Introduction to Carpentry Technology (CAR701A)

Course Description
Introduction to Carpentry Technology allows the student to explore the trade of carpentry. Students will be introduced to the tools, equipment, and practices common to the trade, with a constant emphasis on safe work habits. Students will develop their knowledge of solid wood products and be able to describe their characteristics and applications in industry. They will identify, explore, and apply various methods of wood joinery while developing technical skills with various hand and power tools common to the carpentry trade. They will also develop skills in communication through drafting, and apply basic math concepts to solve trade-related problems. This is a recommended prerequisite course for all other carpentry technology courses.

Classroom Component—Suggested time: 22 hours
This component of the curriculum is required to teach the knowledge and skills associated with the learning outcomes of the curriculum.

Skill Development Component—Suggested time: 88 hours
This component of the curriculum is required by the student to apply the knowledge and develop the skills related to the learning outcomes of the curriculum.

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<td>Describes what the students are expected to know, be able to do, and value in order to achieve the SCO. The teacher is responsible for the planning and facilitation of learning as well as the assessment of each SCO - Delineation.</td>
<td>Provides clarity to the SCO by describing the Knowledge, Abilities, and Competencies that the students develop. This column is designed to indicate the depth and breadth of the SCO. It is not necessary to use all of these suggestions or that all of the students be engaged in the same learning activity.</td>
<td>Provides suggestions for developing and delivering the content for student learning.</td>
<td>Lists a variety of resources that support the teaching and learning related to the SCO. These resources are suggested to support the teacher in developing an effective instructional package for delivery to the students.</td>
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<td>Student Activities / Assessments</td>
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CURRICULUM OUTCOMES

Module 1: Work Site Safety (~3 hours Classroom Component)

1. **Students will be able to apply** *Occupational Health and Safety Regulations and safe work practices* in the workplace.

*Students will be expected to*
1.1 interpret occupational health and safety regulations
1.2 describe requirements related to personal protective equipment and safety measures
1.3 describe emergency procedures for dealing with injured workers
1.4 describe potential health hazards

Module 2: Solid Wood Products (~3 hours Classroom Component)

2. **Students will be able to identify and describe** solid wood products and joinery.

*Students will be expected to*
2.1 describe common types and characteristics of solid wood products
2.2 describe how wood is milled, seasoned, stored, and ordered
2.3 identify and describe the application of commonly used mouldings
2.4 identify and describe the application of wood joints for fabrication and installation

Module 3: Hand Tools (~32 of 88 hours Skill Development Component, ~4 hours Classroom Component)

3. **Students will be able to identify common hand tools and describe** their proper uses.

*Students will be expected to*
3.1 identify and describe the use of measuring, marking, layout, alignment, and squaring tools
3.2 identify and describe the use of cutting tools, boring tools, and drilling tools
3.3 identify and describe the use of assembling, clamping, and dismantling tools
3.4 demonstrate the use of hand tools to construct projects using wood materials

Module 4: Portable Power Tools (~16 of 88 hours Skill Development Component, ~2 hours Classroom Component)

4. **Students will be able to identify and describe** the safe operation and maintenance of portable power tools.

*Students will be expected to*
4.1 identify and describe the safe operation of portable saws
4.2 identify and describe the safe operation of portable planing and shaping equipment
4.3 identify and describe the safe operation of portable drilling and fastening equipment
4.4 identify and describe the safe operation of portable abrasive tools
4.5 demonstrate tool proficiency through selected shop projects using a variety of building materials
Module 5: Stationary Power Tools (~16 of 88 hours Skill Development Component, ~2 hours Classroom Component)

5. Students will be able to identify and describe the safe operation and maintenance of stationary power tools and demonstrate tool proficiency through selected shop projects.

