrams. These visual materials efficiently summarize large amounts of information in a small amount of space and are widely used in trade occupations.

Apprentices must be proficient document users if they are to be successful in technical training and in job performance. This guide has been developed to provide apprentices with strategies to use trade documents quickly, efficiently and accurately. Learners will locate, interpret and evaluate information in documents and will create documents common to their trade. Understanding document structure and the strategies for using them will lead to more efficient information processing. For the purpose of the Trade Essentials project, documents have been categorized and defined as follows:

- **List** – A document that records items in a row.
- **Table**- A document that arranges information in rows and columns.
- **Form** – A document which contains blanks for the insertion of pre-specified information.
- **Chart**- A document that is used primarily to make large quantities of data easier to understand, illustrates the relationship between different parts of the data and commonly presents information as plots with reference to an axis. Charts are generally graphical in nature and contain very little text. Examples of charts include pie chart, flow chart, bar graph, line graph, histogram and pictogram.
- **Graphic Document –** A document which portrays information as an imitation of the real world. Examples of graphic documents include pictures, diagrams, drawings, blueprints, schematics, maps, symbols, signs and icons.

The following guide outlines a list of recommended resources (See Appendix A) for each objective in the Document Use curriculum framework and, where possible, includes online website materials that complement these resources. Three formats are provided to allow learners the opportunity to review competencies in a way that best suits their needs. These resources are categorized below:

- **Non-contextualized** - Curriculum resources that are **not** related to any trade or occupation. These resources may be used to review the competencies in a stand-alone manner before transferring the skill to trade-related materials.

- **Contextualized** - Curriculum resources that provide Essential Skills applications in the context of a specific trade or occupation.

- **Technical** - Trade training materials from which Essential Skills are extracted. For the purpose of the Trade Essentials project, ***Individual Learning Modules*** from Alberta Advanced Education were used as the primary technical resource.

Note: Though only some modules are outlined as resources for specific objectives, all Individual Learning Modules can be used for the instruction of Essential Skills.

The list of resources has been designed to act only as a guide and may, therefore, need to be adapted to meet the needs of individuals or groups. It is the role of you, the instructor, to choose materials and deliver their content as it best suits individual learner needs. A variety of materials are listed under each set of competencies for this purpose.

Document Use in the Steamfitter-Pipefitter and Plumber Trades

Steamfitters-pipefitters and plumbers use documents on a daily basis to complete job tasks. The complexity of these tasks, according to Human Resources and Skills Development Canada's Essential Skills Profiles (http://srv108.services.gc.ca/), ranges from using very simple brief text with uncomplicated structure (i.e., read work schedules/read point-form notes from daily logbooks to track work progress) to using complex documents with multiple pieces of information organized into multiple sections (i.e., interpret blueprints to check locations of piping and catch basins for drainage systems/ Interpret three-dimensional structural and architectural plans).

For background information on Document Use and how documents are used in the steamfitter-pipefitter and plumber trades, visit these sites:

- http://www.hrsdc.gc.ca/eng/workplaceskills/essential_skills/general/home.shtml (Understanding Document Use- Human Resource Skills Development Canada
- http://www.red-seal.ca/Site/trades/analist_e.htm (The Interprovincial Standards Red Seal Program)
- http://www.thelearningpartnership.ca/Passport_to_Prosperity/onlineresources_main.htm (Background Information on Document Use)

The following websites contain plumbing- and fitting-related content which may be used as an additional document use forum.

Plumber and Fitter Online Websites:

- http://www.pipefitter.com/index.html (Pipefitter.com)
- http://employment.alberta.ca/4339.html (Alberta Employment and Immigration; Health and Safety Publications with Links to other Associations)
- http://matcmadison.edu/facilities/ehs/pdf/CraneSafetyProgram.pdf (Crane and Hoist Education Program)
- www.heatinghelp.com/steam_problems.cfm (Heating Help)
- www.pipingdesign.com/ (Piping Design)
- www.ipexinc.com/Content/EN_CA/ (IPEX)
- www.allbusiness.com/construction/building-fixtures-mechanical-systems-hvac/6229374-1.html Steamfitter-Pipefitter Information on Various Topics)
- www.ua.org/ (United Association of Journeymen and Apprentices of the Plumbing, Pipefitting and Sprinkler Fitting Industry of the United States and Canada)
- http://www.acornpipe.com/information_links/Importing%20IDF%20Files.htm (Acorn Pipe Systems Inc.)
- www.process-heating.com/CDA/Archives/2bf9456e42368010VgnVCM100000f932a8c0 (Process heating)
- www.pmmag.com/ (Piping-related Information)
- www.plumbingandhvac.ca/ (Plumbing and HVAC Information)
- www.pipefitter.co.uk/home.htm (Piping-related Information)
- http://www.tlch2o.com/courses/Plumbing.pdf (Basic Plumbing Professional Development Course)
- http://www.zurn.com/operations/wilkins/pages/home.asp?OperationID=11 (Plumbing Illustrations)
- http://www.askthebuilder.com/722_Rough-In_Plumbing_Diagram.shtml (Plumbing Diagrams)
- http://www.thisoldhouse.com/toh/plumbing (Plumbing How-to-Illustrations)
- http://keidel.com/mech/ (Bath and Plumbing)
- http://www.poolcenter.com/poolcare.htm (Pool Information)
- http://www.aetsolar.com/pump_ctrls.shtml (Plumbing-related Information on Various Topics)
- http://home.howstuffworks.com/plumbing.htm (Plumbing-related Information on Various Topics)
- http://www.historichouseparts.com/bathroom.htm (Plumbing Illustrations)
- http://employment.alberta.ca/4339.html (Alberta Employment and Immigration; Health and Safety Publications with Links to other Associations)
- www.plumbingweb.com/pub.html (Plumbing Related Publications)
- www.theplumber.com/ (Plumbing Information on Various Topics)
- www.allplumbingweb.com/ (Waterproofing and Plumbing)
- www.plumbingmart.com/ (Plumbing Information on Various Topics)
- www.ciph.com/ (Canadian Institute of Plumbing and Heating)
- www.plumbingandhvac.ca/ (Plumbing and HVAC Information)

- www.plumbing.ca/ (Plumbing Information on Various Topics)
- www.b4ubuild.com/links/plumbing.shtml (Plumbing Information on Various Topics)
- www2.worksafebc.com/Portals/Construction/Home.asp?_from=construction.healthandsafetycentre.org (Preventing injuries and illnesses in construction trades)
- www.advancedbuildings.org/ (Advanced Buildings)
- www.ccbda.org/ (Canadian Copper and Brass Development Association)
- www.ciph.com/Your_Industry_Trade_Section/About_Us/ (Canadian Institute of Plumbing and Heating)
- www.cwwa.ca/home_e.asp (Canadian Water and Wastewater Association)
- www.mcac.ca/ (Mechanical Contractors Association of Canada)
- www.phccweb.org/ (Plumbing Heating Cooling Contractors Association)
- www.pmihome.org/ (Plumbing Manufacturers Institute)
- www.diydata.com/plumbing/index.php (Plumbing-related Information on Various Topics)
- www.worldplumbing.org/ (World Plumbing Council)
- www.ua.org/ (United Association of Journeymen and Apprentices of the Plumbing, Pipefitting and Sprinkler Fitting Industry of the United States and Canada)
- www2.worksafebc.com/Portals/Construction/Home.asp?_from=construction.healthandsafetycentre.org (Preventing injuries and illnesses in construction trades)

DU1 Use Lists

Upon completion of this objective, learners will be able to:

1.1 define lists
1.2 identify purpose
1.3 locate information in lists
1.4 interpret information in lists
1.5 create lists
1.6 evaluate lists for effectiveness

Suggested Strategies and Activities:

- Identify presence and uses of lists in documents of the steamfitter-pipefitter and plumber trades
- Discuss the different appearances of lists
- Find examples and extract information from the four types of lists (simple, combined, intersected and nested)
- Create lists to organize and compare information by category (i.e., tools, materials and special equipment for each installation)
- Create material lists from specification sheets
- Differentiate between lists and tables
- Analyze lists and determine degree of difficulty (i.e., simple or complex)
- Examine structure and components of a variety of lists
- Encourage learners to share their knowledge and experiences

Non-contextualized Resources:

- The Language of Documents - A Guide to Information Display in the Workplace
- Field Safety, Volume One
- Document Use Refresher for Apprentices (Module 2)
- Successful Technical Writing - A Practical Approach
- Applied Communication Skills for the Construction Trades

Contextualized Resources:

- IPT's Safety First Handbook (Book One)

Technical Resources:

- IPT's Metal Trades and Welding Handbook
- Modern Plumbing (Text, Instructor's Manual, and Job Practice Manual)
- Blueprints and Plans for HVAC, *3rd Edition*

- Individual Learning Module 060307b - Plumber- Commercial DWV Sketching - Blueprint Reading, Sketching, and Drawing - Third Period
- Individual Learning Module 060405a – Plumber - Low-Pressure Gas Line Layout Including Venting and Air Supply-Gasfitting Theory and Lab - Fourth Period
- Individual Learning Module 060401b – Plumber - Pumps for Private Water Supply Systems-Private Water Supply Systems and Water Treatment - Fourth Period
- Individual Learning Module 060402a - Plumber- Cross-Connection Control Awareness - Special Applications - Fourth Period
- Individual Learning Module 060402e - Plumber- Swimming Pools and Spas - Special Applications - Fourth Period
- Individual Learning Module 070403f - Steamfitter-Pipefitter - Industrial Fire Protection Systems - Process Piping and Specialty Systems - Fourth Period
- Individual Learning Module 070104f - Steamfitter-Pipefitter - Fibre Rope, Wire Rope and Hand Rigging Equipment - Practical Applications - First Period

DU2 Use Tables

Upon completion of this objective, learners will be able to:

2.1 define tables
2.2 identify purpose
2.3 locate information in tables
2.4 interpret information in tables
2.5 create tables
2.6 evaluate tables for effectiveness

Suggested Strategies and Activities:

- Brainstorm to identify the use of tables in the steamfitter-pipefitter and plumber trades
- Create tables to sort and separate materials, supplies and equipment
- Discuss tables as being an effective way to organize and present numerical data
- Analyze tables and determine degree of difficulty (i.e., simple or complex)
- Examine structure and components of a variety of tables
- Encourage learners to share their knowledge and experiences

Non-Contextualized Resources:

- Field Safety, Volume One
- Workplace Communications-The Basics, *3rd Edition* (Chapter 3)
- Applied Communication Skills for the Construction Trades
- Successful Technical Writing-A Practical Approach

Contextualized Resources:

- IPT's Safety First Handbook (Book One)

Technical Resources:

- IPT's Metal Trades and Welding Handbook
- Pipefitters Handbook, *3rd Edition*
- National Plumbing Code of Canada 2005, *8th Edition*
- Modern Plumbing (Text, Instructor's Manual, and Job Practice Manual)
- Drawings and Detail Sheets (Module 08202-06)
- Standards and Specifications (Module 08303-07)
- Individual Learning Module 060302c - Plumber- Island Vents, Vent Stacks, Yoke Vents, Offset Vents and Relief Vents - Plumbing Theory - Third Period
- Individual Learning Module 060303a – Plumber - Hydronic Radiant heating and Heat Loss Calculations - Hydronic Heating - Third Period

- Individual Learning Module 060405a - Plumber - Low-Pressure Gas Line Layout including Venting and Air Supply-Gasfitting Theory and Lab - Fourth Period
- Individual Learning Module 060405b - Plumber - 2-PSI Gas Line Layout - Gasfitting Theory and Lab- Fourth Period
- Individual Learning Module 060401b – Plumber - Pumps for Private Water Supply Systems-Private Water Supply Systems and Water Treatment - Fourth Period
- Individual Learning Module 060401c – Plumber - Private Water Supply Pressure System Components - Private Water Supply Systems and Water Treatment - Fourth Period
- IPT's Pipe Trades Training Manual
- IPTs Pipe Trades Handbook
- IPT's Guide to Blueprint Interpretation
    - Blueprint Reading and Drafting for Plumbers, *2nd Edition*
    - Individual Learning Module 070105d - Steamfitter-Pipefitter - Oxyfuel Equipment - Practical Applications - First Period
    - Individual Learning Module 070105f - Steamfitter-Pipefitter - Mild Steel Electrodes - Tools, Equipment and Materials - First Period
    - Individual Learning Module 070101a - Steamfitter-Pipefitter - Safety Guidelines - Safety and WHMIS - First Period
    - Individual Learning Module 070101b - Steamfitter-Pipefitter - Safe Work Practices - Safety and WHMIS- First Period
    - Individual Learning Module 070202c - Steamfitter-Pipefitter - Rigging Procedure: Signals, Cranes, and Hoists - Rigging and Material Handling - Second Period
    - Individual Learning Module A070405d - Steamfitter-Pipefitter - GTAW Welds on Mild Steel –Welding - Fourth Period
    - National Housing Code of Canada 1998 and Illustrated Guide
    - Blueprints and Plans for HVAC, *3rd Edition*

Online Resources:

- https://www.advancededucation.gov.ab.ca/k_12/curriculum/bysubject/ke/Readtolive/Tools/Reading%20Diagrams.pdf (Reading Diagrams, Charts and Tables)
- http://www.cmhc-schl.gc.ca/en/co/maho/gemare/gemare_012.cfm (Material Safety Data Sheet)
- http://www.csc-ca.org/pdf/CSC_ESA_e.pdf (Construction Sector Council-Document Use Activities)

DU3 Use Forms

Upon completion of this objective, learners will be able to:

3.1 define forms
3.2 identify purpose
3.3 locate information in forms
3.4 interpret information in forms
3.5 enter information into forms
3.6 create forms
3.7 evaluate forms for effectiveness

Suggested Strategies and Activities:

- Define entry forms as documents that both share information and require input of information
- Identify features common to workplace forms
- Identify audience for workplace forms
- Interpret vocabulary of workplace forms
- Extract information from forms common to the steamfitter-pipefitter and plumber trades (i.e., accident/incident reports, expense forms, daily time sheets, daily logs, invoices, application forms, purchase orders, material take off sheets, etc.)
- Use title of form to predict purpose and kinds of information requested
- Distinguish between primary and secondary information
- Enter information into forms common to the steamfitter-pipefitter and plumber trades (i.e., accident/incident reports, expense forms, daily time sheets, daily logs, invoices, application forms, purchase orders, material take off sheets, etc.)
- Discuss the importance of providing correct, precise information in forms
- Analyze forms and determine degree of difficulty (i.e., simple or complex)
- Examine structure and components of a variety of forms
- Encourage learners to share their knowledge and experiences

Non-contextualized Resources:

- The Language of Documents - A Guide to Information Display in the Workplace
- Document Use Refresher for Apprentices (Module 6)
- Writing at Work (Module 2 - Entry Forms)
- Tools for Success - Soft Skills for the Construction Industry
- Successful Technical Writing - A Practical Approach

Technical Resources:

- Modern Plumbing (Text, Instructor's Manual, and Job Practice Manual) (Chapter 31)
- Standards and Specifications (Module 08303-07)
- Business Principles for Plumbers (Module 02401-06)
- Individual Learning Module 070102h - Steamfitter-Pipefitter - Introduction to Pressure Testing - Tools, Equipment, and Materials - First Period
- Individual Learning Module 060307a - Plumber- Residential DWV Sketching - Blueprint Reading, Sketching, and Drawing - Third Period
- Individual Learning Module 060301c - Plumber - Approved Effluent and Sewage Treatment Components - Private Sewage Disposal Systems - Third Period
- Reading Commercial Drawings (Module 02202-05)
- Individual Learning Module 060406d - Plumber- Bid Depository and Job Estimating - Plumbing Related Subjects - Fourth Period
- Individual Learning Module 060401d - Plumber- Private Water Supply Pressure System Sizing-Private Water Supply Systems and Water Treatment - Fourth Period
- Individual Learning Module 060402e - Plumber - Swimming Pools and Spas-Special Applications - Fourth Period
- Individual Learning Module 070304a - Steamfitter-Pipefitter - Quality Control-Process Piping and Specialty Systems - Fourth Period
- Individual Learning Module A070405a - Steamfitter-Pipefitter - Introduction to GTAW Process – Welding - Fourth Period
- Individual Learning Module A070405c - Steamfitter-Pipefitter - GTAW Equipment Maintenance and Troubleshooting – Welding - Fourth Period

Online Resources:

- http://www.gov.pe.ca/photos/original/edu_appl_appren.pdf (Application for Apprenticeship)
- http://www.wcb.pe.ca/index.php3?number=60190&lang=E (Worker's Compensation Forms)
- http://www.abcaforms.com/allstates.html (Examples of Construction Forms)
- http://books.google.ca/books?id=DBhILgGvCakC&pg=PA36&lpg=PA36&dq=how+to+complete+construction+invoices&source=web&ots=RLEjAHWmQ9&sig=UTLvWpFGyC5mWNYPWNnL0lWY1CU&hl=en&sa=X&oi=book_result&resnum=1&ct=result (Examples of Forms)

DU4 Use Charts

Upon completion of this objective, learners will be able to:

4.1 define charts
4.2 identify purpose
4.3 locate information in charts
4.4 interpret information in charts
4.5 create charts
4.6 evaluate charts for effectiveness

Suggested Strategies and Activities:

- Identify the presence and use of charts in the steamfitter-pipefitter and plumber trade
- Identify the basic types, i.e., pie chart, bar graph and line graph, etc., and in what circumstance each may be used
- Discuss the use of charts in a variety of trade-related and safety workplace documents
- Review workplace charts common to the trade
- Discuss charts as a useful way to compare numerical data
- Define charts as visual organizers of data
- Analyze charts and determine degree of difficulty (i.e., simple or complex)
- Examine structure and components of a variety of charts
- Encourage learners to share their knowledge and experiences

Non-contextualized Resources:

- The Language of Documents - A Guide to Information Display in the Workplace
- Field Safety, Volume One
- Document Use Refresher for Apprentices (Modules 4 & 5)
- Workplace Communications - The Basics, *3rd Edition* (Chapter 3)
- Successful Technical Writing - A Practical Approach
- Pre-Apprentice Training - A Test Preparation Manual for the Skilled Trades

Technical Resources:

- Individual Learning Module 070202c - Steamfitter-Pipefitter - Rigging Procedure: Signals, Cranes, and Hoists - Rigging and Material Handling - Second Period
- Individual Learning Module 060303b – Plumber - Introduction to Hydronic Radiant Heating Design - Hydronic Heating - Third Period
- Individual Learning Module 060301c – Plumber - Approved Effluent and Sewage Treatment Components - Private Sewage Disposal Systems - Third Period

- Individual Learning Module 060307b – Plumber - Commercial DWV Sketching - Blueprint Reading, Sketching, and Drawing - Third Period
- Individual Learning Module 060401d – Plumber - Private Water Supply Pressure System Sizing - Private Water Supply Systems and Water Treatment- Fourth Period
- Individual Learning Module 060405a – Plumber - Low-Pressure Gas Line Layout Including Venting and Air Supply-Gasfitting Theory and Lab - Fourth Period
- Individual Learning Module 070303a - Steamfitter-Pipefitter - Process Facilities - Part A - Process Piping and Specialty Systems - Fourth Period
- Individual Learning Module 070303b - Steamfitter-Pipefitter - Process Facilities - Part B - Process Piping and Specialty Systems - Fourth Period
- Individual Learning Module 070301cA - Steamfitter-Pipefitter - Refrigeration and Basic HVAC Systems - Part A - Industrial Refrigeration - Fourth Period

Online Resources:

- https://www.advancededucation.gov.ab.ca/k_12/curriculum/bysubject/ke/Readtolive/Tools/Reading%20Diagrams.pdf (Reading Charts and Graphs)
- http://www.constructionforecasts.ca/oft/graph?preset=215 Construction Sector Council (Graphs and Tables)
- http://www.keyskillssupport.net/search/Resource-25836.aspx (Reading Graphs)
- http://web2.concordia.ca/Quality/tools/20pertchart.pdf (Pert Chart)
- http://home.att.net/~dexter.a.hansen/flowchart/flowchart.htm#Analyzing%20Flow%20Charts (Flowcharting Tutorial)

DU5 Use Graphic Documents

Upon completion of this objective, learners will be able to:

5.1 define graphic documents
5.2 identify purpose
5.3 locate information in graphic documents
5.4 interpret information in graphic documents
5.5 create graphic documents
5.6 evaluate graphic documents for effectiveness

Suggested Strategies and Activities:

- Identify symbols commonly used in the trade including WHMIS
- Introduce graphic documents as representations of the "real world"
- Interpret signals
- Interpret signs for safety information
- Interpret product or packaging labels
- Recognize lines used on drawings
- Recognize significance of symbols
- Take measurements from drawings
- Distinguish between orthographic, isometric and oblique drawings
- Create schedules to coordinate with other trades
- Construct drawings
- Use geometry tools to create common angles and shapes
- Make sketches to communicate ideas for changes in existing plans
- Practice drawing to scale using metric and imperial systems
- Display documents common to the steamfitter-pipefitter and plumber trades (i.e., signs, labels, codes, schematics, collective agreements, safety information, maps, product catalogues, installation manuals, scale drawings and blueprints)
- Analyze graphic documents and determine degree of difficulty (i.e., simple or complex)
- Examine structure and components of a variety of graphic documents
- Encourage learners to share their knowledge and experiences

Non-contextualized Resources:

- The Language of Documents - A Guide to Information Display in the Workplace
- Field Safety, Volume One
- Document Use Refresher for Apprentices (Modules 1 & 3)
- Successful Technical Writing - A Practical Approach
- Applied Communication Skills for the Construction Trades
- Workplace Communications - The Basics, *3rd Edition* (Chapter 3)
- Pre-Apprentice Training - A Test Preparation Manual for the Skilled Trades

Contextualized Resources:

- Print Reading for Construction – Residential and Commercial
- EARAT-Communications for Plumber Apprentices: Skill #6
- Blueprint Fundamentals: Interpreting Symbols and Specs (CD-ROM)
- IPT's Safety First Handbook (Book One)

Technical Resources:

- IPT's Metal Trades and Welding Handbook
- Pipefitters Handbook, *3rd Edition*
- IPT's Pipe Trades Training Manual
- IPTs Pipe Trades Handbook
- IPT's Guide to Blueprint Interpretation
- Reading Commercial Drawings (Module 02202-05)
- All Individual Learning Modules, especially:
  - Individual Learning Module 070105a - Steamfitter-Pipefitter - Oxyfuel Equipment - Practical Applications - First Period
  - Individual Learning Module 070101b - Steamfitter-Pipefitter - Safe Work Practices - Safety and WHMIS - First Period
  - Individual Learning Module 070104h - Steamfitter-Pipefitter - Valve Identification and Servicing - First Period
  - Individual Learning Module 070101a - Steamfitter-Pipefitter - Safety Guidelines - Safety and WHMIS - First Period
  - Individual Learning Module 070206d - Steamfitter-Pipefitter - Specifications and Exercises for Drawing Package #1- Second Period
  - Individual Learning Module 070308c - Steamfitter-Pipefitter - Schematics-Blueprint Reading, Sketching and Drawing- Fourth Period

Online Resources:

- http://www.tpub.com/content/draftsman/14040/ (Integrated Publishing-Drafting)
- www.askthebuilder.com (Installation Diagrams)
- http://library.sussex.tec.nj.us/carpentry.htm#Roof (Carpentry and Construction Links)
- http://www.tlch2o.com/courses/Plumbing.pdf (Plumbing Diagrams)
- http://www.labour.gov.on.ca/english/hs/whmis/ (A Guide to WHMIS)
- http://www.ccohs.ca/oshanswers/safety_haz/materials_handling/signals.html (Crane and Hoist Signals)
- http://www.zurn.com/operations/wilkins/pages/home.asp?OperationID=11 (Installation Diagrams, Drawings, Specification Sheets)
- http://www.jandy-downloads.com/pdfs/Plumbing_Schematics.pdf (Plumbing Schematics)

- http://www2.worksafebc.com/Portals/Construction/ToolBoxMeetingGuides-Topic.asp?ReportID=34589 (Work Safe BC -WHMIS)
- http://www.maxboom.com/Members_Only/handsignals.html (Hand Signals)
- http://www.bellgossett.com/BG-SiteMap.asp (Bell and Gossett-Diagrams and Literature on Pipe Systems and Equipment)

Appendix A

Resource Materials:

Alberta Individual Learning Modules for Plumber
Alberta Apprenticeship and Industry Training, 1998
Tel: 1-800-232-7215
http://www.tradesecrets.gov.ab.ca

Alberta Individual Learning Modules for Steamfitter-Pipefitter
Alberta Apprenticeship and Industry Training, 1998
Tel: 1-800-232-7215
http://www.tradesecrets.gov.ab.ca

Applied Communications Skills for the Construction Trades
Stephan A. Rigolosi
Pearson Education Inc., 2002
ISBN: 0-13-093355-4

Blueprints and Plans for HVAC, 3rd Edition
Frank Miller, Wilma Miller and Joseph Moravek
Delmar Cengage Learning, 2008
ISBN: 13-978-1-4283-3520-2

Blueprint Reading and Drafting for Plumbers, 2nd Edition
Michael A. Joyce
Delmar, Cengage Learning, 2004
ISBN 13:978-1-4283-3513-4

Blueprint Fundamentals: Interpreting Symbols and Specs (CD-ROM)
Shopware, 2004
www.shopware-usa.com

Business Principles for Plumbers (Module 02401-06)
Plumbing Level Four- Trainee Guide
National Center for Construction Education and Research, 2006

Document Use Refresher for Apprentices
Nova Scotia Department of Education
Apprenticeship Training and Skills Development
Tel: 902-424-0492

Drawings to Accompany Blueprints and Plans for HVAC, 3rd Edition
Frank Miller, Wilma Miller and Joseph Moravek
Delmar Cengage Learning, 2008
ISBN: 13-978-1-4283-3520-2

Drawings and Detail Sheets (Module 08202-06)
Pipefitting Level Two- Trainee Guide
National Center for Construction Education and Research, 2006

Evaluating Academic Readiness for Apprenticeship Training (EARAT)
Mathematics for Plumber Apprentices
Workplace Support Services Branch
Ontario Ministry of Training, Colleges and Universities, October 2000
Tel: 416-325-2929 or 1-800-387-5514
Email: info@edu.gov.on.ca

Field Safety Volume One
Participant Guide
Contren Learning Series
National Center for Construction Education and Research, 2003
ISBN: 0-13-106760-5

Introduction to Plumbing Drawings (Module 02105-05)
Plumbing-Level One- Trainee Guide
National Center for Construction Education and Research, 2005

IPT's Guide to Blueprint Interpretation
Grant E. Jacobs
IPT Publishing and Training Ltd., 2008
ISBN: 13-978-0-920855-42-3

IPT's Metal Trades and Welding Handbook
Ronald G. Garby and Bruce J. Ashton
IPT Publishing and Training Ltd., 1993
ISBN: 978-0-92855-19-5

IPTs Pipe Trades Handbook
Robert A. Lee
IPT Publishing and Training Ltd., 2007
ISBN: 13-978-0-920855-18-8

IPT's Pipe Trades Training Manual
Robert A. Lee
IPT Publishing and Training Ltd., 2007
ISBN: 13-978-0-920855-20-1

IPT's Safety First Handbook (Book One)
Bruce M. Basaraba
IPT Publishing and Training Ltd., 1999
ISBN: 0-920855-34-2

Modern Plumbing
E. Keith Blankenbaker
The Goodheart-Willcox Company, Inc., 2005
ISBN: 13-978-1-59070-350-2

Modern Plumbing- Instructor's Manual
E. Keith Blankenbaker and Charles H. Owenby
The Goodheart-Willcox Company, Inc., 2005
ISBN: 13-978-1-59070-352-6

Modern Plumbing- Job Practice Manual
Charles H. Owenby
The Goodheart-Willcox Company, Inc., 2005
ISBN: 13-978-1-59070-351-9

National Plumbing Code of Canada 2005, 8th Edition
National Research Council Canada
Institute for Research in Construction
ISBN: 0-660-19429-5

National Housing Code of Canada 1998 and Illustrated Guide
Institute for Research in Construction
National Research Council Canada, 1998
ISBN: 0-660-17653-X

Navigating Texts and Documents in Technical Training
Manitoba Competitiveness Training and Trade
Toll-Free: 1-877-978-7233 (1-877-97-TRADE)
Email: apprenticeship@gov.mb.ca

Pipefitters Handbook, 3rd Edition
Forrest R. Lindsey
Industrial Press Inc., 1967
ISBN: 978-0-8311-3019-0

Pre-Apprentice Training-A Test Preparation Manual for the Skilled Trades
Jack Martin and Mary Serich
Jack Martin and Associates, 2006
ISBN: 0-9649530-1-3

Print Reading for Construction – Residential and Commercial
Walter C. Brown and Daniel P. Dorfmueller
The Goodheart-Willcox Company, Inc., 2005
ISBN: 13-978-1-59070-347-2

Reading Commercial Drawings (Module 02202-05)
Plumbing Level Two-Trainee Guide
National Center for Construction Education and Research, 2005

Standards and Specifications (Module 08303-07)
Pipefitting Level Three- Trainee Guide
National Center for Construction Education and Research, 2007

Successful Technical Writing-A Practical Approach
Bill Wesley Brown
The Goodheart-Willcox Company, Inc., 2000
ISBN: 1-56637-696-3
ISBN (Instructor's Guide): 13-978-1-56637-697-6

The Language of Documents- A Guide to Information Display in the Workplace
Lynda Fownes
Skillplan – The B.C. Construction Industry Skills Improvement Council, 1999
ISBN: 0-9685027-0-9

Tools for Success- Soft Skills for the Construction Industry
Stephen A. Rigolosi
Pearson Education Inc., 2004
ISBN 0-13-160000-1

Writing at Work
Sue Grecki, Sheila Whincup
Skillplan-BC Construction Skills Improvement Council, 1996
ISBN: 0-9685027-4-1
www.skillplan.ca

Workplace Communications-The Basics, 3rd Edition
George J. Searles
Pearson Education, Inc., 2006
ISBN: 0-321-33068-4

All online resources listed in this document were operational at time of publication.

Principles of Mathematics (PM) Learning Outcome – Learners will understand, interpret, and manipulate mathematical concepts in order to solve problems and complete job tasks.

PM1 Use Calculators	**1.1 Identify the benefits and risks involved in using calculators in the trade**	**1.2 Describe how calculators are used in the trade**	**1.3 Determine the best calculator for the trade**	**1.4 Use calculators to solve problems**		
PM2 Use Positive and Negative Numbers	**2.1 Read positive and negative numbers**	**2.2 Write positive and negative numbers**	**2.3 Round positive and negative numbers**	**2.4 Estimate positive and negative numbers**	**2.5 Order positive and negative numbers**	**2.6 Compare positive and negative numbers**
	2.7 Add positive and negative numbers	**2.8 Subtract positive and negative numbers**	**2.9 Multiply positive and negative numbers**	**2.10 Divide positive and negative numbers**	**2.11 Use knowledge of positive and negative numbers to solve problems**	
PM3 Use Order of Operations	**3.1 Identify the necessary steps in performing order of operations**	**3.2 Calculate answers Using correct order of operations**	**3.3 Use order of operations to solve problems**			
PM4 Use Fractions	**4.1 Read fractions**	**4.2 Write fractions**	**4.3 Compare fractions**	**4.4 Round fractions**	**4.5 Simplify fractions**	**4.6 Add fractions**
	4.7 Subtract fractions	**4.8 Multiply fractions**	**4.9 Divide fractions**	**4.10 Use knowledge of fractions to solve problems**		

PM5 Use Mixed Numbers	5.1 Read mixed numbers	5.2 Write mixed numbers	5.3 Compare mixed numbers	5.4 Round mixed numbers	5.5 Simplify mixed numbers	5.6 Add mixed numbers
	5.7 Subtract mixed numbers	5.8 Multiply mixed numbers	5.9 Divide mixed numbers	5.10 Use knowledge of mixed numbers to solve problems		
PM6 Use Decimals	6.1 Read decimals	6.2 Write decimals	6.3 Estimate decimals	6.4 Round decimals	6.5 Add decimals	6.6 Subtract decimals
	6.7 Multiply decimals	6.8 Divide decimals	6.9 Use knowledge of decimals to solve problems			
PM7 Use Percent	7.1 Use formulae to calculate percent	7.2 Use knowledge of percent to solve problems				
PM8 Use Conversion	8.1 Explain the purpose of mathematical conversion	8.2 Convert among fractions, decimals, and percent	8.3 Use automatic recall of decimal and percent equivalents of common fractions	8.4 Use knowledge of conversion to solve problems		

PM9 Use Measurement Systems	9.1 Demonstrate uses of specific measurements	9.2 Perform conversions within the metric measurement system	9.3 Perform conversions within the imperial measurement system	9.4 Perform conversions between the metric and imperial measurement systems	9.5 Perform time conversions	9.6 Use knowledge of measurement and time conversion to solve problems
PM10 Use Rate, Ratio, and Proportion	10.1 Describe the differences among rate, ratio, and proportion	10.2 Give examples of how rate, ratio, and proportion, are used in the trade	10.3 Write numbers as proportions	10.4 Use knowledge of rate to solve problems	10.5 Use knowledge of ratio to solve problems	10.6 Use knowledge of proportion to solve problems
PM11 Use Square Root and Exponents	11.1 Determine square root of positive numbers that are perfect squares	11.2 Determine approximate square root of positive numbers that are not perfect squares	11.3 Use knowledge of square root to solve problems	11.4 Use knowledge of exponent laws to solve problems	11.5 Determine significant digits	11.6 Use knowledge of scientific notation to solve problems
PM12 Solve Equations	12.1 Write variable expressions and equations from sentences	12.2 Simplify variable expressions	12.3 Write equations from sentences	12.4 Solve one-step equations	12.5 Solve two-step equations	12.6 Solve multi-step equations
PM13 Use Trade-Related Formulae	13.1 Identify formulae common to the trade	13.2 Solve problems using formulae as written	13.4 Solve problems by rearranging formulae			

PM14 Use Estimation	14.1 Identify estimation rules	14.2 Use estimation rules to solve single-step problems	14.3 Use estimation rules to solve multi-step problems		
PM15 Use Angles	15.1 Identify various types of angles common to the trade	15.2 Compare angles common to the trade	15.3 Measure angles	15.4 Use knowledge of angles to solve problems	
PM16 Use Geometric Shapes	16.1 Identify geometric shapes	16.2 Use knowledge of geometric shapes to solve problems			
PM17 Use Trigonometry	17.1 Identify the value of trigonometry in the trade	17.2 Set Up trigonometric ratios	17.3 Use trigonometric functions to solve problems		
PM18 Analyze Numerical Data	18.1 Identify ways to organize data	18.2 Organize information into charts and graphs	18.3 Extract information from charts and graphs	18.4 Evaluate information found in charts and graphs	18.5 Make predictions and draw conclusions

	Automotive Service Tech	Carpenter	Cabinet Maker	Construction Electrician	Cook	Industrial Electrician	Machinist
PM1 Use Calculators	✓	✓	✓	✓	✓	✓	✓
PM2 Use Positive and Negative Numbers	✓	✓	Whole numbers only	✓	✓	✓	✓
PM3 Use Order of Operations	✓	✓	✓	✓	✓	✓	✓
PM4 Use Fractions	✓	✓	✓	✓	✓	✓	✓
PM5 Use Mixed Numbers	✓	✓	✓	✓	✓	✓	✓
PM6 Use Decimals	✓	✓	✓	✓	✓	✓	✓
PM7 Use Percent	✓	✓	✓	✓	✓	✓	✓
PM8 Use Conversion	✓	✓	✓	✓	✓	✓	✓
PM9 Use Measurement Systems	✓	✓	✓	✓	✓	✓	✓
PM10 Use Rate, Ratio and Proportion	✓	✓	✓	✓	✓	✓	✓
PM11 Use Square Root and Exponents	✓	✓	-	✓	-	✓	✓
PM12 Solve Equations	✓	✓	✓	✓	✓	✓	✓
PM13 Use Trade-Related Formulae	✓	✓	✓	✓	✓	✓	✓
PM14 Use Estimation	✓	✓	✓	✓	✓	✓	✓
PM15 Use Angles	✓	✓	✓	✓	✓	✓	✓
PM16 Use Geometric Shapes	✓	✓	✓	✓	-	✓	✓
PM17 Use Trigonometry	✓	✓	✓	✓	-	✓	✓
PM18 Analyze Numerical Data	✓	-	-	-		-	✓

	Metal Fabricator	Plumber	Refrigeration & Air Conditioning Mechanic	Oil Burner Mechanic	Steamfitter/ Pipefitter	Welder
PM1 Use Calculators	✓	✓	✓	✓	✓	✓
PM2 Use Positive and Negative Numbers	✓	✓	✓	✓	✓	✓
PM3 Use Order of Operations	✓	✓	✓	✓	✓	✓
PM4 Use Fractions	✓	✓	✓	✓	✓	✓
PM5 Use Mixed Numbers	✓	✓	✓	✓	✓	✓
PM6 Use Decimals	✓	✓	✓	✓	✓	✓
PM7 Use Percent	-	-	✓	✓	✓	✓
PM8 Use Conversion	-	✓	✓	✓	✓	✓
PM9 Use Measurement Systems	✓	✓	✓	✓	✓	✓
PM10 Use Rate, Ratio and Proportion	-	No proportion	✓	✓	✓	No proportion
PM11 Use Square Root and Exponents	-	-	✓	✓	✓	✓
PM12 Solve Equations	-	Plus quadratic equations	✓	✓	✓	✓
PM13 Use Trade-Related Formulae	✓	✓	✓	✓	✓	✓
PM14 Use Estimation	✓	✓	✓	✓	✓	✓
PM15 Use Angles	✓	✓	✓	✓	✓	✓
PM16 Use Geometric Shapes	✓	✓	✓	✓	✓	✓
PM17 Use Trigonometry	✓	✓	✓	✓	✓	✓
PM18 Analyze Numerical Data	-	-	✓	✓	-	-

The following checklist represents an overview of the Essential Skills necessary for Steamfitter/Pipefitter and Plumber apprentices and identifies areas requiring review.

Learner Name: _____

Instructor Name: _____

Inventory Date: _____

Post-Inventory Date: _____

PRINCIPLES OF MATHEMATICS	(Assessor Use) Learning Needs Indicated from ES inventory	(Instructor Use) Learning Needs Identified by Instructor	Learning Needs Addressed Through Instruction	(Assessor Use) Learning Needs Require More Review	Skill Level Meets Trade Requirements (Post-Inventory)
OBJECTIVE 1: USE CALCULATORS	☐	☐	☐	☐	☐
1.1 Identify the risks and benefits involved in using calculators in the trade					
1.2 Describe how calculators are used in the trade					
1.3 Determine the best calculator for the trade					
1.4 Use knowledge of calculators to solve problems					
OBJECTIVE 2: USE POSITIVE AND NEGATIVE NUMBERS	☐	☐	☐	☐	☐
2.1 Read positive and negative numbers					
2.2 Write positive and negative numbers					
2.3 Round positive and negative numbers					
2.4 Estimate positive and negative numbers					
2.5 Order positive and negative numbers					
2.6 Compare positive and negative numbers					
2.7 Add positive and negative numbers					
2.8 Subtract positive and negative numbers					
2.9 Multiply positive and negative numbers					
2.10 Divide positive and negative numbers					
2.11 Use knowledge of positive and negative numbers to solve problems					
OBJECTIVE 3: USE ORDER OF OPERATIONS	☐	☐	☐	☐	☐
3.1 Identify the necessary steps in performing order of operations					
3.2 Calculate answers using correct order of operations					
3.3 Use order of operations to solve problems					

PRINCIPLES OF MATHEMATICS	(Assessor Use) Learning Needs Indicated from ES inventory	(Instructor Use) Learning Needs Identified by Instructor	Learning Needs Addressed Through Instruction	(Assessor Use) Learning Needs Require More Review	Skill Level Meets Trade Requirements (Post-Inventory)
OBJECTIVE 4: USE FRACTIONS	☐	☐	☐	☐	☐
4.1 Read fractions					
4.2 Write fractions					
4.3 Compare fractions					
4.4 Round fractions					
4.5 Simplify fractions					
4.6 Add fractions					
4.7 Subtract fractions					
4.8 Multiply fractions					
4.9 Divide fractions					
4.10 Use knowledge of fractions to solve problems					
OBJECTIVE 5: USE MIXED NUMBERS	☐	☐	☐	☐	☐
5.1 Read mixed numbers					
5.2 Write mixed numbers					
5.3 Compare mixed numbers					
5.4 Round mixed numbers					
5.5 Simplify mixed numbers					
5.6 Add mixed numbers					
5.7 Subtract mixed numbers					
5.8 Multiply mixed numbers					
5.9 Divide mixed numbers					
5.10 Use knowledge of mixed numbers to solve problems					
OBJECTIVE 6: USE DECIMALS	☐	☐	☐	☐	☐
6.1 Read decimals					
6.2 Write decimals					
6.3 Estimate decimals					
6.4 Round decimals					
6.5 Add decimals					
6.6 Subtract decimals					
6.7 Multiply decimals					
6.8 Divide decimals					
6.9 Use knowledge of decimals to solve problems					
OBJECTIVE 7: USE PERCENT	☐	☐	☐	☐	☐
7.1 Use formulae to calculate percent					
7.2 Use knowledge of percent to solve problems					
OBJECTIVE 8: USE CONVERSION	☐	☐	☐	☐	☐
8.1 Explain the purpose of mathematical conversion					
8.2 Convert among fractions, decimals and percents					
8.3 Use automatic recall of decimal and percent equivalents of common fraction					
8.4 Use knowledge of conversion to solve problems					

PRINCIPLES OF MATHEMATICS	(Assessor Use) Learning Needs Indicated from ES inventory	(Instructor Use) Learning Needs Identified by Instructor	Learning Needs Addressed Through Instruction	(Assessor Use) Learning Needs Require More Review	Skill Level Meets Trade Requirements (Post-Inventory)
OBJECTIVE 9: USE MEASUREMENT SYSTEMS	☐	☐	☐	☐	☐
9.1 Demonstrate uses of specific measurements					
9.2 Perform conversions within the Metric Measurement System					
9.3 Perform conversions within the Imperial Measurement System					
9.4 Perform conversions between the Metric and Imperial Measurement System					
9.5 Perform time conversions					
9.6 Use knowledge of conversion to solve problems					
OBJECTIVE 10: USE RATE, RATIO AND PROPORTION	☐	☐	☐	☐	☐
10.1 Describe the differences among rate, ratio and proportion					
10.2 Give examples of how rate, ratio and proportion are used in the trade					
10.3 Write numbers as proportions					
10.4 Use knowledge of rate to solve problems					
10.5 Use knowledge of ratio to solve problems					
10.6 Use knowledge of proportion to solve problems					
OBJECTIVE 11: USE SQUARE ROOT AND EXPONENTS	☐	☐	☐	☐	☐
11.1 Determine the square root of positive numbers that are perfect squares					
11.2 Determine approximate square root of positive numbers that are not perfect squares					
11.3 Use knowledge of square root to solve problems					
11.4 Use knowledge of exponent laws to solve problems					
11.5 Determine significant digits					
11.6 Use knowledge of scientific notation to solve problems					
OBJECTIVE 12: SOLVE EQUATIONS	☐	☐	☐	☐	☐
12.1 Write variable expressions and equations from sentences					
12.2 Simplify variable expressions					
12.3 Write equations from sentences					
12.4 Solve one-step equations					
12.5 Solve two-step equations					
12.6 Solve multi-step equations					
OBJECTIVE 13: USE TRADE-RELATED FORMULAE	☐	☐	☐	☐	☐
13.1 Identify formulae common to the trade					
13.2 Solve problems using formulae as written					
13.3 Solve problems by rearranging formulae					
OBJECTIVE 14: USE ESTIMATION					
14.1 Identify estimation rules					
14.2 Use estimation rules to solve single-step problems					
14.3 Use estimation rules to solve multi-step problems					

PRINCIPLES OF MATHEMATICS	(Assessor Use) Learning Needs Indicated from ES inventory	(Instructor Use) Learning Needs Identified by Instructor	Learning Needs Addressed Through Instruction	(Assessor Use) Learning Needs Require More Review	Skill Level Meets Trade Requirements (Post-Inventory)
OBJECTIVE 15: USE ANGLES	☐	☐	☐	☐	☐
15.1 Identify various types of angles					
15.2 Compare angles common to the trade					
15.3 Accurately measure angles					
15.4 Use knowledge of angles to solve problems					
OBJECTIVE 16: USE GEOMETRIC SHAPES	☐	☐	☐	☐	☐
16.1 Identify geometric shapes					
16.2 Use knowledge of geometric shapes to solve problems					
OBJECTIVE 17: USE TRIGONOMETRY	☐	☐	☐	☐	☐
17.1 Identify the value of trigonometry in the trade					
17.2 Set up trigonometric ratios					
17.3 Use trigonometric functions to solve problems					

Comments:

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Assessor/s Signature Date

Learners will understand, interpret and manipulate mathematical concepts in order to solve problems and complete tasks.