Students will be expected to
5.1 identify and describe the safe operation and regular maintenance of stationary saws
5.2 identify and describe the safe operation and regular maintenance of stationary planing tools
5.3 identify and describe the safe operation and regular maintenance of stationary drilling, grinding, and sanding tools

Module 6: Drafting Basics (~4 hours Classroom Component)

6. Students will be able to identify and demonstrate the use of basic drawing instruments.

Students will be expected to
6.1 describe the function of basic drawing equipment
6.2 use drafting equipment to complete geometric exercises
6.3 describe the applications of geometry in trade situations
6.4 practise producing shapes and angles and drawing to scale with basic drafting instruments

Module 7: Basic Math Concepts (~4 hours Classroom Component)

7. Students will be able to use a calculator and apply basic math concepts to solve trade-related problems using both metric and imperial systems of measurement.

Students will be expected to
7.1 describe basic math concepts and operations
7.2 describe the basic calculator functions and operations
7.3 describe the metric measurement system (SI)
7.4 describe the imperial measurement system
7.5 describe calculations involving fractions
7.6 convert measurements between metric and imperial systems
7.7 work with equations
7.8 describe calculations using the Pythagorean theorem
Work Site Safety
(~3 hours Classroom Component)

Introduction
The Occupational Health and Safety Act provides employers and employees with information on how to create and work in a safe working environment. The OHS Act cannot prevent injuries. It is the responsibility of the apprentice to understand his/her role as related to safety, and the role and responsibility of the employer.

Specific Curriculum Outcome

1. Students will be able to apply *Occupational Health and Safety Regulations* and safe work practices in the workplace.

SCO - Delineations
Students will be expected to

1.1 interpret occupational health and safety regulations
1.2 describe requirements related to personal protective equipment and safety measures
1.3 describe emergency procedures for dealing with injured workers
1.4 describe potential health hazards

Assessment Strategies
Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources
Alberta Module 020101a, *Work Site Safety*
SCO - Delineations

Students will be expected to

<table>
<thead>
<tr>
<th>SCO 1.</th>
<th>interpret occupational health and safety regulations</th>
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<table>
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<tr>
<th>SCO 2.</th>
<th>describe requirements related to personal protective equipment and safety measures</th>
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</table>

Student Knowledge, Abilities, and Competencies

**Topic: Occupational Health and Safety**
- Describe responsibilities of the employer regarding work site safety.
- Describe responsibilities of the employee regarding work site safety.
- Demonstrate a positive attitude towards safety.
- Explain general safety precautions related to
  - work site planning
  - joint work site health and safety committee
  - housekeeping
  - tool safety
  - electrical safety
  - accident prevention, and reporting of unsafe conditions.
- Describe safety training required by employers: (e.g., first aid, WHMIS).
- Demonstrate an understanding of the Occupational Health and Safety Act of PEI.

**Topic: Personal Protective Equipment (PPE)**
- Identify and describe the use of common personal protective equipment (PPE) required in the carpentry trade:
  - head protection
  - eye protection
  - ear protection
  - foot protection
  - limb and body protection
  - respiratory protection
- Demonstrate the use of PPE in the workshop.

**Topic: Safety Measures**
- Describe responsibilities related to working alone (employee/employer).
- Explain the hazards related to working with compressed air.
- Explain the purpose and function of equipment guards.
- Describe “lock-out/tag-out” procedures while maintaining equipment.
- Describe safety practices related to working with or around trenches.
- Describe the proper method of installing and removing shoring, stringers, and bracing of a trench.
- Describe the difference between a trench and an excavation.
- Define “spoil pile.”
- Describe the proper method for guarding and identifying floor openings.
- Describe factors to consider when planning a fall arrest system.
- Compare and contrast a body belt and a body harness.
- Describe the risks in working with asbestos, along with recommended safety precautions.
Work Site Safety (~3 hours Classroom Component)

SCO 1. Students will be able to apply Occupational Health and Safety Regulations and safe work practices in the workplace.