Introduction

The Principles of Mathematics (PM) is an introduction to the foundational math skills necessary for successful technical training and effective job task completion. The intent of the unit is twofold: to review and to further develop the concepts and strategies necessary for solving problems and completing tasks in the steamfitting-pipefitting and plumbing trades.

The following guide outlines a list of recommended resources (see Appendix A) for each objective in the Mathematics curriculum framework and, where possible, includes online website materials that complement these resources. Three formats are provided to allow learners the opportunity to review competencies in a way that best suit their needs. These resources are categorized as follows:

- **Non-contextualized** - Curriculum resources that are **not** related to any trade or occupation. These resources may be used to review the competencies in a stand-alone manner before transferring the skill to trade-related materials.

- **Contextualized** - Curriculum resources that provide Essential Skills applications in the context of a specific trade or occupation.

- **Technical** - Trade training materials from which Essential Skills are extracted. For the purpose of the Trade Essentials project, ***Individual Learning Modules*** from Alberta Advanced Education and ***Modern Plumbing*** by E. Keith Blankenbaker were used as the primary technical resources.

Note: Though only some modules are outlined as resources for specific objectives, all Individual Learning Modules can be used for the instruction of Essential Skills.

The following list has been designed to act only as a guide and may, therefore, need to be adapted to meet the needs of individuals or groups. It is the role of you, the instructor, to choose materials and deliver its content as it best suits individual learner needs. A variety of materials are listed under each set of competencies for this purpose.

Steamfitters/Pipefitters, Plumbers and Numeracy

Steamfitters/Pipefitters and Plumbers often use the skills outlined in the Principles of Mathematics on a daily basis to complete job tasks. The complexity of these tasks, according to HRSDC's Essential Skills profiles (http://srv108.services.gc.ca/), ranges from simple, clearly-defined mathematical operations (i.e., identify acceptable level of particles per million in piping system/ Schedule daily activities to complete assigned tasks) to tasks that involve multiple steps of calculation (i.e., use trigonometry to calculate offsets and rolling offsets when installing fittings in piping systems/ Calculate rolling offsets to design, fabricate, and install pipe).

Contextualized Online Resources:

- http://www.vbisd.org/1621109221347271 20/FileLib/browse.asp?A=374&BMDRN=2000&BCOB=0&C=54575 (On-the-Job Mathematics for Plumbers-Worksheets)

PM1 Use Calculators

Upon completion of this objective, learners will be able to:

1.1 identify the risks and benefits involved in using calculators in the trade
1.2 describe how calculators are used in the trade
1.3 determine the best calculator for the trade
1.4 use knowledge of calculators to solve problems

Note: Calculators are used to improve speed and accuracy of calculations; however, it is important to note that calculators are tools and are only accurate if they are used properly. It is very important to have an understanding of ***order of operations*** *when using calculators.*

Only resources that specifically refer to calculators are outlined here; however, calculator-use skills should be practiced with all identified resources.

Non-contextualized Resources:

- Fundamentals of Mechanical and Electrical Mathematics
- NWT Apprenticeship Support Materials Module 1 (Foundations)
- Introductory Technical Mathematics, *5th Edition* (pp. xx-xxi)

Technical Resources:

- Mathematics for Plumbers and Pipefitters, *7th Edition*
- Advanced Trade Math - Pipefitting Level Three - (Module 08304-07)
- Individual Learning Module 060107a Plumber - Applied Mathematics - Math and Science- First Period
- Individual Learning Module 070107e Steamfitter-Pipefitter - Applied Mathematics - Trade Mathematics and Science (Imperial and SI) - First Period
- Mastering Math for the Building Trades

Online Resources:

- http://www.shodor.org/unchem/math/calc/index.html
- http://www.how2begin.com/business/how-to-use-a-scientific-calculator-3.html
- http://www.uccs.edu/~energy/courses/calculator.html
- http://www.khake.com/page47.html

PM2 Use Positive and Negative Numbers

Upon completion of this objective, learners will be able to:

2.1 read positive and negative numbers
2.2 write positive and negative numbers
2.3 round positive and negative numbers
2.4 estimate positive and negative numbers
2.5 order positive and negative numbers
2.6 compare positive and negative numbers
2.7 add positive and negative numbers
2.8 subtract positive and negative numbers
2.9 multiply positive and negative numbers
2.10 divide positive and negative numbers
2.11 use knowledge of positive and negative numbers to solve problems

Non-contextualized Resources:

- NWT Apprenticeship Support Materials Module 1 (Foundations)
- Fundamentals of Mechanical and Electrical Mathematics
- Introductory Technical Mathematics, *5th Edition*
- Fundamental Mathematics, *4th Edition*
- Measurement and Calculation for the Trades
- Pre-Apprentice Training-A Test Preparation Manual for the Skilled Trades

Contextualized Resources:

- Mathematics for Plumbers and Pipefitters, *7th Edition*
- EARAT (Mathematics for Plumber Apprentices: Skill #1)
- Mastering Math for the Building Trades
- Blueprints and Plans for HVAC, *3rd Edition*

Technical Resources:

- Modern Plumbing (Chapter 4) (Instructor's Manual and Job Practice Manual)
- Individual Learning Module 060306c Plumber – Fixture Spacing - Trade Math and Science - Third Period
- Individual Learning Module 060107a Plumber - Applied Mathematics - Math and Science - First Period

- Individual Learning Module 070201p Steamfitter-Pipefitter –Heat Transfer Equipment and Piping - Hydronic Heating, Cooling, and Water Conditioning - Third Period

Online Resources:

- http://www.math.com/school/subject1/lessons/S1U1L11DP.html
- http://www.mathleague.com/help/integers/integers.htm#subtractingintegers
- http://www.math.com/school/subject1/lessons/S1U1L12DP.html
- http://www.mathleague.com/help/integers/integers.htm#dividingintegers
- http://www.khake.com/page47.html
- http://www.kutasoftware.com/free.html
- http://www.math-drills.com/orderofoperations.shtml
- http://www.mathleague.com/help/integers/integers.htm#multiplyingintegers

PM3 Use Order of Operations

Upon completion of this objective, learners will be able to:

3.1 identify the necessary steps in performing order of operations
3.2 calculate answers using correct order of operations
3.3 use order of operations to solve problems

Non-contextualized Resources:

- NWT Apprenticeship Support Materials Module 1 (Foundations)
- Fundamental Mathematics, *4th Edition*
- Introductory Technical Mathematics, *5th Edition*

Contextualized Resources:

- Mathematics for Plumbers and Pipefitters, *7th Edition*
- EARAT (Mathematics for Plumber Apprentices: Skill #2)

Online Resources:

- http://www.tpub.com/math2/index.htm
- http://www.khake.com/page47.html
- http://www.kutasoftware.com/free.html
- http://www.purplemath.com/modules/orderops.htm
- http://www.math-drills.com/orderofoperations.shtml
- http://amby.com/educate/ord-op/ex_set-1.html

PM4 Use Fractions

Upon completion of this objective, learners will be able to:

4.1 read fractions
4.2 write fractions
4.3 compare fractions
4.4 round fractions
4.5 simplify fractions
4.6 add fractions
4.7 subtract fractions
4.8 multiply fractions
4.9 divide fractions
4.10 use knowledge of fractions to solve problems

Non-contextualized Resources:

- NWT Apprenticeship Support Materials Module 1 (Foundations)
- Fundamentals of Mechanical and Electrical Mathematics
- Introductory Technical Mathematics, *5th Edition*
- Fundamental Mathematics, *4th Edition*
- Math to Build On-A Book for Those Who Build
- Measurement and Calculation for the Trades
- Pre-Apprentice Training-A Test Preparation Manual for the Skilled Trades

Contextualized Resources:

- EARAT (Mathematics for Plumber Apprentices: Skill #3)
- Pipefitter's Math Guide
- Mastering Math for the Building Trades
- Blueprints and Plans for HVAC, *3rd Edition*

Technical Resources:

- Modern Plumbing (Chapter 4) (Instructor's Manual and Job Practice Manual)
- Individual Learning Module 060306c Plumber – Fixture Spacing- Trade Math and Science - Third Period
- Individual Learning Module 060107a Plumber - Applied Mathematics-Math and Science - First Period
- Individual Learning Module 070107e Steamfitter-Pipefitter - Applied Mathematics -Trade Mathematics and Science (Imperial and SI) - First Period
- Pipefitters Handbook

Online Resources:

- http://mathforum.org/%7esarah/hamilton/
- http://www.khake.com/page47.html
- http://www.math-drills.com/fractions.shtml
- http://xpmath.com/careers/jobsresult.php?groupID=7&jobID=16

PM5 Use Mixed Numbers

Upon completion of this objective, learners will be able to:

5.1 read mixed numbers
5.2 write mixed numbers
5.3 compare mixed numbers
5.4 round mixed numbers
5.5 simplify mixed numbers
5.6 add mixed numbers
5.7 subtract mixed numbers
5.8 multiply mixed numbers
5.9 divide mixed numbers
5.10 use knowledge of mixed numbers to solve problems

Non-contextualized Resources:

- Fundamentals of Mechanical and Electrical Mathematics
- NWT Apprenticeship Support Materials Module 1 (Foundations)
- Introductory Technical Mathematics, *5th Edition*
- Fundamental Mathematics, *4th Edition*
- Math to Build On-A Book for Those Who Build
- Measurement and Calculation for the Trades
- Pre-Apprentice Training-A Test Preparation Manual for the Skilled Trades

Contextualized Resources:

- EARAT (Mathematics for Plumber Apprentices: Skill #3)
- Pipefitter's Math Guide
- Blueprints and Plans for HVAC, *3rd Edition*

Technical Resources:

- Modern Plumbing (Chapter 4) (Instructor's Manual and Job Practice Manual)
- Individual Learning Module 060306c Plumber – Fixture Spacing - Trade Math and Science - Third Period
- Individual Learning Module 070107e Steamfitter-Pipefitter - Applied Mathematics - Trade Mathematics and Science (Imperial and SI)- First Period
- Individual Learning Module 060107a Plumber - Applied Mathematics - Math and Science - First Period
- Pipefitters Handbook

Online Resources:

- http://mathforum.org/%7esarah/hamilton/
- http://www.khake.com/page47.html
- http://www.math-drills.com/fractions.shtml
- http://xpmath.com/careers/jobsresult.php?groupID=7&jobID=16

PM6 Use Decimals

Upon completion of this objective, learners will be able to:

6.1 read decimals
6.2 write decimals
6.3 estimate decimals
6.4 round decimals
6.5 add decimals
6.6 subtract decimals
6.7 multiply decimals
6.8 divide decimals
6.9 use knowledge of decimals to solve problems

Non-contextualized Resources:

- NWT Apprenticeship Support Materials Module 1 (Foundations)
- Fundamentals of Mechanical and Electrical Mathematics
- Introductory Technical Mathematics, *5th Edition*
- Fundamental Mathematics, *4th Edition*
- Measurement and Calculation for the Trades
- Pre-Apprentice Training-A Test Preparation Manual for the Skilled Trades

Contextualized Resources:

- Mastering Math for the Building Trades
- Blueprints and Plans for HVAC, *3rd Edition*
- EARAT (Mathematics for Plumber Apprentices: Skill #4)
- Pipefitter's Math Guide

Technical Resources:

- Individual Learning Module 060306d Plumber – Grades and Elevations - Trade Mathematics and Science - Third Period
- Individual Learning Module 060107a Plumber - Applied Mathematics - Math and Science - First Period
- Individual Learning Module 070107e Steamfitter-Pipefitter Applied Mathematics Trade Mathematics and Science (Imperial and SI) - First Period
- Pipefitters Handbook

Online Resources:

- http://mathforum.org/%7esarah/hamilton/
- http://www.khake.com/page47.html
- http://xpmath.com/careers/jobsresult.php?groupID=7&jobID=16

PM7 Use Percent

Upon completion of this objective, learners will be able to:

7.1 use formulae to calculate percent
7.2 use knowledge of percent to solve problems

Non-contextualized Resources:

- Introductory Technical Mathematics, *5th Edition*
- Fundamental Mathematics, *4th Edition*
- Fundamentals of Mechanical and Electrical Mathematics
- Measurement and Calculation for the Trades
- Pre-Apprentice Training-A Test Preparation Manual for the Skilled Trades

Contextualized Resources:

- EARAT (Mathematics for Plumber Apprentices: Skill #5)

Technical Resources:

- Individual Learning Module 060301c Plumber – Approved Effluent and Sewage Treatment Components - Private Sewage Disposal Systems - Third Period
- Individual Learning Module 060306d Plumber – Grades and Elevations - Trade Math and Science - Third Period
- Individual Learning Module A070305c Steamfitter-Pipefitter – Carbon and Alloy Steels and Alloy Steel Filler Metals-SMAW Two - Third Period
- Individual Learning Module 060107b Plumber – Perimeters, Areas, Percentage and Grade - Math and Science - First Period

Online Resources:

- http://www.khake.com/page47.html
- http://xpmath.com/careers/jobsresult.php?groupID=7&jobID=16

PM8 Use Conversion

Upon completion of this objective, learners will be able to:

8.1 explain the purpose of mathematical conversion
8.2 convert among fractions, decimals and percent
8.3 use automatic recall of decimal and percent equivalents of common fractions
8.4 use knowledge of conversion to solve problems

Non-contextualized Resources:

- NWT Apprenticeship Support Materials Module 1 (Foundations)
- Fundamentals of Mechanical and Electrical Mathematics
- Introductory Technical Mathematics, *5th Edition*
- Pre-Apprentice Training-A Test Preparation Manual for the Skilled Trades

Contextualized Resources:

- Pipefitter's Math Guide
- Mastering Math for the Building Trades
- EARAT (Mathematics for Plumber Apprentices: Skill #6)
- Introduction to Plumbing Math (Module 02104-05)

Technical Resources:

- Individual Learning Module 060107a Plumber Applied Mathematics (Math and Science) - First Period
- Individual Learning Module 060107b Plumber – Perimeters, Areas, Percentage and Grade - Math and Science - First Period
- Individual Learning Module 070107e Steamfitter-Pipefitter - Applied Mathematics - Trade Mathematics and Science (Imperial and SI) - First Period

Online Resources:

- http://www.khake.com/page47.html
- http://xpmath.com/careers/jobsresult.php?groupID=7&jobID=16

PM9 Use Measurement Systems

Upon completion of this objective, learners will be able to:

9.1 demonstrate uses of specific measurements
9.2 perform conversions within the Metric Measurement System
9.3 perform conversions within the Imperial Measurement System
9.4 perform conversions between the Metric and Imperial Measurement Systems
9.5 perform time conversions
9.6 use knowledge of conversion to solve problems

Note: Emphasis should be made on temperature conversion.

Non-contextualized Resources:

- Fundamentals of Mechanical and Electrical Mathematics (Chapter 8)
- Introductory Technical Mathematics, *5th Edition* (Units 8 & 9)
- Math to Build On - A Book for Those Who Build
- Measurement and Calculation for the Trades
- Pre-Apprentice Training - A Test Preparation Manual for the Skilled Trades

Contextualized Resources:

- Mathematics for Plumbers and Pipefitters, *7th Edition*
- Individual Learning Module 060107a Plumber – Applied Mathematics - Math and Science - First Period
- EARAT (Mathematics for Plumber Apprentices: Skill # 8)
- EARAT (Mathematics for Plumber Apprentices: Skill # 9)
- EARAT (Mathematics for Plumber Apprentices: Skill # 10)
- Introduction to Plumbing Math (Module 02104-05)
- Blueprints and Plans for HVAC, *3rd Edition*

Technical Resources:

- IPT's Metal Trades and Welding Handbook
- Modern Plumbing (Chapter 4 & 6) (Instructor's Manual and Job Practice Manual)
- Pipefitters Handbook
- Individual Learning Module 060107c Plumber – Temperature and Heat - Math and Science - First Period
- Individual Learning Module 060107d Plumber – Matter, Density and Relative Density - Math and Science - First Period

- Individual Learning Module 060102c Plumber – Iron Pipe and Fittings – Tools and Materials - First Period
- Individual Learning Module 060107d Plumber – Matter, Density and Relative Density - Math and Science - First Period
- Individual Learning Module 070107c Steamfitter-Pipefitter – Temperature and Heat Calculations - Trade Mathematics and Science (Imperial and SI) - First Period
- Individual Learning Module 070106a Steamfitter-Pipefitter – Drawing Tools - Blueprint Reading and Drawings - First Period
- Individual Learning Module 070106b Steamfitter-Pipefitter – Introduction to Drawing - Blueprint Reading and Drawings - First Period
- Individual Learning Module 070107c Steamfitter-Pipefitter – Temperature and Heat Calculations - Trade Mathematics and Science (Imperial and SI) - First Period
- Individual Learning Module 070107d Steamfitter-Pipefitter – Properties of Matter - Trade Mathematics and Science (Imperial and SI) - First Period
- Individual Learning Module 070201i Steamfitter-Pipefitter – Boiler, Low-Temperature Hot Water Piping and Trim - Low-Temperature Heating Systems - Second Period
- Individual Learning Module 060301c Plumber – Approved Effluent and Sewage Treatment Components – Private Sewage Disposal systems- Third Period
- Individual Learning Module 060306d Plumber – Grades and Elevations - Trade Mathematics and Science - Third Period

Online Resources:

- http://www.khake.com/page47.html
- http://xpmath.com/careers/jobsresult.php?groupID=7&jobID=16

PM10 Use Rate, Ratio and Proportion

Upon completion of this objective, learners will be able to:

10.1 describe the differences among rate, ratio and proportion
10.2 give examples of how rate, ratio and proportion are used in the trade
10.3 write numbers as proportions
10.4 use knowledge of rate to solve problems
10.5 use knowledge of ratio to solve problems
10.6 use knowledge of proportion to solve problems

Non-contextualized Resources:

- NWT Apprenticeship Support Materials Module 1 (Foundations)
- Introductory Technical Mathematics, *5th Edition*
- Fundamental Mathematics, *4th Edition*
- Measurement and Calculation for the Trades
- Pre-Apprentice Training - A Test Preparation Manual for the Skilled Trades

Contextualized Resources:

- EARAT (Mathematics for Plumber Apprentices: Skill # 7)
- Mathematics for Plumbers and Pipefitters, *7th Edition*

Technical Resources:

- Individual Learning Module 070106b Steamfitter-Pipefitter – Introduction to Drawing - Blueprint Reading and Drawings - First Period
- Individual Learning Module 060306d Plumber – Grades and Elevation – Trade Math and Science - Third Period
- Individual Learning Module 070308d Steamfitter-Pipefitter – Piping Spools - Blueprint Reading, Sketching, and Drawing- Fourth Period

Online Resources:

- http://www.khake.com/page47.html
- http://www.mathleague.com/help/ratio/ratio.htm#ratio
- http://xpmath.com/careers/jobsresult.php?groupID=7&jobID=16

PM11 Use Square Root and Exponents

Upon completion of this objective, learners will be able to:

11.1 determine the square root of positive numbers that are perfect squares
11.2 determine approximate square root of positive numbers that are not perfect squares
11.3 use knowledge of square root to solve problems
11.4 use knowledge of exponent laws to solve problems
11.5 determine significant digits
11.6 use knowledge of scientific notation to solve problems

Non-contextualized Resources:

- Introductory Technical Mathematics, *5th Edition*
- Fundamentals of Mechanical and Electrical Mathematics
- Math to Build On-A Book for Those Who Build
- Pre-Apprentice Training-A Test Preparation Manual for the Skilled Trades

Contextualized Resources:

- Mathematics for Plumbers and Pipefitters, *7th Edition*
- Pipefitter's Math Guide
- Mastering Math for the Building Trades

Technical Resources:

- Individual Learning Module 060107e Plumber – Pressure and Atmosphere - Math and Science - First Period
- Individual Learning Module 070107e Steamfitter-Pipefitter – Pressure and Atmosphere - Trade Mathematics and Science (Imperial and SI)- First Period
- Individual Learning Module 060207b Plumber – Pressure and Flow of Gases, Buoyancy and Water Properties - Math and Science - Second Period
- Individual Learning Module 070202a Steamfitter-Pipefitter – Rigging Procedures: Planning, Weights, Jacks and Tuggers - Rigging and Material Handling - Second Period
- Individual Learning Module 060306b Plumber – Square Roots, Piping Offsets and Fitting Allowance - Trade Math and Science - Third Period
- Individual Learning Module 060406a Plumber – Related Subjects- Fourth Period
- Pipefitters Handbook

Online Resources:

- http://mathforum.org/%7esarah/hamilton/
- http://www.khake.com/page47.html
- http://www.kutasoftware.com/free.html

PM12 Solve Equations

Upon completion of this objective, learners will be able to:

12.1 write variable expressions and equations from sentences
12.2 simplify variable expressions
12.3 write equations from sentences
12.4 solve one-step equations
12.5 solve two-step equations
12.6 solve multi-step equations

Non-contextualized Resources:

- NWT Apprenticeship Support Materials Module 3 (Variables and Equations)
- Fundamentals of Mechanical and Electrical Mathematics
- Introductory Technical Mathematics, *5th Edition*
- Pre-Apprentice Training-A Test Preparation Manual for the Skilled Trades

Contextualized Resources:

- Mathematics for Plumbers and Pipefitters, *7th Edition*
- Blueprints and Plans for HVAC, *3rd Edition*

Technical Resources:

- Individual Learning Module 070202a Steamfitter-Pipefitter - Rigging Procedure: Planning, Weights, Jacks and Tuggers - Rigging and Material Handling - Second Period
- Individual Learning Module 060306d Plumber – Grades and Elevations - Trade Mathematics and Science - Third Period
- Individual Learning Module 070201p Steamfitter-Pipefitter - Heat Transfer Equipment and Piping - Hydronic Heating, Cooling and Water Conditioning - Third Period
- Individual Learning Module 070307b Steamfitter-Pipefitter- Trade Science - Trade Math and Science - Fourth Period

Online Resources:

- http://www.khake.com/page47.html
- http://www.kutasoftware.com/free.html

PM13 Use Trade-Related Formulae

Upon completion of this objective, learners will be able to:

13.1 identify formulae common to the trade
13.2 solve problems using formulae as written
13.3 solve problems by rearranging formulae

General Contextualized and Technical Resources:

- Mathematics for Plumbers and Pipefitters, *7th Edition*
- Evaluating Academic Readiness for Apprenticeship Training for Plumber Apprentices- Mathematical Skill #11 (Manipulation of Variables)
- Individual Learning Module 060107f Plumber - Transfer of Heat and the Effects of Heat- Math and Science- First Period
- Pipefitters Handbook
- IPT's Metal Trades and Welding Handbook

Perimeter, Area, Circumference

Non-contextualized Resources:

- Math to Build On - A Book for Those Who Build
- Introductory Technical Mathematics, *5th Edition*
- Measurement and Calculation for the Trades

Contextualized Resources:

- NWT Apprenticeship Support Materials Module 4 (Measuring Time, Shapes, and Space)
- Formulas at Work (SkillPlan)
- Applied Math - Plumbing Level Three (Module 02301-06)
- Pipefitting Trade Math- Pipefitting Level Two (Module 08204-06)
- Blueprints and Plans for HVAC, *3rd Edition*

Technical Resources:

- Modern Plumbing (Chapter 4) (Instructor's Manual and Job Practice Manual)
- Individual Learning Module 070107d Steamfitter-Pipefitter – Pressure and atmosphere - Trade Mathematics and Science (Imperial and SI) - First Period
- Individual Learning Module 070201l Steamfitter-Pipefitter – Pipe Bending - Low-Temperature Heating Systems - Second Period
- Individual Learning Module 070107b Steamfitter-Pipefitter or 060107b Plumber – Perimeters, Areas, Percentage, and Grade - Trade Mathematics and Science (Imperial and SI) - First Period
- Pipefitters Handbook

Volume and Surface Area

Non-contextualized Resources:

- Introductory Technical Mathematics, *5th Edition*
- Math to Build On - A Book for Those Who Build
- Measurement and Calculation for the Trades
- Formulas at Work (SkillPlan)

Contextualized Resources:

- Applied Math - Plumbing Level Three (Module 02301-06)
- Mathematics for Plumbers and Pipefitters, *7th Edition*
- Pipefitting Trade Math - Pipefitting Level Two (Module 08204-06)
- Blueprints and Plans for HVAC, *3rd Edition*

Technical Resources:

- Modern Plumbing (Chapter 4) (Instructor's Manual and Job Practice Manual)
- Pipefitters Handbook
- Individual Learning Module 070107d Steamfitter-Pipefitter – Properties of Matter - Trade Mathematics and Science (Imperial and SI) - First Period
- Individual Learning Module 060107d Plumber – Matter, Density and Relative Density Math and Science - First Period
- Individual Learning Module 060207a Plumber – Volumes, Capacities, and 45° Offsets Math and Science - Second Period
- Individual Learning Module 070205a Steamfitter-Pipefitter – Volumes and Capacities Math and Science - Second Period
- Individual Learning Module 060306a Plumber - Volumes, Capacities and Surface Areas - Trade Math and Science - Third Period
- Individual Learning Module 070407a Steamfitter-Pipefitter – Trade Mathematics and Science - Fourth Period

Pythagorean Theorem

Learners should be able to apply the Pythagorean Theorem to determine whether or not a triangle is a right triangle; to determine the measure of the third side of a right triangle when the measures are given for the two other sides; and to determine the distance between two points on a coordinate plane.

Non-contextualized Resources:

- Math to Build On-A Book for Those Who Build
- Measurement and Calculation for the Trades
- Introductory Technical Mathematics, *5th Edition*
- Formulas at Work (SkillPlan)

Contextualized Resources:

- Mathematics for Plumbers and Pipefitters, *7th Edition*
- EARAT (Mathematics for Plumber Apprentices: Skill #12)
- Pipefitting Trade Math - Pipefitting Level Two (Module 08204-06)
- Pipefitters Math Guide

Technical Resources:

- Modern Plumbing (Chapter 4) (Instructor's Manual and Job Practice Manual)
- Individual Learning Module 060406a Plumber–related Subjects - Fourth Period
- Plumbing Math Two - Plumbing Level Two (Module 02201-05)
- Individual Learning Module 060207a Plumber – Volumes, Capacities and 45° Offsets - Math and Science - Second Period
- Individual Learning Module 060306b Plumber – Square Roots, Piping Offsets and Fitting Allowance - Trade Mathematics and Science - Third Period

Online Resources

- http://xpmath.com/careers/jobsresult.php?groupID=7&jobID=16
- http://www.swtc.edu:8082/mscenter/tutorial.htm#Formulas

PM14 Use Estimation

Upon completion of this objective, learners will be able to:

14.1 identify estimation rules
14.2 use estimation rules to solve single-step problems
14.3 use estimation rules to solve multi-step problems

Non-contextualized Resources:

- Fundamental Mathematics, *4th Edition*
- NWT Apprenticeship Support Materials Module 4 (Measuring Time, Shapes and Space)
- Introductory Technical Mathematics, *5th Edition*

Contextualized Resources:

- Mathematics for Plumbers and Pipefitters, *7th Edition*

PM15 Use Angles

Upon completion of this objective, learners will be able to:

15.1 identify various types of angles
15.2 compare angles common to the trade
15.3 accurately measure angles
15.4 use knowledge of angles to solve problems

Non-contextualized Resources:

- Introductory Technical Mathematics, *5th Edition*
- Measurement and Calculation for the Trades
- Pre-Apprentice Training-A Test Preparation Manual for the Skilled Trades

Contextualized Resources:

- Mathematics for Plumbers and Pipefitters, *7th Edition*
- EARAT (Mathematics for Plumber Apprentices: Skill #12)
- Math to Build On-A Book for Those Who Build
- Pipefitter's Math Guide
- Mastering Math for the Building Trades
- Blueprints and Plans for HVAC, *3rd Edition*

Technical Resources:

- IPT's Metal Trades and Welding Handbook
- Modern Plumbing (Chapter 4) (Instructor's Manual and Job Practice Manual)
- Pipefitters Handbook
- Individual Learning Module 060108a Plumber – Introduction to Sketching and Drawing - Blueprint Reading - First Period
- Individual Learning Module 060108c Plumber – Single Line drawing and Blueprint Interpretation - First Period
- Individual Learning Module A070105b Steamfitter-Pipefitter – Shop/Lab Practices: SMAW Welds on Mild Steel - Welding- First Period
- Individual Learning Module 070106a Steamfitter-Pipefitter – Drawing Tools-Blueprint Reading and Drawings - First Period
- Individual Learning Module 070106b Steamfitter-Pipefitter – Introduction to Drawing - Blueprint Reading and Drawings - First Period
- Individual Learning Module 060205b Plumber – Rigging and Hoisting - Practical Applications - Second Period

- Individual Learning Module 060207a Plumber –Volumes, Capacities, and 45° Offsets Math and Science- Second Period
- Individual Learning Module 070407a Steamfitter-Pipefitter – Trade Mathematics and Science - Fourth Period
- Individual Learning Module 070102i Steamfitter-Pipefitter – Pipe Bending Theory
- Individual Learning Module 070201l Steamfitter-Pipefitter – Expansion and Contraction Control - Low-Temperature Heating Systems - Second Period
- Individual Learning Module 070202b Steamfitter-Pipefitter – Rigging Procedures: Slings and Hoisting Equipment Hardware - Rigging and Material Handling - Second Period

Online Resources:

- http://mathforum.org/%7esarah/hamilton/
- http://www.khake.com/page47.html
- http://www.math-drills.com/orderofoperations.shtml
- http://xpmath.com/careers/jobsresult.php?groupID=7&jobID=16
- http://www.ibd.ab.ca/files/Numeracy@work-sample.pdf (Calculating offsets)

PM16 Use Geometric Shapes

Upon completion of this objective, learners will be able to:

16.1 identify geometric shapes
16.2 use knowledge of geometric shapes to solve problems

Non-contextualized Resources:

- Introductory Technical Mathematics, *5th Edition*
- Measurement and Calculation for the Trades
- Pre-Apprentice Training-A Test Preparation Manual for the Skilled Trades

Contextualized Resources:

- Mathematics for Plumbers and Pipefitters, *7th Edition*
- Math to Build On-A Book for Those Who Build

Technical Resources:

- IPT's Metal Trades and Welding Handbook
- Modern Plumbing (Chapter 4) (Instructor's Manual and Job Practice Manual)
- Pipefitters Handbook
- Individual Learning Module 060108a Plumber – Introduction to Sketching and Drawing- Blueprint Reading - First Period
- Individual Learning Module 070106a Steamfitter-Pipefitter – Drawing Tools- Blueprint Reading and Drawings - First Period
- Individual Learning Module 070106b Steamfitter-Pipefitter – Introduction to Drawing- Blueprint Reading and Drawings - First Period
- Individual Learning Module 070106c Steamfitter-Pipefitter – Isometric and Oblique Drawings - Blueprint Reading and Drawings - First Period
- Individual Learning Module 060108c Plumber – Single Line Drawing and Blueprint Interpretation - First Period
- Individual Learning Module 070107e Steamfitter-Pipefitter – Pressure and the Atmosphere- Trade Mathematics and Science (Imperial and SI) - First Period
- Individual Learning Module 070102i Steamfitter-Pipefitter – Pipe Bending Theory
- Individual Learning Module 070201l Steamfitter-Pipefitter – Expansion and Contraction Control - Low-Temperature Heating Systems - Second Period
- Individual Learning Module 070202a Steamfitter-Pipefitter – Rigging Procedures: Planning, Weights, Jacks and Tuggers - Rigging and Material Handling - Second Period
- Individual Learning Module 060406a Plumber–related Subjects - Plumbing Related Subjects - Fourth Period

- Individual Learning Module 070206c Steamfitter-Pipefitter – Piping Offsets Part A – Blueprint Reading, Sketching and Drawing - Third Period
- Blueprints and Plans for HVAC, *3rd Edition*
- Individual Learning Module 070107b Steamfitter-Pipefitter or 060107b Plumber – Perimeters, Areas, Percentage, and Grade - Trade Mathematics and Science (Imperial and SI) - First Period
- Individual Learning Module 060306b Plumber – Square Roots, Piping Offsets and Fitting Allowance - Trade Math and Science - Third Period
- Individual Learning Module 060306a Plumber – Volumes, Capacities, and Surface Areas - Trade Math and Science - Third Period

Online Resources:

- http://www.tpub.com/math2/index.htm
- http://www.khake.com/page47.html
- http://xpmath.com/careers/jobsresult.php?groupID=7&jobID=16

PM17 Use Trigonometry

Upon completion of this objective, learners will be able to:

17.1 identify the value of trigonometry in the trade
17.2 set up trigonometric ratios
17.3 use trigonometric functions to solve problems

Non-contextualized Resources:

- Fundamentals of Mechanical and Electrical Mathematics
- Introductory Technical Mathematics, *5th Edition* (Section VII)
- Measurement and Calculation for the Trades
- NWT Apprenticeship Support Materials Module 4 (Measuring Time, Shapes, and Space)

Contextualized Resources:

- Math to Build On-A Book for Those Who Build
- Pipefitters Math Guide

Technical Resources:

- Modern Plumbing (Chapter 4) (Instructor's Manual and Job Practice Manual)
- Advanced Trade Math- Pipefitting Level Three - (Module 08304-07)
- Pipefitters Handbook
- Individual Learning Module 070205b Steamfitter-Pipefitter – Miter Elbow- Third Period
- Individual Learning Module 070207g Steamfitter-Pipefitter – Stainless Steel Miter- Blueprint Reading, Sketching, and Drawing - Third Period
- Individual Learning Module 070206e Steamfitter-Pipefitter – Piping Offsets - Part A - Blueprint Reading, Sketching, and Drawing - Third Period
- Individual Learning Module 060207a Plumber – Volumes, Capacities, and 45° Offsets Math and Science - Second Period
- Individual Learning Module 060306b Plumber – Square Roots, Piping Offsets and Fitting Allowance - Trade Mathematics and Science - Third Period
- Individual Learning Module 070307a Steamfitter-Pipefitter – Trade Math - Trade Mathematics and Science - Fourth Period

Online Resources:

- http://www.tpub.com/math2/index.htm
- http://www.swtc.edu:8082/mscenter/tutorial.htm#Introduction%20to%20Trigonometry
- http://www.onlinemathlearning.com/basic-trigonometry.html
- http://mathforum.org/%7esarah/hamilton/
- http://www.khake.com/page47.html
- http://www.funmaths.com/worksheets/math_trigonometry_05.htm
- http://www.xpmath.com/exercises/files/sincos.pdf
- http://www.xpmath.com/exercises/files/tan.pdf

Appendix A

Resource Materials:

Alberta Individual Learning Modules for Plumber
Alberta Apprenticeship and Industry Training, 1998
Tel: 1-800-232-7215
http://www.tradesecrets.gov.ab.ca

Alberta Individual Learning Modules for Steamfitter-Pipefitter
Alberta Apprenticeship and Industry Training, 1998
Tel: 1-800-232-7215
http://www.tradesecrets.gov.ab.ca

Blueprints and Plans for HVAC, 3rd Edition
Frank Miller, Wilma Miller and Joseph Moravek
Delmar Cengage Learning, 2008
ISBN: 13-978-1-4283-3520-2

Evaluating Academic Readiness for Apprenticeship Training (EARAT)
Mathematics for Plumber Apprentices
Workplace Support Services Branch
Ontario Ministry of Training, Colleges and Universities, October 2000
Tel: 416-325-2929 or 1-800-387-5514
Email: info@edu.gov.on.ca

Formulas at Work: Tradesworkers on the Job
Sue Grecki
SkillPlan: BC Construction Industry Skills Improvement Council, 2007
ISBN: 978-0-9739232-6-1
www.skillplan.ca

Fundamental Mathematics 4th Edition
Marvin L. Bittinger
Pearson Education Inc., 2007
ISBN: 0-321-31907-9

Fundamentals of Mechanical and Electrical Mathematics
National Centre for Construction Education and Research
Prentice Hall Inc., 1996
ISBN: 0-13-910142-X

Introduction to Plumbing Math (Module 02104-05)
Plumbing Math Two (Module 02201-05)
Applied Math (Module 02301-06)
National Center for Construction Education and Research
Contren Learning Series
Prentice Hall Inc., 2005
ISBN: 0-13-160040-0; 0-13-168302-0; 0-13-229269-6

Introductory Technical Mathematics, 5th Edition
Robert Smith and John C. Peterson
Thomson Delmar Learning, 2007
ISBN: 1-4180-1543-1
www.delmarlearning.com

IPT's Metal Trades and Welding Handbook
Ronald G. Garby and Bruce J. Ashton
IPT Publishing and Training Ltd., 1993
ISBN: 978-0-92855-19-5

Mastering Math for the Building Trades
James Gerhart
McGraw-Hill, 2000
ISBN: 0-07-136023-9

Math to Build On - A Book for Those Who Build
Johnny and Margaret Hamilton
Construction Trades Press, 1993
ISBN: 0-9624197-1-0
www.pipefitter.com

Mathematics for Plumbers and Pipefitters 7th Edition
Lee Smith
Thomson Delmar Learning, 2008
ISBN: 1-4283-0461-4

Measurement and Calculation for the Trades
Sue Grecki and Bob Whitaker
SkillPlan: BC Construction Industry Skills Improvement Council, 2006
ISBN: 0-9685027-9-2
www.skillplan.ca

Modern Plumbing
E. Keith Blankenbaker
The Goodheart-Willcox Company Inc., 2005
ISBN: 13-978-1-59070-351-9

Modern Plumbing, Job Practice Manual
Charles H. Owenby
The Goodheart-Willcox Company Inc., 2005
ISBN: 1-59070-350-2

Modern Plumbing, Instructor's Manual
E. Keith Blankenbaker and Charles H. Owenby
The Goodheart-Willcox Company Inc., 2005
ISBN: 13-978-1-59070-352-6

NWT Apprenticeship Support Materials Math
Thomas O'Connor
Genesis Group Ltd., Yellowknife, NWT, 2003

Pipefitters Handbook, 3rd Edition
Forrest R. Lindsey
Industrial Press Inc.
ISBN: 978-0-8311-3019-0

Pipefitter's Math Guide
Johnny E. Hamilton
Construction Trades Press, 1989
ISBN: 0-9624197-0-2
www.pipefitter.com

Pipefitting Trade Math (Module 08204-06)
Advanced Trade Math (Module 08304-07)
National Center for Construction Education and Research
Contren Learning Series
Prentice Hall, 2007
ISBN: 0-13-613599-4; 0-13-614630-9

Pre-Apprentice Training-A Test Preparation Manual for the Skilled Trades
Jack Martin and Mary Serich
Jack Martin and Associates, 2006
ISBN: 0-9649530-1-3

All online resources listed in this document were operational at time of publication.

Oral Communication (OC) Learning Outcome: Learners will perform tasks which use speech to give and exchange thoughts and information.

OC1 Demonstrate an Understanding of Oral Communication	**1.1 Differentiate between oral and other forms of communication**	**1.2 Identify purpose of oral communication**	**1.3 Identify the benefits of effective oral communication**	**1.4 Identify barriers to effective oral communication**	**1.5 Identify the risks associated with ineffective oral communication**	**1.6 Outline ways to reduce the risk of ineffective communication**
OC2 Communicate Effective Messages	**2.1 Identify audience**	**2.2 Identify the purpose of communicating effective messages**	**2.3 Organize thoughts and ideas**	**2.4 Communicate effectively to a variety of audiences**		
OC3 Listen Effectively	**3.1 Identify the difference between listening and active listening**	**3.2 Identify the purpose of effective listening**	**3.3 Identify active listening strategies**	**3.4 Implement active listening strategies**		
OC4 Respond to Oral Communication	**4.1 Identify the main idea**	**4.2 Interpret verbal messages**	**4.3 Clarify received verbal messages**	**4.4 Respond appropriately to verbal messages**		

Learners will perform tasks which use speech to give and exchange thoughts and information

Introduction

Success in technical training and effective job performance requires strong Essential Skills. Although all Essential Skills contribute to success, this guide is intended to help apprentices develop positive oral communication (OC) for their trade. Competence in oral communication provides the foundation for better performance in technical training, both on the job and when mentoring new apprentices.

Strong oral communication skills are required in every occupation. In fact, many surveys indicate that it is one of the most highly valued skills among employers as it is intimately tied to everyday workplace functions. Oral communication in trade occupations is usually presented face-to-face, by telephone, or by two-way radio with a number of factors affecting the transfer of the message.