Teacher Lessons / Demonstrations

**Topic: Occupational Health and Safety Discussion**
- Introduce the topic of safety—not as a lesson, but as a way of working and living every day, developing safe habits and thinking “safety first.”
- Point out any P.E.I. rules and regulations which may differ from those in the ILM.
- Indicate the importance of basic first aid certification.

**Literacy**

*Anticipation Guide:* Create an anticipation guide to assess students’ prior knowledge of personal protective equipment, (PPE).

*Document Reading:* Read relevant sections of
  - the P.E.I. Occupational Health and Safety Act

**Topic: Personal Protective Equipment (PPE)**
- Identify the location of and understand expectations for the use of PPE.
- Model and demonstrate the care of PPE.
- Model and demonstrate specific lab requirements for PPE.

**Topic: Safety Measures**
- Guide students through a “walkabout” around the lab, highlighting all of the safety features (e.g., location of fire extinguishers, fire exits, first-aid kits, PPE).
- Discuss fire safety and evacuation routes.
- **As a follow-up the next day...**
  - before the class arrives, take the time to stage 10 work site safety problems (e.g., remove the fire exit signs or switch the fire extinguishers).
- *Brainstorm* in a class discussion the lab safety rules and safety contract.
- Show safety videos.
- Identify and demonstrate the various machine safety features and guards.
- Model and demonstrate lock-out/tag-out procedures.
- Use a KWL chart as a prompt for students to discuss aspects of fall protection.

**Literacy**
- *Freewrite:* Have students write about their current knowledge and previous use of personal protective equipment.

Student Activities / Assessments

- Review lab safety rules and sign safety contract.
- Identify PPE equipment.
- Prepare a safety plan to be used in case of an accident.
- Write a test on safe work practices in the workplace.
- Draw a detailed floor plan of the lab on grid paper and locate all of the safety areas and exits as defined during the walkabout.
- **As a follow-up the next day...**
  - circulate through the lab to identify the work site safety problems staged by the instructor.

Resources

**Texts/Teacher Resources**
Alberta Module 020101a
*Work Site Safety*
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Occupational Health and Safety Act

**SAS Resource Sharing**

**Videos**
- *Lost Youth*
- *It Only Takes a Second*
- *Things You’d Better Know...*

**Visuals/Handouts/Tests**
- Lab safety rules
- Safety contract
- Rights and Responsibilities
- OHS exercise
- Guide to Workplace Safety for Residential Construction Sites

**Internet**

WorkSafe
SCO - Delineations

Students will be expected to

1.3 describe emergency procedures for dealing with injured workers

1.4 describe potential health hazards

Topic: Lab Safety

- Locate and identify all emergency-related features in the lab environment:
  - eye wash stations
  - emergency exits
  - first-aid kit
  - certified first aider
  - fire extinguisher
  - fire alarm
  - telephone
  - emergency phone numbers

- Describe how to properly handle an emergency situation should one arise.
  1. Take charge.
  2. Call out for help.
  3. Assess hazards and make the area safe.
  4. Find out what happened.
  5. Identify yourself and offer help.
  6. If head or spinal injuries are suspected, support the head or neck.
  7. Assess responsiveness.
  8. Send someone or go for help.

Topic: Impact Loading

- Define “static loading”, and “impact loading.”
- Explain the importance of not impact loading a scaffold.

Topic: Personal Safety

- Identify the characteristics of and preventative measures for the following:
  - heatstroke
  - frostbite
  - hypothermia
  - fatigue

- Identify the hazards and preventative measures for exposure to the following:
  - natural wood dust
  - lead-based paint
  - carbon monoxide
  - flammable liquids and gases

- Interpret MSDS and product label information.
- Demonstrate how to properly lift and handle heavy objects.
Work Site Safety (~3 hours Classroom Component)

SCO 1. Students will be able to apply Occupational Health and Safety Regulations and safe work practices in the workplace.