The following guide is an introduction to the basic principles and methods of oral communication with an emphasis on the importance of speaking, listening and interacting in the context of customer service and interpersonal communication.

A list of resources (See Appendix A) has been outlined for each objective in the Oral Communication curriculum framework and, where possible, includes online website materials that complement these resources. All information is presented in a generic manner; the contextualization to specific trades will be found in the expected tasks of each trade, determined by the instructor.

The list of resources has been designed to act only as a guide and may, therefore, need to be adapted to meet the needs of individuals or groups. It is the role of you, the instructor, to choose materials and deliver their content as it best suits individual learner needs. A variety of materials are listed under each set of competencies for this purpose.

Oral Communication in Trades Occupations

To make the most of technical training, apprentices need to develop strategies for effective listening, as well as the confidence and speaking skills to ask for help. These same strategies are used in the workplace to interact with co-workers, supervisors, workers in other trades, suppliers and customers. Understanding the many elements in the communications process helps apprentices send clear messages and understand the messages received.

Trades people communicate orally on a daily basis to complete job tasks. The complexity of these tasks, according to Human Resources and Skills Development Canada's Essential Skills Profiles (http://srv108.services.gc.ca/), varies slightly

among the thirteen trades outlined in the Trade Essentials project (See Curriculum Guidebook). All thirteen trades describe the least complex oral communication tasks as those containing some or all of the following characteristics:

- Limited oral communication demands
- Narrow range of subject matter
- Familiar topic
- One main issue
- Factual, literal or concrete language
- Narrow range of content and context-specific or technical vocabulary
- Clearly defined role of speaker
- Interaction with one person at a time
- Low risk
- Brief exchange (less than 10 minutes)

The most difficult tasks vary among the trades. The most complex tasks performed by cooks, welders, carpenters, automotive service technicians, steamfitters-pipefitters, cabinetmakers, machinists, industrial and construction electricians and metal fabricators contain some or all the following characteristics:

- Extensive oral communication demands
- Significant range of subject matter
- Professional, organizational, theoretical social issues
- Abstract and conceptual language
- Extensive range of technical vocabulary and idiom
- Complex and detailed information content
- Unpredictable context
- Various communication venues used
- Significant range of formats and styles
- Communicator may have more than one role
- New and unfamiliar situation and setting
- Medium to extended (30+ minutes) exchange
- Significant noise or interference
- Significant level of risk

The most complex oral communication tasks performed by plumbers, oil burner mechanics and refrigeration and air conditioning mechanics contain some or all of the following characteristics:

- Moderate oral communication demands
- Narrow range of subject matter
- Familiar topic
- Usually one main issue
- Factual or concrete and abstract language

- Moderate range of general and context-specific or technical vocabulary and idiom
- Moderately complex and detailed content
- Less predictable context
- Interaction is frequently one-on-one or with several people
- Give a short talk or give directions to a small group
- Select from a moderate range of formats and styles
- Established rules
- Brief to moderate (10-30 minutes) exchange
- Physical conditions may impede communication
- Moderate level of risk
- May be one-on-one hostility

Upon completion of this course, apprentices will better understand how communication skills impact safety, productivity, job satisfaction and job progression. Effective communication skills will benefit apprentices as they reach journeyperson status and as they accept additional responsibility for supervising and mentoring new employees.

For specific information and examples of the use of oral communication for each trade, instructors should refer to the Essential Skills Profile and the National Occupational Analysis. It should be noted that, according to HRSDC's Essential Skills profiles, oral communication is one of the most important Essential Skills for cooks, plumbers and automotive service technicians as these tradespeople interact frequently with customers.

Note: It is intended that the oral communication curriculum be embedded in other Essential Skills curricula where possible. Many of the competencies in oral communication and the five other essential skills may be mastered concurrently.

For background information on Oral Communication and how it is used in the trade, visit these sites:

General Online Resources:

Essential Skills Profile and Readers Guide
Human Resources and Skills Development Canada
http://srv108.services.gc.ca/english/general/home_e.shtml

National Occupational Analysis
http://www.red-seal.ca/Site/trades/analist_e.htm

Teaching Speaking and Listening - a toolkit for practitioners
http://www.lsneducation.org.uk/user/order.aspx?code=060014

OC1 Demonstrate an Understanding of Oral Communication

Upon completion of this objective, learners will be able to:

1.1 differentiate between oral and other forms of communication
- distinguish between verbal and non-verbal communication

1.2 identify the purpose of oral communication

1.3 identify the benefits of effective oral communication
- project a professional image through oral communication

1.4 identify barriers to effective oral communication
- identify how the following can produce barriers: sender, listener, content, environment
- outline personal habits that may interfere with effective oral communication: tone, volume, voice speed, facial expression, eye contact, etc.

1.5 identify the risks associated with ineffective oral communication

1.6 outline ways to reduce the risk of ineffective oral communication

Suggested Strategies and Activities:

- Hold a general discussion on benefits of effective oral communication
- Ask learners for examples of workplace communication, both effective and ineffective, and the consequences of each
- Refer to Essential Skills profile for the trade and find examples of the various types of communication and their purpose
- Discuss the factors that determine whether the communication is simple or complex
- Explain the elements of communication
- Discuss the difference between, and the importance of, both verbal and non-verbal communication
- Discuss specific, common barriers as they relate to the trade
- Provide learners with an opportunity to assess areas of strength and those areas where they should improve
- Establish some rules for effective communication in class
- Have learners reflect upon communicative challenges in everyday life

Resources:

- Applied Communication Skills for the Construction Trades
- Tools for Success: *Soft Skills for the Construction Industry*
- Business English and Communication, *5th Canadian Edition*

- Effective Workplace Communication, *3rd Edition*
- Communicating in the Workplace, *6th Canadian Edition*
- HVACR 101 (Chapter 10)

Online Resources:

- https://www.lsneducation.org.uk/user/order.aspx?code=060014 (Teaching speaking and listening; a toolkit for practitioners)
- http://www.mindtools.com/page8.html (Mind Tools: Communication Skills)
- http://www.khake.com/page66.html
- https://www.lsneducation.org.uk/user/login.aspx?code=078838&P=078838PD&action=pdfdl&src=XOWEB (Key Skills Support Program: Communication)

OC2 Communicate Effective Messages

Upon completion of this objective, learners will be able to:

2.1 identify audience
2.2 identify purpose
2.3 organize thoughts and ideas
2.4 communicate effectively to a variety of audiences
- use non-verbal techniques to reinforce the verbal message
- use appropriate terminology
- communicate one-on-one
- participate in group discussions
- present information to groups

Suggested Strategies and Activities:

- Ask learners to identify the different people they speak with at work (i.e., project managers, supervisors, foremen, co-workers, workers in other trades, customers, suppliers)
- Discuss the differences in communicating with each
- Ask learners to think about the jargon, technical language and abbreviations that are used in their trade and the appropriateness of using this language with each audience
- Increase awareness of poor speech habits by creating a list of those that learners have observed
- Identify and discuss significance of non-verbal communication such as facial expression, posture and gestures
- Identify strategies for effective telephone communication, use of cellular telephone, and two-way radio
- Provide opportunities for learners to give instructions in class setting by giving oral instructions to others one-on-one or to the group
- Provide opportunities for engaging learners in discussion
- Encourage speaking in class to increase learner confidence
- Hand out materials on effective participation in meetings/group discussions
- Provide opportunities for learners to share information in the form of a short presentation on a topic that they are comfortable with, using a visual aid such as a picture, sketch or diagram to increase understanding
- Use the process of giving and receiving of feedback as a communication situation
- Create a safe atmosphere for giving and receiving feedback on communication style

- Assign learners the task of leading the class through some of the assigned material

Resources:

- Tools for Success: *Soft Skills for the Construction Industry*
- Applied Communications Skills for the Construction Trades
- Business English and Communication, *5th Canadian Edition*
- Communicating in the Workplace, *6th Canadian Edition*
- HVACR 101 (Chapter 10)
- Effective Workplace Communication, *3rd Edition*

Online Resources:

- https://www.lsneducation.org.uk/user/order.aspx?code=060014 (Teaching speaking and listening; a toolkit for practitioners)
- https://www.lsneducation.org.uk/user/login.aspx?code=078838&P=078838PD&action=pdfdl&src=XOWEB (Key Skills Support Program: Communication)
- http://www.mindtools.com/page8.html (Mind Tools: Communication Skills)
- http://www.khake.com/page66.html

OC3 Listen Effectively

Upon completion of this objective, learners will be able to:

3.1 identify the difference between listening and active listening
3.2 identify the purpose of active listening
3.3 identify active listening strategies
3.4 implement active listening strategies

Suggested Strategies and Activities:

- Discuss the importance of good listening skills in a variety of situations at work
- Define active listening
- Identify barriers to effective listening
- Have learners think about and monitor their listening skills
- Identify strategies for active listening including paraphrasing, questioning and note-taking
- Practice strategies for active listening
- Encourage learners to implement active listening strategies during training and on the job
- Have learners receive and follow-up on messages and instruction

Resources:

- Effective Workplace Communication, *3rd Edition*
- Tools for Success: *Soft Skills for the Construction Industry*
- Applied Communications Skills for the Construction Trades
- Business English and Communication, *5th Canadian Edition*
- Communicating in the Workplace, *6th Canadian Edition*
- HVACR 101 (Chapter 10)

Online Resources:

- https://www.lsneducation.org.uk/user/order.aspx?code=060014 (Teaching speaking and listening; a toolkit for practitioners)
- https://www.lsneducation.org.uk/user/login.aspx?code=078838&P=078838PD&action=pdfdl&src=XOWEB (Key Skills Support Program: Communication)
- http://www.mindtools.com/page8.html (Mind Tools: Communication Skills)
- http://www.khake.com/page66.html
- http://www.cte.uwaterloo.ca/teaching_resources/teaching_tips/tips_challenges/effective_communication.pdf (Teaching Tips)

OC4 Respond to Oral Communication

Upon completion of this objective, learners will be able to:

4.1 identify the main idea
4.2 interpret verbal messages
- differentiate among fact, opinion and feeling
- distinguish between relevant and irrelevant information
- identify the role of non-verbal messages in oral communication

4.3 clarify received messages
- ask questions to understand
- summarize and restate information

4.4 respond appropriately to verbal messages

Suggested Strategies and Activities:

- Discuss the role of intonation, posture, gestures, tone of voice, facial expression, and eye movement
- Have learners recognize and interpret visual cues (i.e., gestures, facial expression) to help understand messages
- Discuss 'vocally produced noises' (i.e., ah)
- Have learners brainstorm common "vocally produced noises"
- Discuss how emotion can impact oral communication
- Have learners listen and respond to the viewpoints of others by asking relevant questions, offering opinions and/or interpretations
- Use suitable resources for discussion (i.e., newspaper or magazine article on trade-related material)
- Have learners judge what information is relevant in verbal messages and trade-related material

Resources:

- Applied Communication Skills for the Construction Trades
- Tools for Success: *Soft Skills for the Construction Industry*
- Effective Workplace Communication, *3rd Edition*
- Business English an Communication, *5th Canadian Edition*
- Communicating in the Workplace, *6th Canadian Edition*

Online Resources:

- http://www.khake.com/page66.html

Appendix A

Resources:

Applied Communications Skills for the Construction Trades
Stephan A. Rigolosi
Pearson Education Inc., 2002
ISBN 0-13-093355-4

Business English and Communication, 5th Canadian Edition
Lyn R. Clark et al
McGraw-Hill Ryerson Limited, 1996
ISBN: 0-07-551777-9 (Teacher's Edition)

Communicating in the Workplace, 6th Canadian Edition
Margaret Dombeck et al
McGraw-Hill Ryerson Limited, 2003
ISBN: 978-0-07090-814-7

Effective Workplace Communications-Skills for Success in Life and on the Job, 3rd Edition
Marsha Ludden
JIST Works, 2007
ISBN: 978-1-59357-433-8
www.jist.com

HVACR 101
Air Conditioning Contractors of America
PHCC Educational Foundation
Refrigeration Service Engineers Society
Delmar CENGAGE Learning, 2009
ISBN: 13-978-1-4180-663-5

Tools for Success - Soft Skills for the Construction Industry, 2nd Edition
National Centre for Construction Education and Research
Pearson Education Inc., 2004
ISBN: 0-13-109194-8

All online resources listed in this document were operational at time of publication.

Computer Use (CU) Learning Outcome: Learners will use computer technology to access and interpret information and to communicate.

CU1 Use Computer Operations	**1.1 Identify the primary components of a computer**	**1.2 Describe the function of the primary components of a computer**	**1.3 Start up the computer, monitor, and printer**	**1.4 Shut down the computer, monitor, and printer**	**1.5 Log onto a network using a personal password**	**1.6 Demonstrate basic trouble-shooting strategies**
CU2 Use Word Processing Skills	**2.1 Open and close software**	**2.2 Create written documents**	**2.3 Create tables, graphs, and charts**	**2.4 Open existing written documents, tables, graphs, and charts**	**2.5 Save written documents, tables, graphs, and charts**	**2.6 Preview and print written documents. tables, graphs, and charts**
	2.7 Copy and move text	**2.8 Delete text**	**2.9 Format text**	**2.10 Set tabs**	**2.11 Set margins**	**2.12 Add and delete headers and footers**
	2.13 Add and delete page numbers	**2.14 Set page layout**	**2.15 Check and correct spelling**	**2.16 Check and correct grammar**	**2.17 Use thesaurus**	
CU3 Use File Management Skills	**3.1 Distinguish between files and folders**	**3.2 Create files and folders**	**3.3 Save files**	**3.4 Copy files and folders**	**3.5 Move files and folders**	**3.6 Organize files and folders**
	3.7 Rename files and folders	**3.8 Delete files and folders**				

CU4 Use Spreadsheets	4.1 Identify the purpose of spreadsheets in the trade	4.2 Interpret information in existing spreadsheets	4.3 Enter data into existing spreadsheets	4.4 Manipulate data within existing spreadsheets	4.5 Create spreadsheets	4.6 Create and copy formulas to perform calculations
	4.7 Print spreadsheets	4.8 Print selected parts of spreadsheets				
CU5 Read and Write Email Messages	5.1 Open messages	5.2 Reply to messages	5.3 Write, send, and forward messages	5.4 Print messages	5.5 Add attachments to messages	5.6 Delete messages
	5.7 Create folders	5.8 Move messages to folders	5.9 Delete folders	5.10 Identify and manage common email problems		
CU6 Use Web Search Skills	6.1 Define web browser	6.2 Access a specific website	6.3 Use a search engine	6.4 Evaluate information found on the World Wide Web	6.5 Download information from the World Wide Web	6.6 Copy information from the World Wide Web
	6.7 Save information from the World Wide Web	6.8 Share information from the World Wide Web	6.9 Print information from the World Wide Web			

Learners will use computer technology to access and interpret information and to communicate

Introduction

The workforce is constantly changing. Today's employees are highly mobile, expect continuous learning to be an integral part of their job, and are adapting to a technological world. In fact, technology has changed the very fabric of the workplace and, as a result, workers are expected to acquire a broad range of skills if they are to remain current, accurate and competitive. Trades occupations are no exception. For example: automation in plants and factories have demanded an increased knowledge of networking and software use; lathes and cutting tools are often linked to computers; and entrepreneurs require skills in word processing, accounting, e-mail and internet use and database management.

This Computer Use (CU) course has been designed to help workers adapt to this ever-changing society. It is intended for individuals who are inexperienced computer users but who want to gain some hands-on skill and confidence. It assumes no previous knowledge of computers and will provide learners with a broad overview of computer and internet technology. The following major topic areas are explored:

- Computer Operations
- File Management
- Email
- Safe Use of Computers
- Word Processing
- Spreadsheets
- Web Browsing

This following guide outlines a list of recommended resources (see Appendix A) for each objective in the Computer Use curriculum framework and, where possible, includes online website materials that complement these resources. Because computer skills are generic in the workplace, this course is not contextualized to specific trades. Apprentices, however, should be provided with examples of how computers are used in their respective trades. Contextualized website lists are provided in Appendix B.

The list of resources has been designed to act only as a guide and may, therefore, need to be adapted to meet the needs of individuals or groups. It is the role of you, the instructor, to choose materials and deliver its content as it best suits individual learner needs. A variety of materials are listed under each set of competencies for this purpose.

Note: The computer use curriculum can be used in one of two ways: as a stand-alone course or embedded in other Essential Skills curriculum. For instance, computer use competencies (i.e., email, word processing) and writing competencies may be mastered concurrently.

CU1 Use Computer Operations

Upon completion of this objective, learners will be able to:

1.1 identify the primary components of a computer – monitor, keyboard, mouse, system unit, ports, disk drives, printers
1.2 describe the function of the primary components of a computer
1.3 start up the computer, monitor and printer
1.4 shut down the computer, monitor and printer
1.5 log onto a network using a personal password
1.6 demonstrate basic troubleshooting strategies
- protect and care for flash drives, CD ROMS and other media
- clean computer components
- maintain back-up copies of documents
- perform basic maintenance

Resources:

- Essential Skills for Digital Literacy - IC3 Module A ~ Courseware 2105-2 - Computing Fundamentals using Windows XP

Online Resources:

- www.ctdlc.org/remediation/indexComputer.html
- www.homepages.ed.ac.uk/calarks/arks/materials.html
- www.functionx.com/windows/Lesson01.htm
- www.bcot1.com/

CU2 Use Word Processing Skills

Upon completion of this objective, learners will be able to:

2.1 open and close software
2.2 create written documents
2.3 create tables, graphs and charts
2.4 open existing written documents, tables, graphs and charts
2.5 save written documents, tables, graphs and charts
2.6 preview and print written documents, tables, graphs and charts
2.7 copy and move text
2.8 delete text
2.9 format text
- change font
- highlight text
- italicize, bold and underline text

2.10 set tabs
2.11 set margins
2.12 add and delete headers and footers
2.13 add and delete page numbers
2.14 set page layout
2.15 check and correct spelling
2.16 check and correct grammar
2.17 use thesaurus

Resources:

- Essential Skills for Digital Literacy IC3 Module B ~ Courseware 2109-2 - Key Applications using Microsoft Office 2003

Online Resources:

- http://www.baycongroup.com/wlesson0.htm
- www.ctdlc.org/remediation/indexWord.html
- www.shaunakelly.com/word/concepts/starttyping/index.html
- www.baycongroup.com/tutorials.htm
- www.itrainonline.org/itrainonline/english/computers.shtml
- www.homepages.ed.ac.uk/calarks/arks/materials.html
- http://www.hilc.ns.ca/downloads/pdfs/resources/TheESLComputerBookWord2003.pdf
- www.nald.ca/library/learning/WPerfect/WP8.pdf
- www.bcot1.com/

CU3 Use File Management Skills

Upon completion of this objective, learners will be able to:

3.1 distinguish between files and folders
3.2 create files and folders
3.3 save files
3.4 copy files and folders
3.5 move files and folders
3.6 organize files and folders
3.7 rename files and folders

Resources:

- Essential Skills for Digital Literacy - IC3 Module A ~ Courseware 2105-2 - Computing Fundamentals Using Windows XP

Online Resources:

- www.onlinecomputertips.com/tutorials/file_mgmt.html
- www.inet4.swtjc.net/nmasters/Orientation/Topic05.htm
- www.cter.ed.uiuc.edu/tutorials/filemanagmt/
- www.facweb.furman.edu/~pecoy/mfl195/tutorial/index.htm
- www.bcot1.com/

CU4 Use Spreadsheets

Upon completion of this objective, learners will be able to:

4.1 identify the purpose of spreadsheets in the trade
4.2 interpret information in existing spreadsheets
4.3 enter data into existing spreadsheets
4.4 manipulate data within an existing spreadsheet
4.5 create a spreadsheet
4.6 create and copy formulas to perform calculations
4.7 print spreadsheets
4.8 print selected parts of spreadsheets

Resources:

- Essential Skills for Digital Literacy - IC3 Module B ~ Courseware 2109-2 - Key Applications Using Microsoft Office 2003

Online Resources:

- http://www.baycongroup.com/el0.htm
- www.homepages.ed.ac.uk/calarks/arks/Materials/it2001/Database_2001.pdf
- http://www.swtc.edu:8082/mscenter/tutorial.htm#Editing%20in%20Excel
- www.nald.ca/CLR/Excel2k2/Excel2k2.pdf
- www.bcot1.com/

CU5 Read and Write Email Messages

Upon completion of this objective, learners will be able to:

5.1 open messages
5.2 reply to messages
5.3 write, send, and forward messages
5.4 print messages
5.6 add attachments to messages
5.7 delete messages
5.8 create folders
5.9 move messages to folders
5.10 delete folders
5.11 identify and manage common e-mail problems

Resources:

- Essential Skills for Digital Literacy - IC3 Module C ~ Courseware 2118-2 - Living Online Using Windows XP
- Tools for Success Soft Skills for the Construction Industry, *2nd Edition*, Module 6
- Effective Workplace Communications - Skills for Success in Life and on the Job, *3rd Edition* (Chapter 7)

Online Resources:

- www.ctdlc.org/remediation/indexe-mail.html (tutorial)
- www.colc.co.uk/new/index.html (tutorial)
- www.homepages.ed.ac.uk/calarks/arks/Materials/it2001/e-mail.pdf
- www.misa.ns.ca/downloads/pdfs/resources/newESLComputerBookTheInternet.pdf
- www.bcot1.com/

CU6 Use Web Search Skills

Upon completion of this objective, learners will be able to:

6.1 define web browser
6.2 access a specific website
6.3 use a search engine
6.4 evaluate information found on the World Wide Web
6.5 download information from the World Wide Web
6.6 copy information from the World Wide Web
6.7 save information from the World Wide Web
6.8 share information from the World Wide Web
6.9 print information from the World Wide Web

Resources:

- Essential Skills for Digital Literacy - IC3 Module C ~ Courseware 1103-1 - Living Online Using Windows XP
- Applied Communication Skills for the Construction Trades (Module 6)

Online Resources:

- www.ctdlc.org/remediation/indexWeb.html (tutorial)
- www.colc.co.uk/new/index.html (tutorial)
- www.homepages.ed.ac.uk/calarks/arks/Materials/it2001/internet_explorer.pdf
- www.nald.ca/CLR/Internet/internet.pdf
- www.bcot1.com/
- http://www.newbie.org/internet_explorer/

General Search Engines:

- www.a9.com (Powered by Amazon)
- www.google.ca/ (Google Canada)
- www.live.com/ (MSN Search)
- ca.yahoo.com/?p=us (Yahoo)

Appendix A

Resources:

Effective Workplace Communications - Skills for Success in Life and on the Job, 3rd Edition
Marsha Ludden
JIST Works, 2007
ISBN: 978-1-59357-433-8
www.jist.com

Essential Skills for Digital Literacy - IC3 Module A ~ Courseware 2105-2 - Computing Fundamentals Using Windows XP
CCI Learning Solutions Inc., 2004
ISBN: 1-55332-086-7
www.ccilearning.com

Essential Skills for Digital Literacy - IC3 Module B ~ Courseware 2109-2 - Key Applications Using Microsoft Office 2003
CCI Learning Solutions Inc., 2004
ISBN: 1-55332-087-5
www.ccilearning.com

Essential Skills for Digital Literacy - IC3 Module C ~ Courseware 2118-2 - Living Online Using Windows XP
CCI Learning Solutions Inc., 2004
ISBN: 1-55332-088-3
www.ccilearning.com

Tools for Success- Soft Skills for the Construction Industry, 2nd Edition
National Centre for Construction Education and Research
Pearson Education Inc., 2004
ISBN: 0-13-109194-8

Appendix B

General Websites

- www.red-seal.ca/Site/index_e.htm (The Interprovincial Standards Red Seal Program)
- www.ccohs.ca/ (Canadian Centre for Occupational Health and Safety)
- trades.exambank.com/index.html (Trades Exam Bank)
- www.hrsdc.gc.ca/en/labour/workplace_health/index.shtml (Workplace Health and Safety)
- www.hrsdc.gc.ca/en/hip/hrp/essential_skills/essential_skills_index.shtml (Human Resources and Social Development Canada-Essential Skills Website)
- www.hc-sc.gc.ca/ewh-semt/occup-travail/whmis-simdut/index-eng.php (WHMIS)
- www.wcb.pe.ca/index.php3?number=60189 (Workers Compensation Board of PEI)
- www.gov.pe.ca/educ/index.php3?number=74951 (PEI Apprenticeship Training)
- www.irc.nrc-cnrc.gc.ca/codes/home_E.shtml (Canadian Codes Centre)
- www.jobsafecanada.ca/en/default.html (Job Safety Information)
- www.canoshweb.org/ (Canada's National Occupational Health and Safety Website)
- www.oshweb.com/ (Index of Occupational Health and Safety Resources)
- www.iapa.on.ca/about_iapa/about_intro.asp (Industrial Accident Prevention Association)
- www.cos-mag.com/ (Canadian Occupational Safety Magazine)
- www.nationalcodes.ca/ (National Code Documents)
- www.theglobeandmail.com/ (The Globe and Mail Newspaper)
- www.nationalpost.com/ (National Post Newspaper)
- www.theguardian.pe.ca/ (The Guardian Newspaper)
- www.cbc.ca/pei/ (CBC-PEI)
- www.cbc.ca (CBC-National)

Websites for Steamfitter-Pipefitters

- www.heatinghelp.com/steam_problems.cfm (Heating Help)
- www.pipingdesign.com/ (Piping Design)
- www.srv108.services.gc.ca/english/profiles/221.shtml (HRSDC Essential Skills Profile)
- www.ipexinc.com/Content/EN_CA/ (IPEX)
- www.allbusiness.com/construction/building-fixtures-mechanical-systems-hvac/6229374-1.html Steamfitter-Pipefitter Information on Various Topics)
- www.process-heating.com/CDA/Archives/2bf9456e42368010VgnVCM100000f932a8c0 (Process heating)
- www.pmmag.com/ (Piping-related Information)
- www.plumbingandhvac.ca/ (Plumbing and HVAC Information)
- www.pipefitter.co.uk/home.htm (Piping-related Information)
- www2.worksafebc.com/Portals/Construction/Home.asp?_from=construction.healthandsafetycentre.org (Preventing injuries and illnesses in construction trades)
- www.ua.org/ (United Association of Journeymen and Apprentices of the Plumbing, Pipefitting and Sprinkler Fitting Industry of the United States and Canada)
- www.acornpipe.com/LearningCentre.htm (Acorn Pipe Systems Inc.)

Websites for Plumbers

- www.srv108.services.gc.ca/english/profiles/223.shtml (HRSDC Essential Skills Profile)
- www.plumbingweb.com/pub.html (Plumbing-related Publications)
- www.theplumber.com/ (Plumbing Information on Various Topics)
- www.allplumbingweb.com/ (Waterproofing and Plumbing)
- www.pmmag.com/ (Piping-related Information)
- www.plumbingmart.com/ (Plumbing Information on Various Topics)
- www.ciph.com/ (Canadian Institute of Plumbing and Heating)
- www.plumbingandhvac.ca/ (Plumbing and HVAC Information)
- www.plumbing.ca/ (Plumbing Information on Various Topics)
- www.b4ubuild.com/links/plumbing.shtml (Plumbing Information on Various Topics)
- www2.worksafebc.com/Portals/Construction/Home.asp?_from=construction.healthandsafetycentre.org (Preventing injuries and illnesses in construction trades)
- www.advancedbuildings.org/ (Advanced Buildings)
- www.ccbda.org/ (Canadian Copper and Brass Development Association)
- www.ciph.com/Your_Industry_Trade_Section/About_Us/ (Canadian Institute of Plumbing and Heating)
- www.cwwa.ca/home_e.asp (Canadian Water and Wastewater Association)
- www.mcac.ca/ (Mechanical Contractors Association of Canada)
- www.phccweb.org/ (Plumbing Heating Cooling Contractors Association)
- www.pmihome.org/ (Plumbing Manufacturers Institute)
- www.diydata.com/plumbing/index.php (Plumbing-related Information on Various Topics)
- www.ua.org/ (United Association of Journeymen and Apprentices of the Plumbing, Pipefitting and Sprinkler Fitting Industry of the United States and Canada)
- www.worldplumbing.org/ (World Plumbing Council)

All online resources listed in this document were operational at time of publication.

Writing (W) Learning Outcome – Learners will write to communicate for a variety of purposes.

W1 Plan the Writing Process	**1.1 Identify purpose**	**1.2 Identify audience**	**1.3 Identify the most effective writing format for task**			
W2 Write Clear Words, Sentences and Paragraphs	**2.1 Use words effectively**	**2.2 Write effective sentences**	**2.3 Write effective paragraphs**			
W3 Use Correct Mechanics	**3.1 Use correct spelling**	**3.2 Use correct punctuation**	**3.3 Use correct capitalization**	**3.4 Use correct grammar**		
W4 Write Business Communications	**4.1 Write lists**	**4.2 Complete forms**	**4.3 Write notes**	**4.4 Write memos**	**4.5 Write letters**	**4.6 Write résumés**
	4.7 Write reports					
W5 Edit Business Communications	**5.1 Proofread for clarity, tone, accuracy and brevity**	**5.2 Rewrite for clarity, tone, accuracy and brevity**				

Learners will write to communicate for a variety of purposes

Introduction

Effective written communication is the backbone to any workplace or organization. More specifically, good communication skills reduce the chance of faulty interpretation, which, in turn, allows for maximum productivity.

As the economy changes, so too, does the workplace. Necessary reorganization and technological change demand that workers who would generally not be responsible for a high level of workplace writing are now expected to communicate internally and externally on a regular basis though memos, emails, faxes and reports.

The following guide is an introduction to the key writing skills workers need to deal effectively with everyday written correspondence and business communications and provides strategies to help learners improve their ability to write.

A list of resources (see Appendix A) has been outlined for each objective in the Writing Curriculum Framework and, where possible, includes online website materials that complement these resources. All information is presented in a generic manner; the contextualization to specific trades will be found in the expected writing tasks of each trade, determined by the instructor.

The following information has been designed to act only as a guide and may, therefore, need to be adapted to meet the needs of individuals or groups. It is the role of you, the instructor, to choose materials and deliver its content as it best suits individual learner needs. A variety of materials are listed under each set of competencies for this purpose.

Outlined below are examples of writing tasks performed by tradespeople. These tasks may be used as a basis for writing expectations.

Examples of Writing Tasks

- ✓ Incident/accident reports
- ✓ Detailed lists of materials needed for a job
- ✓ Inventory lists
- ✓ Brief descriptions of work for invoices
- ✓ Progress notes
- ✓ Proposals
- ✓ Meeting minutes
- ✓ Emails/memos
- ✓ Quotations
- ✓ Material requests
- ✓ Daily logbook
- ✓ Informative notes to co-workers
- ✓ Safety guidelines
- ✓ Technical service reports

WR1 Plan the Writing Process

Upon completion of this objective, learners will be able to:

1.1 identify purpose
1.2 identify audience
1.3 identify the most effective writing format for task

Resources:

- Making Choices: Teaching Writing in the Workplace
- Applied Communication Skills for the Construction Trades
- Write for Business: A Compact Guide to Writing & Communicating in the Workplace
- Successful Technical Writing - A Practical Approach
- Workplace Communications - The Basics, Third Edition

Online Resources:

- http://www.scribd.com/doc/63429/GP-BUSINESS-WRITING
- http://www.keyskillssupport.net/teacandlearresoa/
- http://www.learnatest.com/LearningExpressEBooks/download.cfm?b=1576854647&CFID=11332069&CFTOKEN=e85e76858482c2-E02C2DF7-BCDF-04A2-B71D21CCD13D388C
- http://www.khake.com/page66.html

WR2 Write Clear Words, Sentences and Paragraphs

Upon completion of this learning objective, learners will be able to:

2.1 use words effectively
2.2 write effective sentences
2.3 write effective paragraphs

Resources:

- Applied Communication Skills for the Construction Trades
- Write for Business: A Compact Guide to Writing & Communicating in the Workplace
- Workplace Communications - The Basics, *3rd Edition*

Online Resources:

- http://www.scribd.com/doc/63429/GP-BUSINESS-WRITING
- http://www.keyskillssupport.net/teacandlearresoa/
- http://www.learnatest.com/LearningExpressEBooks/download.cfm?b=1576854647&CFID=11332069&CFTOKEN=e85e76858482c2-E02C2DF7-BCDF-04A2-B71D21CCD13D388C
- http://www.khake.com/page66.html

WR3 Use Correct Mechanics

Upon completion of this objective, learners will be able to:

3.1 use correct spelling
3.2 use correct punctuation
3.3 use correct capitalization
3.4 use correct grammar

Resources:

- Applied Communication Skills for the Construction Trades
- Write for Business: A Compact Guide to Writing & Communicating in the Workplace
- Successful Technical Writing - A Practical Approach
- Workplace Communications - The Basics, *3rd* Edition

Online Resources:

- http://www.scribd.com/doc/63429/GP-BUSINESS-WRITING
- http://www.keyskillssupport.net/teacandlearresoa/
- http://www.learnatest.com/LearningExpressEBooks/download.cfm?b=1576854647&CFID=11332069&CFTOKEN=e85e76858482c2-E02C2DF7-BCDF-04A2-B71D21CCD13D388C
- http://www.ucalgary.ca/UofC/eduweb/grammar/
- http://www.khake.com/page66.html

WR4 Write Business Communications

Upon completion of this objective, learners will be able to:

4.1 write lists
4.2 complete forms
4.3 write notes
4.4 write memos
4.5 write letters
4.6 write resumés
4.7 write reports

Resources:

- Making Choices: Teaching Writing in the Workplace
- Applied Communication Skills for the Construction Trades
- Tools for Success: Soft Skills for the Construction Industry, *2nd Edition*
- Write for Business: A Compact Guide to Writing & Communicating in the Workplace
- Effective Workplace Communications-Skills for Success in Life and on the Job, *3rd Edition* (Chapter 6)
- Successful Technical Writing - A Practical Approach
- Workplace Communications - The Basics, *3rd Edition*

Online Resources:

- http://oregonstate.edu/dept/eli/buswrite/Business_Writing_Help.html
- http://www.scribd.com/doc/63429/GP-BUSINESS-WRITING
- http://www.keyskillssupport.net/teacandlearresoa/
- http://www.learnatest.com/LearningExpressEBooks/download.cfm?b=1576854647&CFID=11332069&CFTOKEN=e85e76858482c2-E02C2DF7-BCDF-04A2-B71D21CCD13D388C
- http://www.khake.com/page66.html

WR5 Edit Business Communications

Upon completion of this objective, learners will be able to:

5.1 proofread written work
5.2 rewrite written work for clarity, tone, accuracy and brevity

Resources:

- Applied Communication Skills for the Construction Trades
- Write for Business: A Compact Guide to Writing & Communicating in the Workplace
- Successful Technical Writing - A Practical Approach
- Workplace Communications - The Basics, *3rd Edition*

Online Resources:

- http://www.scribd.com/doc/63429/GP-BUSINESS-WRITING
- http://www.keyskillssupport.net/teacandlearresoa/
- http://www.learnatest.com/LearningExpressEBooks/download.cfm?b=1576854647&CFID=11332069&CFTOKEN=e85e76858482c2-E02C2DF7-BCDF-04A2-B71D21CCD13D388C
- http://www.khake.com/page66.html

Appendix A

Resource Materials:

Applied Communication Skills for the Construction Trades
Steven A. Rigolosi
Pearson Education Inc., 2002
ISBN: 0-13-093355-4

Effective Workplace Communications-Skills for Success in Life and on the Job, 3rd Edition
Marsha Ludden
JIST Works, 2007
ISBN: 978-1-59357-433-8
www.jist.com

Making Choices: Teaching Writing in the Workplace
Diane Millar
Instructional Activities Manual (ISBN: 1-894593-13-8)
Reference Manual (ISBN: 1-894593-12-X)
Grass Roots Press, 2002

Successful Technical Writing - A Practical Approach
Bill Wesley Brown
The Goodheart-Willcox Company Inc., 2000
ISBN: 1-56637-696-3
ISBN (Instructor's Guide): 13-978-1-56637-697-6

Tools for Success: Soft Skills for the Construction Industry, 2nd Edition
National Centre for Construction Education and Research
Contren Learning Series
Pearson Education Inc., 2004
ISBN: 0-13-160000-1

Workplace Communications - The Basics, 3rd Edition
George J. Searles
Pearson Education Inc., 2006
ISBN: 0-321-33068-4

Write for Business: A Compact Guide to Writing & Communicating in the Workplace
Verne Meyer, Pat Sebranek and John Van Rys
UpWrite Press, 2004
ISBN (hardcover): 1-932436-00-6
ISBN (spiral): 1-932436-01-4

All online resources listed in this document were operational at time of publication.

Technical Skills Inventory

Trade essentials

More skills … more opportunities

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STEAMFITTER/PIPEFITTER NOC 7252

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SECTION 1 - INTRODUCTION

Points to Consider

- 80% of learning in a trade happens in the workplace.
- Every workplace in every province and territory has its own unique learning culture.
- Each journeyperson has their individual approach to guiding an apprentice.
- Every apprentice will write the **same** national exam.

Background

The road to a trade certification has many paths. For an apprentice who has not taken the pre-apprentice training and Block/Period/Level in-school route, it can be a difficult road to navigate. The primary focus appears to be accumulating enough hours for eligibility to challenge the Interprovincial (Red Seal) Exam.

The one tool that is available, if an apprentice chooses the Block/Period/Level route, is the Provincial Log Book. This Log Book tracks the Blocks, Tasks and Sub-tasks that an apprentice has learned in the workplace. For apprentices who have chosen the route through which 100% of their learning happens in the workplace, it can be difficult to "know what you don't know." On this path the apprentices never had a log book, so in order to challenge, they have their journeyperson sign off on the blocks when they have accumulated the hours required to challenge the IP certification exam in their trade.

Provincial/territorial log books are developed from the National Occupational Analysis (NOA) in a trade. Most apprentices are never introduced to the NOA of their trade even though it is used to develop trades curriculum, block/period/level tests and the IP exam.

Technical Skills Inventory (TSI)

The Technical Skills Inventory (TSI) is created from the NOA. It is a self-assessment tool designed to give apprentices the opportunity to reflect on their technical skills, identify skills gaps and make a plan to fill those gaps **before** they challenge the IP exam.

The TSI also provides information for Essential Skills assessors to create technical skills learning plans for individual apprentices and Essentials Skills program instructors. These learning plans are used by the instructor and the apprentice to select technical skills resources that support Essential Skills learning programs.

Feature

The TSI "Group Summary" has formulas imbedded so data can be easily extracted and manipulated for presentation in a pie chart format.

SECTION 2 - NATIONAL OCCUPATIONAL ANALYSIS (NOA) – TECHNICAL SKILLS INVENTORY (TSI) DIAGRAM

NATIONAL OCCUPATIONAL ANALYSIS (NOA)

The NOA is the national standard for a trade and it is:

- a list of all the skills in a trade;
- used to create curriculum for trade school programs and Block Release/Period programs in a trade;
- used to create a Log Book that records an apprentice's progress in the general skill areas of a trade;
- used to create all the questions for the Interprovincial (Red Seal) Exam.

TECHNICAL SKILLS INVENTORY (TSI)

The TSI is created from the NOA and

- gives a general picture of the technical skills required for a trade;
- contains the same information as an apprentice log book;
- guides an instructor in choosing learning materials for an Essential Skills program.

SECTION 3 - ASSESSOR'S GUIDE

STEP ONE: INTRODUCE PARTICIPANTS TO THE **NATIONAL OCCUPATIONAL ANALYSIS (NOA)**

Rationale

National Occupational Analysis (NOA)

The NOA is recognized as the national standard for all trades. There is an NOA for each trade in Canada and, although the NOAs are readily accessible online, few tradespeople take advantage of this information. (To access NOAs on line, go to www.red-seal.ca and click on national occupational analysis)

NOA Background

An NOA is reviewed and revised at least every five years. Each NOA is developed by a Joint Planning Committee and the Interprovincial Program Guide Working Group, comprised of industry and instructional representatives in a specific trade from each province and territory in Canada. All Joint Planning Committees operate under the auspices of the Canadian Council of Directors of Apprenticeship (CCDA) which recognizes the NOA as the key document in an occupation. The CCDA consists of directors/managers of apprenticeship from every province and territory in Canada.

The NOA:

- lists every technical skill requirement in a trade;
- is used to create the apprentice log book in a trade;
- is used to develop curriculum for trades training programs; and
- is used to develop the questions for Interprovincial (Red Seal) Exam.

Activity

Preparation

Have an NOA printed for each participant. Ensure each NOA has page indicators at these sections:

- Analysis
- Tools and Equipment
- Glossary
- Exam Components

NOTE: *Move pie chart to the first page of the exam component section.*

Timeline

The first night of class

Direction

Ask the participants if they have ever used, or worked in, an NOA before. If so, engage him/her in a discussion of where they used it and in what context. Then:

- distribute an NOA to each participant;
- review the development and layout of the document;
- emphasize the use of the document, e.g., creating a log book, curriculum, possible exam questions, etc.; and
- review each section of the document with particular attention to the Blocks, Tasks and sub-tasks in the Analysis section.

STEP TWO: INTRODUCE PARTICIPANTS TO THE **TECHNICAL SKILLS INVENTORY (TSI)**

Rationale

Technical Skills Inventory (TSI)

The TSI is created from the NOA. It gives a general picture of the technical skills required for a trade by listing the **Blocks, Tasks** and **Sub-tasks** in the trade. The TSI:

- Contains the same information as the Apprentice Log Book in a trade;
- Provides the participant with an opportunity to **self-assess** his/her general skills in their trade; and
- Guides the instructor in choosing contextualized resources for the Essential Skills program.

TSI Terminology

Two sets of terms can be used depending on where a participant learns and works in their trade. In this TSI Document, you will find the **common terminology** listed first. It is followed by the **competency-based terminology** in italics and underlined.

TSI Terminology
Blocks - *Learning Categories*: Tasks - *Learning Outcomes*:
Sub-tasks - *Learning Objectives*

By completing this Technical Skills Inventory (TSI) the participant will:

- be introduced to the **blocks** (*learning categories)*, the **tasks** (*learning outcomes*), and the **sub-tasks** (*learning objectives)* in the NOA;
- reflect on his/her technical skills, then list what he/she knows and can do;
- document any technical skills gaps the participant may have;
- help create a group learning needs profile to assist curriculum developers and the instructor gather learning materials specific to a trade for an Essential Skills Program; and
- help the participant make a plan for any technical skills they may need to learn or improve

Activity

Preparation

Print an NOA Analysis Diagram for each participant.

Print a Learners Guide – Technical Skills Inventory (TSI).

Print a personalized TSI for each participant.

Timeline

The first night of class

Direction

Distribute an NOA Analysis Diagram to each participant in the program and review the content with him/her. Then:

- Distribute the Learner's Guide – Technical Skills Inventory (TSI) to each participant;
- Distribute the personalized TSI to each participant;
- Summarize the directions for completing the TSI;
- Advise the participants to review each sub-task and put a ✓ in the column that best describes their self-assessment of their skill:
  - Yes, I did this
  - I need to work on this
  - Not sure what this means
- Advise participants to include any comments they may have; and
- Collect TSIs when participants have completed them.

It should take approximately 20 minutes for a participant to complete their individual TSI. If some take longer, do not rush them.

Advise participants that you will meet with them at the **half-way** point of the program to give them feedback on their TSI. Advise them that in the meantime, you will be collecting the information from each TSI and compiling it for the instructor so he/she can prepare materials for the Essential Skills Program.

STEP THREE: COMPILE DATA FOR THE INSTRUCTOR

Rationale

The Essential Skills Programs at Trade Essentials are contextualized to the trade. This results in participants being easily engaged in their learning because they relate to the materials that support concepts and applications in their trade. Data collected through the TSI guides the instructor as to what contextual and technical resources will best engage his/her participants.

Timeline

Within 24 to 48 hours of the participants completing the TSI, provide the instructor with a **TSI Group Summary Chart** and **Group Learning Plan.**

Activity

Preparation

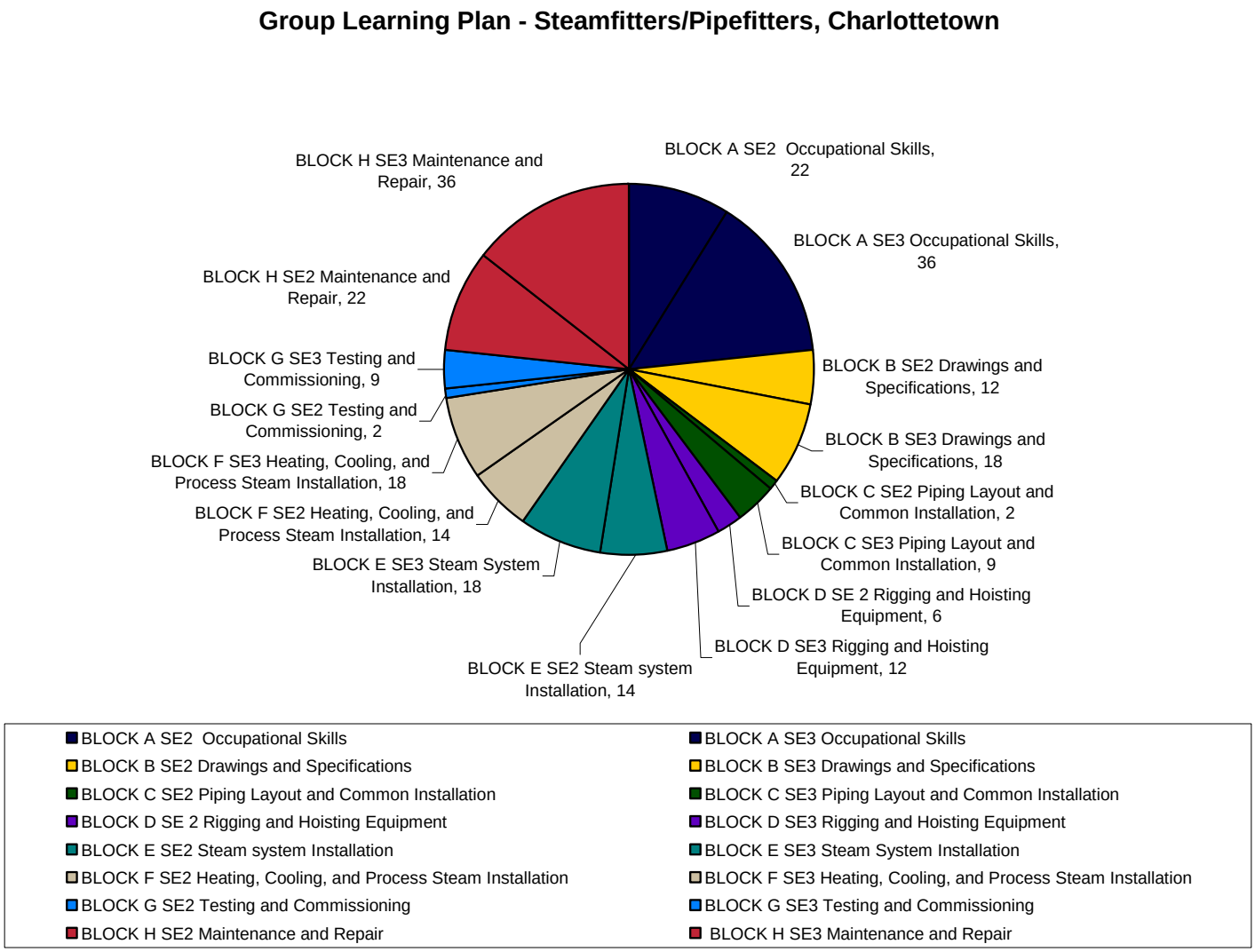
Develop a TSI Group Summary Chart

- Complete an Excel spreadsheet assigning one column to each participant;
- Assign the number code to each TSI column
  - 0 to the first column – Yes, I did this
  - 2 to the second column – I need to work on this
  - 3 to the third column – Not sure what this means
- Collect the data from the TSI and transfer it to the spreadsheet; and
- The 2s will automatically highlight in **yellow** and the 3s in **blue** so the instructor can easily identify a participant who has a learning need that differs significantly from the group;
- A group summary chart will appear at the bottom of your spreadsheet.

Direction

- Create a Pie Chart to produce a visual depiction of a group's learning needs
  - Highlight the entire "Summary Chart" on the last page of your spreadsheet.
  - On the tool bar, choose the "Chart Wizard"  (Microsoft Office Excel 2003)
  - Under chart "Chart type" choose "Pie"
  - Under "Chart Sub-Type" choose the first Pie picture
  - Click "Next"
  - Choose "Data Range" and "Columns" then click "Next"
  - Choose "Titles" and fill in "Chart Name" (Group Location and Trade)
  - On the same tool bar, choose "Legend" then "Bottom"
  - On the same tool bar choose "Data Labels" then choose "Category Name," "Value," and "Legend Key," then click "Next"
  - Under Chart Location choose "As New Sheet" and click "Finish"
  - To change a colour of a piece of the pie chart so 2s and 3s in the same piece of the pie match,
    - click inside the pie
    - click on the piece of pie you want to change
    - double click on that same piece and the colour chart will appear
    - choose your colour
  - To move or adjust items in the pie chart, right click on the pie chart, choose "Edit" then choose the item you want to adjust or move. Click outside the chart when you are finished
  - Choose "Edit", then "Copy" the pie chart and "Paste" it into the "Group Learning Plan"
- Provide the instructor with a copy of both the **TSI Group Summary Chart** and the **Group Learning Plan** within 24 to 48 hours so he/she can choose appropriate learning resources; and put one copy of the TSI Group Summary and the Group Learning Plan Pie Chart in the office files.

Sample Pie Chart



STEP FOUR: ASSIST THE PARTICIPANT TO DEVELOP AN **INDIVIDUAL TECHNICAL SKILLS LEARNING PLAN**

Rationale

Information from the TSI is used to create an individual report for each participant. This report includes:

- Information on the TSI so the participant has a record of how he/she completed this tool;
- A Pie Chart that provides a visual depiction of the participant's learning needs; and
- A series of questions that result in each participant developing an individual technical skills learning plan.

Timeline

At the **mid-point** of the Essential Skills Program, provide participants with feedback on their TSI. This timeline:

- gives the participant an opportunity to focus entirely on their Essential Skills for the first few weeks of the program;
- gives the participant time to evaluate if, through their Essential Skills studies, they have discovered that their technical learning needs are more extensive than they previously assessed through their TSI;
- creates an opportunity for the participant to share how they are adjusting to a learning environment with someone other than the instructor; and
- provides an opportunity for the assessor to gather information from each participant to determine if resources and instruction are meeting their learning needs.

Activity

Preparation

Develop an Individual Learning Needs Plan Pie Chart for each participant to produce a visual depiction of a participant's learning needs.

Direction

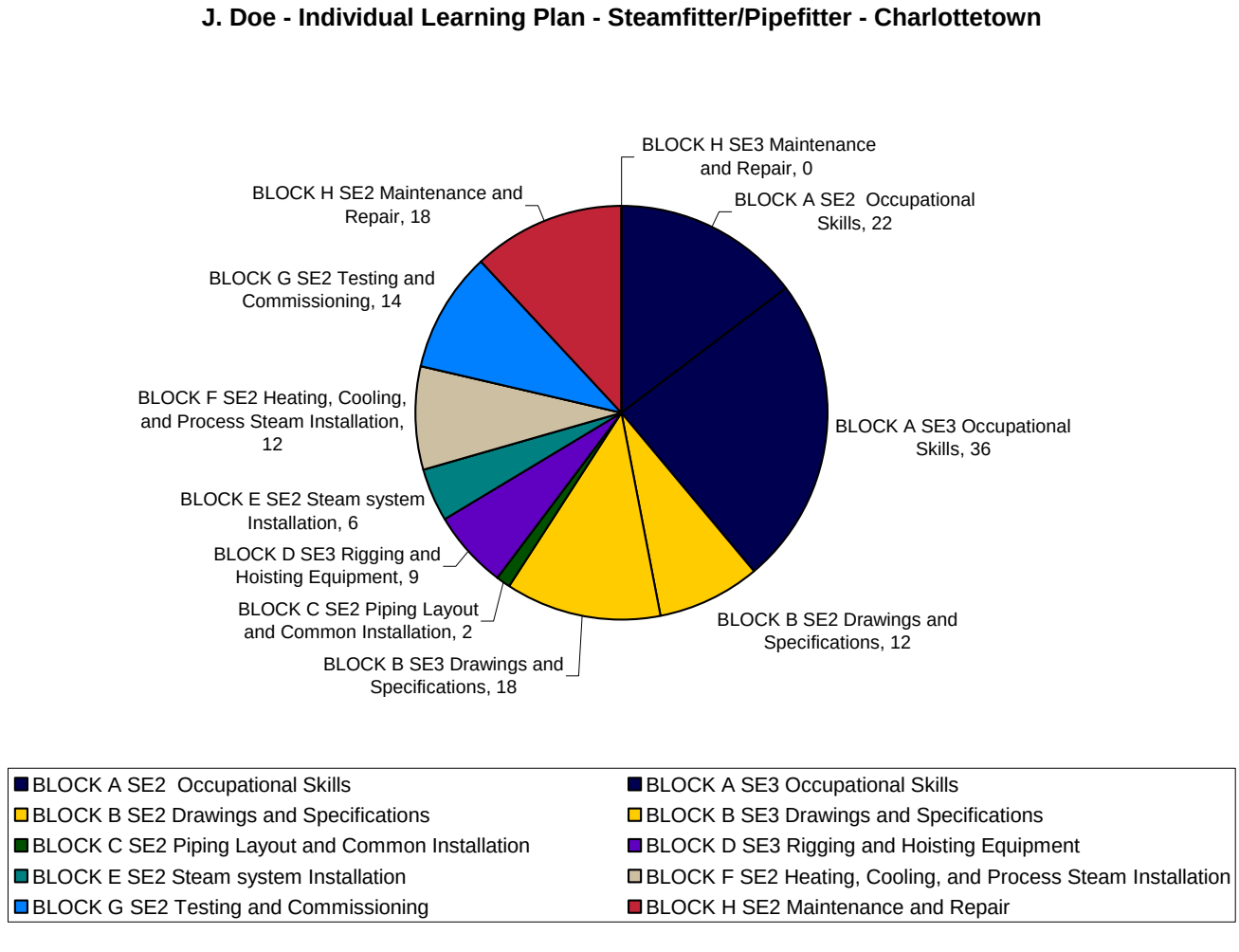
- Transfer each participant's total for each Block both SE 2 - I need to work on this and SE 3 - Not sure what this means into a Pie Chart;
    - Highlight all of the Block titles in the "Summary Chart" on the last page of the spreadsheet
    - Hold down the Control Key (Ctrl) on your keyboard
    - Highlight one client column
    - On the tool bar, choose the "Chart Wizard"  (Microsoft Office Excel 2003)
    - Under chart "Chart type" choose "Pie"
    - Under "Chart Sub-Type" choose the first Pie picture
    - Click "Next"
    - Choose "Data Range" and "Columns" then click "Next"
    - Choose "Titles" and fill in "Chart Name" (Client name and Trade)
    - On the same tool bar, choose "Legend" then "Bottom"
    - On the same tool bar choose "Data Labels" then choose "Category Name," "Value," and "Legend Key," then click "Next"
    - Under Chart Location choose "As New Sheet" and click "Finish"
    - To change a colour of a piece of the pie chart so 2s and 3s in the same piece of the pie match,
        - click inside the pie
        - click on the piece of pie you want to change
        - double click on that same piece and the colour chart will appear
        - choose your colour
    - To move or adjust items in the pie chart, right click on the pie chart, choose "Edit" then choose the item you want to adjust or move. Click outside the chart when you are finished.
    - Choose "Edit", then "Copy" the pie chart and "Paste" it into the "Individual Learning Plan"

Feedback

- Schedule a one-on-one TSI feedback appointment with each participant during which you compare and discuss their Individual Learning Needs Pie Chart with the group Learning Needs Pie Chart
- Complete the **Individual Learning Plan** with the participant.
- Make 2 copies of the Individual Learning Plan. Put one copy in office file and one copy in your files.
- Give the original TSI and the original Individual Learning Plan back to the participant.

Each one-on-one meeting with a client should average 20 to 30 minutes.

Sample Pie Chart



SECTION 4 - LEARNER'S GUIDE

Key Document in your Trade

The National Occupational Analysis (NOA) is a trade document approved nationally and used in each province and territory across Canada. The NOA lists every technical skill required to be successful in your trade. Each NOA is used to:

- create the apprentice log book in your trade;
- develop curriculum for trades training programs; and
- prepare questions for Red Seal exams.

Technical Skills Inventory (TSI)

The TSI is created from the NOA. It gives a general overview of the technical skills required for your trade by listing the Blocks, Tasks and Sub-Tasks in your trade. The TSI:

- contains the same information as the apprentice log book in your trade; and
- gives you the opportunity to self-assess your general skills in your trade.

TSI Terms

Two sets of terms can be used depending on where you learn and work in your trade. In this TSI document, you will find the **common terms** listed first. It is followed by the **competency-based terms** in italics and underlined. *(In the future, all NOA updates will be using competency-based terms.)*

TSI Terms

Common Terms	Competency-based Terms
Blocks	*Learning Categories*
Tasks	*Learning Outcomes*
Sub-tasks	*Learning Objectives*

Why complete a TSI?	
	By completing this Technical Skills Inventory (TSI) you will: ➢ be introduced to the **blocks** (*learning categories)*, the **tasks** (*learning outcomes*), and the **sub-tasks** (*learning objectives)* in the NOA; ➢ help you think about your technical skills, then help you list what you know and can do; ➢ help you highlight any technical skills gaps you may have; ➢ help create a group learning needs profile to assist the instructor gather learning materials specific to your trade and your learning needs for your Essential Skills Program; and ➢ help you make a plan to get any technical skills you may need to learn or skills you may want to improve.
Directions	
	Review each sub-task and put a ✓ in the column that best describes your self-assessment of your skills: o Yes, I did this o I need to work on this o Not sure what this means Include any comments that may help the instructor choose learning materials for you.

NAME: _____ DATE: _____

Block A – *Learning Category*
OCCUPATIONAL SKILLS

Task 1 – Block A *Learning Outcome* Uses tools and equipment		Yes, I did this	I need to work on this	Not sure what this means	Comments
A 1.01	Uses hand tools				
A 1.02	Uses power tools				
A 1.03	Uses measuring tools				
A 1.04	Uses welding equipment				
A 1.05	Uses soldering and brazing equipment				
A 1.06	Uses ladders and work platforms				
A 1.07	Uses personal protective equipment (PPE) and safety equipment				
Task 2 – Block A ***Learning Outcome*** **Organizes work**					
A 2.01	Plans job				
A 2.02	Uses documentation				
A 2.03	Communicates with others				
A 2.04	Selects piping and components				
A 2.05	Performs quality control functions				
A 2.06	Maintains safe work environment				

Block B – *Learning Category*
DRAWINGS AND SPECIFICATIONS

Task 3 – Block B ***Learning Outcome*** Interprets drawings and specifications		Yes, I did this	I need to work on this	Not sure what this means	Comments
B 3.01	Compares specifications to drawings				
B 3.02	Refers to types of drawings				
B 3.03	Determines location of piping and equipment				
B 3.04	Generates material list				
Task 4 – Block B ***Learning Outcome*** **Performs drafting**					
B 4.01	Generates drawings				
B 4.02	Develops templates				

Block C – *Learning Category*
PIPING LAYOUT AND COMMON INSTALLATION

Task 5 – Block C *Learning Outcome* Performs layout and fabrication		Yes, I did this	I need to work on this	Not sure what this means	Comments
C 5.01	Uses templates				
C 5.02	Lays out pipe and fittings				
C 5.03	Prepares pipe and fittings				
C 5.04	Fabricates spools				
Task 6 – Block C *Learning Outcome* Performs common installation processes					
C 6.01	Installs supports, hangers, guides and anchors				
C 6.02	Joins pipes				
C 6.03	Installs piping system components and equipment				

Block D – *Learning Category*
RIGGING AND HOISTING

Task 7 – Block D *Learning Outcome* Plans lift		Yes, I did this	I need to work on this	Not sure what this means	Comments
D 7.01	Determines load				
D 7.02	Selects rigging equipment				
D 7.03	Selects lifting equipment				
Task 8 – Block D *Learning Outcome* Hoists load					
D 8.01	Secures lift area				
D 8.02	Sets up rigging equipment				
D 8.03	Performs lift				
D 8.04	Conducts post-lift equipment inspection				
D 8.05	Stores equipment				

Block E – *Learning Category*
STEAM SYSTEM INSTALLATION

Task 9 – Block E *Learning Outcome* Installs high and low pressure process steam systems		Yes, I did this	I need to work on this	Not sure what this means	Comments
E 9.01	Installs equipment for high and low pressure process steam				
E 9.02	Installs piping for high pressure process steam				
E 9.03	Installs piping for low pressure process steam				
Task 10 – Block E ***Learning Outcome*** **Installs steam heating systems**					
E 10.01	Installs equipment for steam heating systems				
E 10.02	Installs piping for steam heating systems				

Block F – *Learning Category*
HEATING, COOLING AND PROCESS SYSTEM INSTALLATION

Task 11 – Block F *Learning Outcome* Installs hydronic systems		Yes, I did this	I need to work on this	Not sure what this means	Comments
F 11.01	Installs equipment for hydronic systems				
F 11.02	Installs piping for hydronic systems				
Task 12 – Block F *Learning Outcome* Installs refrigeration systems					
F 12.01	Installs equipment for refrigeration systems				
F 12.02	Installs piping and tubing for refrigeration systems				
Task 13 – Block F *Learning Outcome* Installs process piping systems					
F 13.01	Installs equipment for process piping systems				
F 13.02	Installs piping for process piping systems				
Task 14 – Block F *Learning Outcome* Installs hydraulic systems					
F 14.01	Installs equipment for hydraulic systems				
F 14.02	Installs piping and tubing for hydraulic systems				
Task 15 – Block F *Learning Outcome* Installs fuel systems					
F 15.01	Installs equipment for fuel systems				
F 15.02	Installs piping for fuel systems				

Task 16 – Block F *Learning Outcome* Installs compressed air and medical gas systems		Yes, I did this	I need to work on this	Not sure what this means	Comments
F 16.01	Installs equipment for compressed air and medical gas systems				
F 16.02	Installs piping and tubing for compressed air systems				
F 16.03	Installs piping and tubing for medical gas systems				

Block G – *Learning Category*
TESTING AND COMMISSIONING

Task 17 – Block G *Learning Outcome* Prepares system for test		Yes, I did this	I need to work on this	Not sure what this means	Comments
G 17.01	Pre-checks system for test				
G 17.02	Selects test equipment				
G 17.03	Isolates system				
G 17.04	Connects test equipment				
Task 18 – Block G *Learning Outcome* Performs test					
G 18.01	Secures test area				
G 18.02	Pressurizes system				
G 18.03	Inspects system				
G 18.04	Corrects leaks				
G 18.05	Removes test equipment				
Task 19 – Block G *Learning Outcome* Commissions systems					
G 19.01	Flushes system				
G 19.02	Chemically treats system				
G 19.03	Assists in start-up procedure				

Block H – *Learning Category*
MAINTENANCE AND REPAIRS

Task 20 – Block H *Learning Outcome* Maintains systems		Yes, I did this	I need to work on this	Not sure what this means	Comments
H 20.01	Follows lock-out procedures				
H 20.02	Performs preventative maintenance and service				
Task 21 – Block H *Learning Outcome* Performs repairs					
H 21.01	Locates problems				
H 21.02	Repairs piping and components				

Trade Essentials
Technical Skills Inventory (TSI) Group Summary
Steamfitter - Pipefitter - (NOA) National Occupational Analysis 2007)
NOC 7252 (National Occupational Classification)