**Teacher Lessons / Demonstrations**

*Topic: Lab Safety*
- Locate and discuss lab safety features.
- Discuss safety procedures.
- Introduce Material Safety Data Sheets (MSDS).

*Topic: Impact Loading*
- Use a hammer and nail to explain the difference between static and impact loading.
  - Start a nail in a piece of wood.
  - Rest the hammer on the nail (static load).
  - Push on the nail with the hammer (static load).
  - Hammer the nail with the hammer (impact load).

*Topic: Personal Safety*
- Identify environmental hazards of working in various weather conditions.
- Describe the dangers of fatigue in the workplace.
- Identify various hazardous materials that may be in the workplace.
- Describe the precautions required when working with, or around, hazardous materials.
- Demonstrate proper lifting methods.

**Literacy**
- Read and interpret MSDS and product label information.
- Complete a workshop MSDS label.

**Student Activities / Assessments**
- Draw a lab floor plan indicating the various safety features.
- Interpret a MSDS sheet.
- Complete a workshop MSDS label.
- Demonstrate PPE required for various situations (handout sheet).
- Explain the concepts of static and impact loading.
- Identify common work site hazardous materials.
- List PPE and safety requirements for working with hazardous materials.
- Demonstrate proper lifting techniques.

**Resources**

*Texts/Teacher Resources*
Alberta Module 020101a
*Work Site Safety*
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Occupational Health and Safety Act

*SAS Resource Sharing*

*Videos*
- *Lost Youth*
- *It Only Takes a Second*
- *Things You’d Better Know...*

*Visuals/Handouts/Tests*
- Lab floor plan
- PPE sheets
- MSDS
- Rules of Lifting
- ILM Self-Test
  *Work Site Safety*
Solid Wood Products
 (~3 hours Classroom Component)

Introduction
In residential construction the most common building material is wood. It is important for the apprentice to identify the various common species, with their characteristics, uses, and limitations. A solid knowledge of wood joinery is essential.

Specific Curriculum Outcome

2. Students will be able to identify and describe solid wood products and joinery.

SCO - Delineations
Students will be expected to
2.1 describe common types and characteristics of solid wood products
2.2 describe how wood is milled, seasoned, stored, and ordered
2.3 identify and describe the application of commonly used mouldings
2.4 identify and describe the application of wood joints for fabrication and installation

Assessment Strategies
Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources
Alberta Module 020102a, Solid Wood Products
## Solid Wood Products (~3 hours Classroom Component)

SCO 2. Students will be able to identify and describe solid wood products and joinery.

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<th>Student Knowledge, Abilities, and Competencies</th>
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| 2.1 describe common types and characteristics of solid wood products | Topic: Growth and Structure of a Tree  
- Explain (in a general way) how a tree grows, and the process of photosynthesis.  
- Identify the three main parts of a tree (roots, trunk, crown).  
- Describe the annual growth cycle of trees.  
- Explain the terms “annual rings,” “springwood,” and “summerwood.”  
- Describe the anatomy of a tree trunk.  
- Explain tree classification: hardwoods (deciduous), and softwoods (coniferous).  
- Identify the characteristics and uses of some common species of woods.  
- Identify several common tree species in Eastern Canada. |
| 2.2 describe how wood is milled, seasoned, stored, and ordered | Topic: Lumber Production  
- Explain the two common methods for lumber production, flat-sawn and quarter-sawn.  
- List advantages and disadvantages of both flat-sawn and quarter-sawn lumber.  
- Describe the three classifications of milled lumber: rough, surfaced, and worked. |
| | Topic: Lumber Seasoning  
- Explain the two methods of drying lumber, air drying and kiln drying.  
- Explain the moisture content of wood and how it is measured.  
- List moisture contents for common uses of wood (green, construction, furniture).  
- Demonstrate a test for moisture content.  
- List five reasons for properly seasoning and storing lumber.  
- Explain the process of moisture loss and lumber shrinkage.  
- Define the terms “free water,” “bound water,” “green lumber,” and “fibre saturation point.”  
- Explain the effects of lumber shrinkage (i.e., warp, twist, cup, check). |
| | Topic: Lumber Grading  
- Explain lumber grading rules and standards.  
- Interpret lumber grading stamps. |
| | Topic: Lumber Defects  
- Identify wood defects and determine appropriate actions.  
- List three main groups of wood defects: natural flaws, manufactured flaws, and seasoning flaws. |
Solid Wood Products (~3 hours Classroom Component)
SCO 2. Students will be able to identify and describe solid wood products and joinery.

Teacher Lessons / Demonstrations

Topic: Characteristics of Wood
- Use visuals to teach about the growth and structure of trees.
- Assemble an assortment of various types and species of wood for the student to examine.
- Display a sample cross-section of a tree.

Topic: Lumber Production
- Introduce and explain lumber production and seasoning.
- Display examples of quarter-sawn and plain-sawn lumber.

Topic: Lumber Seasoning
- Highlight the procedures for seasoning lumber.
- Explain moisture content requirements for kiln-dried lumber.
- Demonstrate a moisture content test (procedure sheet).

Topic: Lumber Grading
- Display an example of a lumber grading stamp.
- Explain lumber grading rules and standards.

Literacy
- Anticipation Guide: Use as a pre-reading strategy to assess students' knowledge of the growth and structure of trees.
- Freewrite: Have students describe how a tree grows.

CBL
- Plan a field trip to a local lumber mill.

Student Activities / Assessments

- Label the parts of a tree.
- Describe the differences between hardwoods and softwoods.
- Select and identify specific types of wood for various applications.
- Identify quarter-sawn and plain-sawn lumber samples.
- Identify common lumber sizes (e.g., 2x4, 2x8).
- Explain the difference between rough and nominal sizes.
- Describe the moisture requirements for kiln-dried lumber.

Literacy
Read and interpret a lumber grading stamp.

Enrichment / Research Activities

- Complete a moisture content lab experiment.

Resources

Texts/Teacher Resources
Alberta Module 020102a
Solid Wood Products
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SAS Resources

Visuals/Handouts/Tests
- Growth and structure of trees
- Eastern tree species
- ILM Self-Test
  Solid Wood Products
Solid Wood Products (~3 hours Classroom Component)
SCO 2. Students will be able to identify and describe solid wood products and joinery.

SCO - Delineations
Students will be expected to

2.2 describe how wood is milled, seasoned, stored, and ordered

Student Knowledge, Abilities, and Competencies

Topic: Lumber Defects
- Identify and describe the appropriate action to take in dealing with natural flaws in lumber:
  - grub or insect holes
  - pitch pockets
  - shake, through shake, ring shake
  - honeycomb, peck, rot
  - wane, bark pockets
  - pith
  - pitch streak, stain
  - knots (shape and type, live, dead)
- Identify and describe various manufacturing flaws:
  - machine offset, snipe
  - skip
  - trimming
  - dog holes
  - machine bite, chip channels
- Identify and describe various seasoning defects:
  - check
  - split
  - bow
  - crook
  - cup
  - twist
  - stresses
  - shakes

Topic: Lumber Grading, Sizing, and Ordering
- Explain the grading systems for hardwood and softwood lumber.
- Explain lumber size terminology (e.g., board, lumber, timber).
- Define the terms “nominal size” and “actual size.”
- Create a list of common dimensions and lengths of lumber.
- Calculate board feet.

Topic: Lumber Storage
- Describe and demonstrate proper methods for handling and storing lumber products.
Solid Wood Products (~3 hours Classroom Component)

SCO 2. Students will be able to identify and describe solid wood products and joinery.