BLOCK A (Learning Category) OCCUPATIONAL SKILLS Task 1 (Learning Outcome) - Uses tools and equipment Sub-Tasks (Learning Objectives)		Client 1	Client 2	Client 3	Client 4	Client 5	Client 6	Client 7	Client 8	Client 9	Client 10	TOTALS	
A 1.01	Uses hand tools											0	A 1.01
A 1.02	Uses power tools											0	A 1.02
A 1.03	Uses measuring tools											0	A 1.03
A 1.04	Uses welding equipment											0	A 1.04
A 1.05	Uses soldering and brazing equipment											0	A 1.05
A 1.06	Uses ladders and work platforms											0	A 1.06
A 1.07	Uses personal protective equipment (PPE) and safety equipment											0	A 1.07
Task 2 (Learning Outcome) - Organizes work Sub-Tasks (Learning Objectives)												Task Total	0
A 2.01	Plans job											0	A 2.01
A 2.02	Uses documentation											0	A 2.02
A 2.03	Communicates with others											0	A 2.03
A 2.04	Selects piping and components											0	A 2.04
A 2.05	Performs quality control functions											0	A 2.05
A 2.06	Maintains safe work environment											0	A 2.06
												Task Total	0
	BLOCK A TOTALS	0	0	0	0	0	0	0	0	0	0	0	**0**
	SE 0 2	0	0	0	0	0	0	0	0	0	0	0	
	SE 0 3	0	0	0	0	0	0	0	0	0	0	0	

BLOCK B (Learning Category) DRAWINGS AND SPECIFICATIONS Task 3 (Learning Outcome) - Interprets drawings and specifications Sub-Tasks (Learning Objectives)		Client 1	Client 2	Client 3	Client 4	Client 5	Client 6	Client 7	Client 8	Client 9	Client 10	TOTALS	
B 3.01	Compares specifications to drawings											0	B 3.01
B 3.02	Refers to types of drawings											0	B 3.02
B 3.03	Determines location of piping and equipment											0	B 3.03
B 3.04	Generates material list											0	B 3.04
Task 4 (Learning Outcome) - Performs drafting Sub-Tasks (Learning Objectives)												Task Total	0
B 4.01	Generates drawings											0	B 4.01
B 4.02	Develops templates											0	B 4.02
												Task Total	0
	BLOCK B TOTALS	0	0	0	0	0	0	0	0	0	0	0	**0**
	SE 0 2	0	0	0	0	0	0	0	0	0	0	0	
	SE 0 3	0	0	0	0	0	0	0	0	0	0	0	

BLOCK C (Learning Category) PIPING LAYOUT AND COMMON INSTALLATION		Client 1	Client 2	Client 3	Client 4	Client 5	Client 6	Client 7	Client 8	Client 9	Client 10		
Task 5 (Learning Outcome) - Performs layout and fabrication													
Sub-Tasks (Learning Objectives)												TOTALS	
C 5.01	Uses templates											0	C 5.01
C 5.02	Lays out pipe and fittings											0	C 5.02
C 5.03	Prepares pipe and fittings											0	C 5.03
C 5.04	Fabricates spools											0	C 5.04
Task 6 (Learning Outcome) - Performs common installation processes												Task Total	0
Sub-Tasks (Learning Objectives)													
C 6.01	Installs supports, hangers, guides and anchors											0	C 6.01
C 6.02	Joins pipes											0	C 6.02
C 6.03	Installs piping system components and equipment											0	C 6.03
												Task Total	0
	BLOCK C TOTALS	0	0	0	0	0	0	0	0	0	0	0	**0**
	SE 0 2	0	0	0	0	0	0	0	0	0	0	0	
	SE 0 3	0	0	0	0	0	0	0	0	0	0	0	

BLOCK D (Learning Category) RIGGING AND HOISTING		Client 1	Client 2	Client 3	Client 4	Client 5	Client 6	Client 7	Client 8	Client 9	Client 10		
Task 7 (Learning Outcome) - Plans lift													
Sub-Tasks (Learning Objectives)												TOTALS	
D 7.01	Determines load											0	D 7.01
D 7.02	Selects rigging equipment											0	D 7.02
D 7.03	Selects lifting equipment											0	D 7.03
Task 8 (Learning Outcome) - Hoists load												Task Total	0
Sub-Tasks (Learning Objectives)													
D 8.01	Secures lift area											0	D 8.01
D 8.02	Sets up rigging equipment											0	D 8.02
D 8.03	Performs lift											0	D 8.03
D 8.04	Conducts post-lift equipment inspection											0	D 8.04
D 8.05	Stores equipment											0	D 8.05
												Task Total	0
	BLOCK D TOTALS	0	0	0	0	0	0	0	0	0	0	0	**0**
	SE 0 2	0	0	0	0	0	0	0	0	0	0	0	
	SE 0 3	0	0	0	0	0	0	0	0	0	0	0	

BLOCK E (Learning Category) STEAM SYSTEM INSTALLATION		Client 1	Client 2	Client 3	Client 4	Client 5	Client 6	Client 7	Client 8	Client 9	Client 10		
Task 9 (Learning Outcome) - Installs high and low pressure process steam													
Sub-Tasks (Learning Objectives)												TOTALS	
E 9.01	Installs equipment for high and low pressure process steam											0	E 9.01
E 9.02	Installs piping for high pressure process steam											0	E 9.02
E 9.03	Installs piping for low pressure process steam											0	E 9.03
Task 10 (Learning Outcome) - Installs steam heating systems												Task Total	0
Sub-Tasks (Learning Objectives)													
E 10.01	Installs equipment for steam heating systems											0	E 10.01
E 10.02	Installs piping for steam heating systems											0	E 10.02
												Task Total	0
	BLOCK E TOTALS	0	0	0	0	0	0	0	0	0	0	0	**0**
	SE 0 2	0	0	0	0	0	0	0	0	0	0	0	
	SE 0 3	0	0	0	0	0	0	0	0	0	0	0	

BLOCK F (Learning Category) HEATING, COOLING AND PROCESS SYSTEM INSTALLATION		Client 1	Client 2	Client 3	Client 4	Client 5	Client 6	Client 7	Client 8	Client 9	Client 10		
Task 11 (Learning Outcome) - Installs hydronic systems													
Sub-Tasks (Learning Objectives)												TOTALS	
F 11.01	Installs equipment for hydronic systems											0	F 11.01
F 11.02	Installs piping for hydronic systems											0	F 11.02
Task 12 (Learning Outcome) - Installs refrigeration systems												Task Total	0
Sub-Tasks (Learning Objectives)													
F 12.01	Installs equipment for refrigeration systems											0	F 12.01
F 12.02	Installs piping and tubing for refrigeration systems											0	F 12.02
Task 13 (Learning Outcome) - Installs process piping systems												Task Total	0
Sub-Tasks (Learning Objectives)													
F 13.01	Installs equipment for process piping systems											0	F 13.01
F 13.02	Installs piping for process piping systems											0	F 13.02
Task 14 (Learning Outcome) - Installs hydraulic systems												Task Total	0
Sub-Tasks (Learning Objectives)													
F 14.01	Installs equipment for hydraulic systems											0	F 14.01
F 14.02	Installs piping and tubing for hydraulic systems											0	F 14.02
Task 15 (Learning Outcome) - Installs fuel systems												Task Total	0
Sub-Tasks (Learning Objectives)													
F 15.01	Installs equipment for fuel systems											0	F 15.01
F 15.02	Installs piping for fuel systems											0	F 15.02
Task 16 (Learning Outcome) - Installs compressed air and medical gas systems												Task Total	0
Sub-Tasks (Learning Objectives)													
F 16.01	Installs equipment for compressed air and medical gas systems											0	F 16.01
F 16.02	Installs piping and tubing for compressed air systems											0	F 16.02
F 16.03	Installs piping and tubing for medical gas systems											0	F 16.03
												Task Total	0
	BLOCK F TOTALS	0	0	0	0	0	0	0	0	0	0	0	**0**
	SE 0 2	0	0	0	0	0	0	0	0	0	0	0	
	SE 0 3	0	0	0	0	0	0	0	0	0	0	0	

BLOCK G (Learning Category) TESTING AND COMMISSIONING		Client 1	Client 2	Client 3	Client 4	Client 5	Client 6	Client 7	Client 8	Client 9	Client 10		
Task 17 (Learning Outcome) - Prepares system for test													
Sub-Tasks (Learning Objectives)												TOTALS	
G 17.01	Pre-checks system for test											0	G 17.01
G 17.02	Selects test equipment											0	G 17.02
G 17.03	Isolates system											0	G 17.03
G 17.04	Connects test equipment											0	G 17.04
Task 18 (Learning Outcome) - Performs test												Task Total	0
Sub-Tasks (Learning Objectives)													
G 18.01	Secures test area											0	G 18.01
G 18.02	Pressurizes system											0	G 18.02
G 18.03	Inspects system											0	G 18.03
G 18.04	Corrects leaks											0	G 18.04
G 18.05	Removes test equipment											0	G 18.05
Task 19 (Learning Outcome) - Commissions systems												Task Total	0
Sub-Tasks (Learning Objectives)													
G 19.01	Flushes system											0	G 19.01
G 19.02	Chemically treats system											0	G 19.02
G 19.03	Assists in start-up procedure											0	G 19.03
												Task Total	0
	BLOCK G TOTALS	0	0	0	0	0	0	0	0	0	0	0	**0**
	SE 0 2	0	0	0	0	0	0	0	0	0	0	0	
	SE 0 3	0	0	0	0	0	0	0	0	0	0	0	

BLOCK H (Learning Category) MAINTENANCE AND REPAIR		Client 1	Client 2	Client 3	Client 4	Client 5	Client 6	Client 7	Client 8	Client 9	Client 10	TOTALS	
Task 20 (Learning Outcome) - Maintains system													
Sub-Tasks (Learning Objectives)													
H 20.01	Follows lock-out procedures											0	H 20.01
H 20.02	Performs preventative maintenance and service											0	H 20.02
Task 21 (Learning Outcome) - Performs repairs												Task Total	0
Sub-Tasks (Learning Objectives)													
H 21.01	Locates problems											0	H 21.01
H 21.02	Repairs piping and components											0	H 21.02
												Task Total	0
	BLOCK H TOTALS	0	0	0	0	0	0	0	0	0	0	0	**0**
	SE 0 2	0	0	0	0	0	0	0	0	0	0	0	
	SE 0 3	0	0	0	0	0	0	0	0	0	0	0	

Group Sumary Chart

BLOCK A SE2 Occupational Skills	0	0	0	0	0	0	0	0	0	0	0
BLOCK A SE3 Occupational Skills	0	0	0	0	0	0	0	0	0	0	0
BLOCK B SE2 Drawings and Specifications	0	0	0	0	0	0	0	0	0	0	0
BLOCK B SE3 Drawings and Specifications	0	0	0	0	0	0	0	0	0	0	0
BLOCK C SE2 Piping Layout and Common Installation	0	0	0	0	0	0	0	0	0	0	0
BLOCK C SE3 Piping Layout and Common Installation	0	0	0	0	0	0	0	0	0	0	0
BLOCK D SE 2 Rigging and Hoisting Equipment	0	0	0	0	0	0	0	0	0	0	0
BLOCK D SE3 Rigging and Hoisting Equipment	0	0	0	0	0	0	0	0	0	0	0
BLOCK E SE2 Steam system Installation	0	0	0	0	0	0	0	0	0	0	0
BLOCK E SE3 Steam System Installation	0	0	0	0	0	0	0	0	0	0	0
BLOCK F SE2 Heating, Cooling, and Process Steam Installation	0	0	0	0	0	0	0	0	0	0	0
BLOCK F SE3 Heating, Cooling, and Process Steam Installation	0	0	0	0	0	0	0	0	0	0	0
BLOCK G SE2 Testing and Commissioning	0	0	0	0	0	0	0	0	0	0	0
BLOCK G SE3 Testing and Commissioning	0	0	0	0	0	0	0	0	0	0	0
BLOCK H SE2 Maintenance and Repair	0	0	0	0	0	0	0	0	0	0	0
BLOCK H SE3 Maintenance and Repair	0	0	0	0	0	0	0	0	0	0	0

SECTION 7 - GROUP LEARNING PLAN AND PIE CHART (SAMPLE)

Group Learning Plan – Group ID	
Date TSI Completed	
Instructor	

The Technical Skills Inventory (TSI) is designed to:

- introduce apprentices to the **blocks** *(learning categories)*, **tasks** (*learning outcomes)*, and **sub-tasks** *(learning objectives)* in the National Occupational Analysis (NOA).
- have apprentices **reflect** and then **self-assess** their tasks *(learning outcomes)* and sub-tasks *(learning objectives)* in their trade.
- compile information from the TSI to **create a group profile** of technical skills learning needs.
- provide information from the TSIs to assist instructors in choosing contextualized and technical skills resources to support Essential Skills curriculum that will support client needs.

The TSI assessment tool lists the block *(learning categories),* tasks (*learning outcomes)* and sub-tasks *(learning objectives*) identified in the National Occupational Analysis (NOA) of each trade. The TSI is a **self-assessment** tool through which an apprentice reflects and records their personal evaluation on each task and sub-task. Self-evaluation (SE) categories for the tasks *(learning outcomes)* and sub-tasks *(learning objectives)* are:

SE 0 – Yes, I did this
SE 2 – I need to work on this
SE 3 – Not sure what this means

GENERAL GROUP PROFILE: **Steamfitter/Pipefitter Group - Charlottetown**

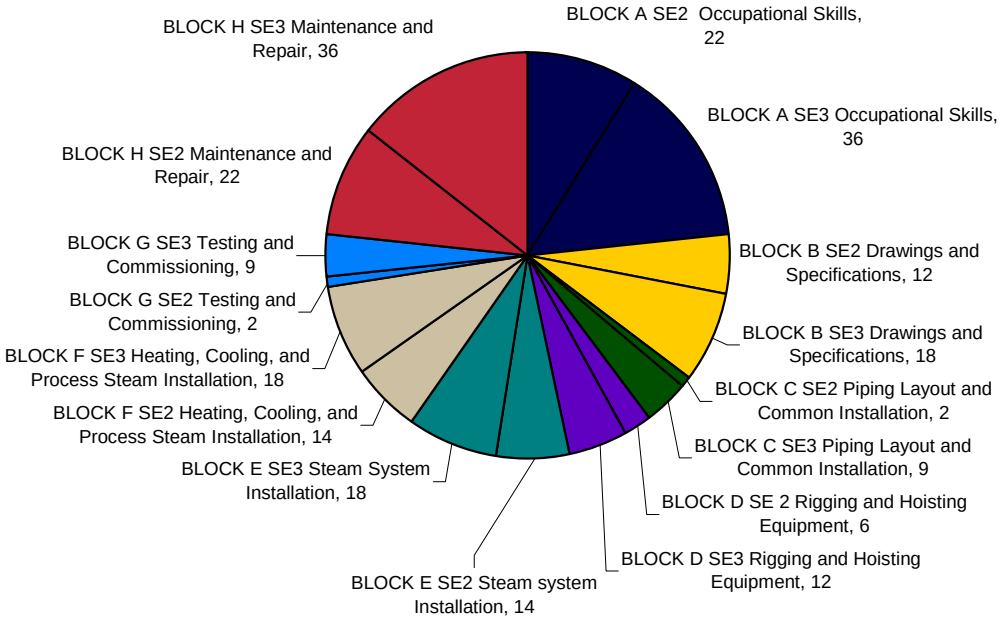
Nine Steamfitter/Pipefitter learners are participating in this program. The geographic territory covers from the central part of PEI to Charlottetown. Trade expertise within the group ranges from those working in specific sections of the trade to those who own their own businesses. Seven have previously challenged but were unsuccessful in the Red Seal exam. One has attended pre-apprenticeship training in a post-secondary institution.

Group Learning Plan Pie Chart
Technical Skills Inventory (TSI) Group Learning Needs Profile

***NOTE**: Any divided sections with the same colour that may occur in the chart highlights where both SE 2 and SE 3 are recorded in the same block.*

Self-evaluation (SE)	0 – Yes, I can do this
Self-evaluation (SE)	2 – I need to work on this
Self-evaluation (SE)	3 – Not sure what this means

Group Learning Plan - Steamfitters/Pipefitters, Charlottetown



BLOCK A SE2 Occupational Skills	BLOCK A SE3 Occupational Skills
BLOCK B SE2 Drawings and Specifications	BLOCK B SE3 Drawings and Specifications
BLOCK C SE2 Piping Layout and Common Installation	BLOCK C SE3 Piping Layout and Common Installation
BLOCK D SE 2 Rigging and Hoisting Equipment	BLOCK D SE3 Rigging and Hoisting Equipment
BLOCK E SE2 Steam system Installation	BLOCK E SE3 Steam System Installation
BLOCK F SE2 Heating, Cooling, and Process Steam Installation	BLOCK F SE3 Heating, Cooling, and Process Steam Installation
BLOCK G SE2 Testing and Commissioning	BLOCK G SE3 Testing and Commissioning
BLOCK H SE2 Maintenance and Repair	BLOCK H SE3 Maintenance and Repair

SECTION 8 - INDIVIDUAL LEARNING PLAN AND PIE CHART (SAMPLE)

The Technical Skills Inventory (TSI) is designed to:

- introduce you to the **blocks** *(learning categories)*, **tasks** (*learning outcomes)* and **sub-tasks** *(learning objectives)* in the National Occupational Analysis (NOA);

  These three sections of the NOA are used in provinces and territories to create an apprenticeship log book. The log book is used by apprentices and journeypersons to record and sign-off technical skill areas learned on the job.

- help you **think about** your technical skills and then help you **list** what you know and can do;

- help you **know what technical skills to focus** on as you go through your **school training** and while you are working under the **direction of a journeyperson;**

- help you make a **technical skills learning plan** to highlight your technical skills learning needs;

- help you prepare to complete a Professional Skills Record (PSR) **(if needed)** which lists the details and **all** the skill requirements in your trade.

Self-Assessment (SE) ratings assigned to interpret and record data are:

SE 0 – Yes, I did this
SE 2 – I need to work on this
SE 3 – Not sure what this means

Through the completion of your TSI, you have indicated that you do not have any immediate learning needs in the following block(s):

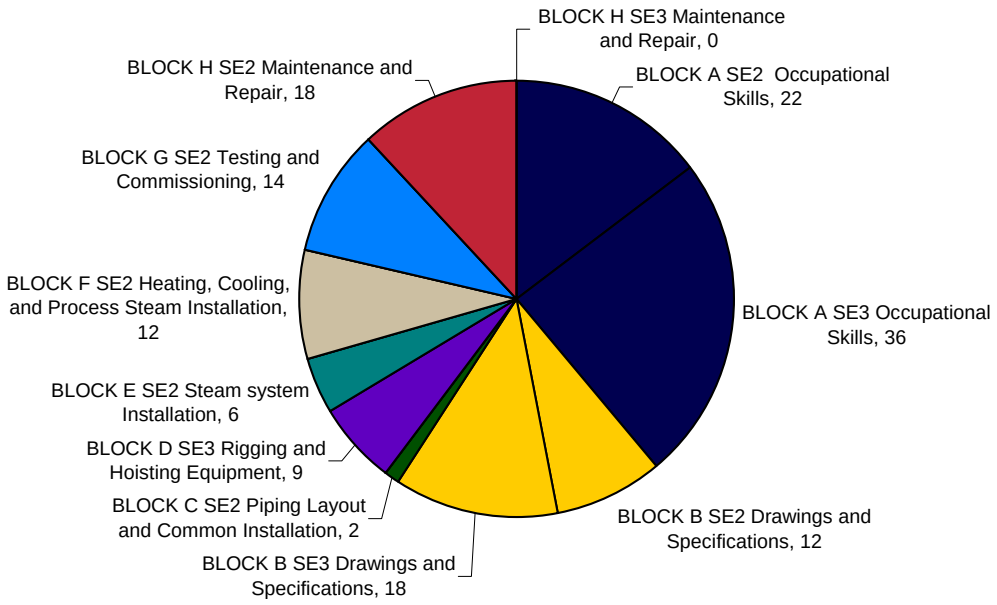
- **Block C - Piping Layout and Common Installation**

Individualized Learning Plan

The pie chart represents the learning needs you have identified in your TSI. They are listed from the most needed to the least needed.

NOTE: Any divided section of the same colour that may occur in your chart highlights where you recorded both SE 2 and SE 3 in the same block.

J. Doe - Individual Learning Plan - Steamfitter/Pipefitter - Charlottetown



BLOCK A SE2 Occupational Skills	BLOCK A SE3 Occupational Skills
BLOCK B SE2 Drawings and Specifications	BLOCK B SE3 Drawings and Specifications
BLOCK C SE2 Piping Layout and Common Installation	BLOCK D SE3 Rigging and Hoisting Equipment
BLOCK E SE2 Steam system Installation	BLOCK F SE2 Heating, Cooling, and Process Steam Installation
BLOCK G SE2 Testing and Commissioning	BLOCK H SE2 Maintenance and Repair

Technical Skills Personal Learning Plan NAME

Technical Skills Goal:

Path to reach goal	Yes	No	How will I reach my goal?
Enter an apprenticeship Block Release program			
Enter a six-week IP exam preparation (technical skills trade refresher program)			
Technical skills self-study			
Other (explain)			

NOTE: *To complete an in-depth, detailed self-assessment of technical skills in a trade, a Professional Skills Record (PSR) is available. (A PSR is the self-assessment tool used in a Recognizing Prior Learning (RPL) Assessment Process). Information on this process is available through the apprenticeship section of the Department of Innovation and Advanced Learning. This document is designed to be used by an apprentice in the workplace and must be signed off by a licensed journeyperson.)*

Additional Comments:

Apprentice Signature

Date **Trade Essential Signature(s)**