**Teacher Lessons / Demonstrations**

*Topic: Lumber Defects*
- Hold class discussion on the various lumber defects and how to deal with them.
- Create a slideshow using select images from the ILM graphics CD to support learning about various lumber defects.
- Set up an ID station that includes examples of the most common wood defects.
- Create a lumber ID activity:
  - Have an assortment of lumber samples (2x4s, 2x6s, 4x4s, pressure treated, spruce, manufactured, etc.).
  - Create a lumber defect checklist/ID sheet for the students.

*Topic: Lumber Grading, Sizing, and Ordering*
- Explain the lumber grading system and grading stamps.
- Introduce and explain the process for ordering lumber using a lumber ordering chart.
- Explain how to estimate for waste.

*Topic: Materials Handling and Storage*
- Demonstrate the proper methods used to store lumber.

**Literacy**
- Use a KWL strategy to facilitate learning about lumber defects.
- Read and interpret lumber grading stamps.
- Develop a lumber ordering chart.
- *Anticipation Guide:* Use as a pre-reading strategy to assess students’ knowledge of lumber defects.

**Numeracy**
- Demonstrate how to calculate board feet.

**Student Activities / Assessments**
- Select solid wood materials in the shop and identify and highlight any defects.
- Identify various wood samples in a lumber ID station.
- Identify the size and type of material, and record any defects.
- Demonstrate proper lumber storage techniques, and housekeeping.

**Literacy**
- Complete a KWL strategy to learn about lumber defects.
- Read and interpret lumber grading stamps.

**Numeracy**
- Calculate board feet from samples.
- Estimate the length of various pieces of lumber.
- Estimate the amount of lumber required for a simple project.
- Complete a lumber ordering sheet.

**Enrichment / Research Activities**
- Develop a display of various lumber products.
- Develop a display of various lumber species.
- Develop a display of various lumber defects.

**Resources**

*Texts/Teacher Resources*
Alberta Module 020102a
Solid Wood Products
pp. 1-50

*Visuals/Handouts/Tests*
- Lumber defects
- ILM Self-Test
Solid Wood Products
Solid Wood Products (~3 hours Classroom Component)

SCO 2. Students will be able to identify and describe solid wood products and joinery.

**SCO - Delineations**

*Students will be expected to*

2.3 identify and describe the application of commonly used mouldings

2.4 identify and describe the application of wood joints for fabrication and installation

**Student Knowledge, Abilities, and Competencies**

**Topic: Mouldings**

- State the function of different mouldings.
- Label molding locations on a typical room diagram.
- Describe moulding shapes and purpose.
- Differentiate among the following moulding materials:
  - softwood
  - hardwood
  - available grades (paint, stain, solid, finger-jointed)
  - manufactured wood products
  - synthetic materials
- Identify several common router bits used to make mouldings.
- Identify a circular saw moulding head used to make mouldings.

**Topic: Wood Joinery**

- Identify the different wood joints:
  - butt joint
  - mitre joint
  - rabbet joint
  - dado joint
  - groove joint
  - half lap joint
  - coped joints
  - dowel joint
  - mortise and tenon joints
  - dovetail joints
- Identify common methods used to fasten wood joints:
  - nails (end nailing and toe nailing)
  - screws
  - dowels
  - biscuits
  - splines
  - glues
  - speciality fasteners
Solid Wood Products (~3 hours Classroom Component)
SCO 2. Students will be able to identify and describe solid wood products and joinery.

Teacher Lessons / Demonstrations

**Topic: Mouldings**
- Use samples of various mouldings used in residential construction to help students develop an understanding of these products.
- Identify the various common mouldings.
- Illustrate and/or demonstrate various application and finishing methods.

**Topic: Wood Joinery**
- Hold a class discussion on the various joints used to assemble wood products. Have examples to display to the class to support the discussion.
- Create slides of various wood joints from the ILM graphics CD.
- Demonstrate models of the most common joints in construction.
- Demonstrate how to properly cut/assemble the following joints:
  - butt joints
  - mitre joints
  - rabbet joints
  - dado joints
  - biscuit joints
  - coped joints

**Literacy**
- Develop a KWL to facilitate learning about common wood joints.

**Student Activities / Assessments**
- Identify several common router bits.
- Identify several common mouldings.
- Identify various wood joints.
- Suggest appropriate applications for wood joints.
- Cut and assemble models of the joints listed above.
  - Note: This activity will also support skills in the hand tools, portable power tools, and stationary power tools modules.

**Enrichment / Research Activities**
- Create a display of mouldings.
- Create a display of wood joinery.
- Develop the various wood joints into shop projects.

Resources

**Texts/Teacher Resources**
Alberta Module 020102a
Solid Wood Products
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**SAS Resources**

**Visuals/Handouts/Tests**
- Common mouldings
- Wood joints
- ILM Self-Test
  *Solid Wood Products*
Hand Tools
(~4 hours Classroom Component)

Introduction
The ability to use hand tools effectively and efficiently is one of the most basic skills required in carpentry. The apprentice must be able to identify and demonstrate the proper use and maintenance of these basic tools of the trade. Considerable time must be devoted to building and honing hand tool skills.

Specific Curriculum Outcome

3. Students will be able to identify common hand tools and describe their proper uses.

SCO - Delineations
Students will be expected to
3.1 identify and describe the use of measuring, marking, layout, alignment, and squaring tools
3.2 identify and describe the use of cutting tools, boring tools, and drilling tools
3.3 identify and describe the use of assembling, clamping, and dismantling tools
3.4 demonstrate the use of hand tools to construct projects using wood materials

Assessment Strategies
Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources
Alberta Module 020103a, Hand Tools
Hand Tools (~4 hours Classroom Component)
SC0 3. Students will be able to identify common hand tools and describe their proper uses.

**SCO - Delineations**

*Students will be expected to*

| 3.1 | identify and describe the use of measuring, marking, layout, alignment, and squaring tools |
| 3.2 | identify and describe the use of cutting tools, boring tools, and drilling tools |

**Student Knowledge, Abilities, and Competencies**

*Topic: Measuring and Layout Tools*
- Identify and describe the function of the following hand tools:
  - tape measure
  - framing square, combination square, angle (speed) square, tri-square
  - spirit level, line level
  - chalk line, dry line
  - plumb bob
  - sliding t-bevel
  - compass, dividers, trammel points
  - centre punches, self-centring punches

*Topic: Cutting and Shaping Tools*
- Identify and describe the function of the following hand tools:
  - handsaws (crosscut, rip, back, coping, keyhole, hacksaw)
  - planes (jointer, jack, smoothing, block, spoke shave)
  - chisels
  - bevel utility knives
  - sheers and aviation snips
  - files and rasps
  - sanding blocks
  - sand paper (grit identification)

*Topic: Boring and Drilling Tools*
- Identify hand drills (brace and bit, Yankee push drill, geared hand drill).
- Identify the various systems for drill bit sizing (fractional, imperial, metric).
Teacher Lessons / Demonstrations

**Topic: Measuring and Layout Tools**
- Demonstrate layout and marking tools.
- Develop a pre-test with a slide show of the measuring tools in your shop:
  - Use the supporting graphics CD for images of tools.
  - Use a matching format for the test.
- Demonstrate how to read a measuring tape or ruler, with accuracy to 1/16th in. (imperial), and 1 mm (metric, SI).

**Topic: Cutting and Shaping Tools**
- Display the common cutting and shaping tools in the lab.
- Identify the specific parts of each tool.
- Demonstrate the proper use of cutting and shaping tools.
- Demonstrate the proper care and storage of each of the tools.
- Use a video on the proper use and care of hand tools.
- Develop a task block that the students must duplicate. This activity could include some of the following tasks:
  - Square a piece of stock to a pre-determined size.
  - Cut one end square, the other on a set angle that the students must measure.
  - Plane a bevel to a specific angle on one edge.
  - Cut out a square hole (specific location).
  - Drill a variety of sized holes (specific locations).
  - Lay out and mortise a small hinge.
  - Cut a rabbet or dado joint.
- Demonstrate the use of a brace and bit and other boring tools.

Student Activities / Assessments
- Identify the various measuring tools.
- Demonstrate the use of measuring tools to complete assigned tasks and worksheets.
- Demonstrate proficiency in measuring to a specified accuracy.
- Identify the various cutting and shaping tools.
- Demonstrate the use of cutting and shaping tools to complete assigned tasks and worksheets.
- Sharpen chisels using a grinder and water stones.
- Build a task block (see above).

**Literacy**
- Create a list of the layout, measuring, and cutting tools in the workshop.

**Numeracy**
- Develop competency in measuring fractions and decimals, accurate to 1/16th in. (imperial) and 1 mm (metric, SI).

Enrichment / Research Activities
- Create a small simple project using only hand tools (e.g., small shelf, tool box).

Resources

**Texts/Teacher Resources**
Alberta Module 020103a
*Hand Tools*
pp. 1-62

**SAS Resources**

**Visuals/Handouts/Tests**
- Tool ID sheets
- Measuring task sheets
- Task Block Plan
- ILM Self-Test
  *Hand Tools*

**Internet**
- Tool manufacturers’ sites
- Retail tool sites

Hand Tools (≈4 hours Classroom Component)
SCO 3. Students will be able to identify common hand tools and describe their proper uses.
Hand Tools (~4 hours Classroom Component)

SCO 3. Students will be able to identify common hand tools and describe their proper uses.

**SCO - Delineations**

Students will be expected to

| 3.3 | identify and describe the use of assembling, clamping, and dismantling tools |

**Student Knowledge, Abilities, and Competencies**

**Topic: Assembling Tools**

- Identify and describe the function of each of the following assembling tools:
  - hammers—claw, ripping (framing), hatchet (Gyproc), sledgehammers
  - staplers—staple gun, hammer tacker
  - nail sets
  - screwdrivers—Robertson, Phillips, slot
  - pliers—slip joint, groove joint, linesman, needle nose, locking (vice-grip), diagonal (side cutting), end nipper
  - wrenches—open/box end, combination, adjustable, Allen

**Topic: Clamping Tools**

- Identify and describe the function of each of the following clamping tools:
  - bar clamps
  - spring clamps
  - pipe clamps
  - c-clamps
  - hand screw clamps
  - web or band clamps

**Topic: Dismantling Tools**

- Identify and describe the function of each of the following dismantling tools:
  - wrecking bars, ripping chisels, flat bars
  - nail pullers, nail claws (cat’s-paw)
  - hammers

**Topic: Hand Tool Skill Development**

- Hand tool skill development is intended to be an integrated component of the course. Students will develop their skills through work on meaningful projects designed to offer a variety of learning opportunities. They will develop the knowledge, ability, and competency to
  - use the hand tools listed in the ILM for construction of projects using solid wood and manufactured materials
  - demonstrate the effective use of PPE
  - demonstrate safe practices
  - demonstrate the ability to read and follow plans and procedures
  - sharpen and maintain hand tools.
Hand Tools (~4 hours Classroom Component)
SCO 3. Students will be able to identify common hand tools and describe their proper uses.

Teacher Lessons / Demonstrations

**Topic: Assembling Tools**
- Identify the various types of assembling tools.
- Demonstrate the use of each tool.
- Identify the various types of screwdriver heads.

**Topic: Clamping Tools**
- Identify the various types of clamping tools.
- Demonstrate the use of each clamp.

**Topic: Dismantling Tools**
- Identify the various types of dismantling tools.
- Demonstrate the use of each tool.

**Literacy**
- Develop tool identification worksheets.
- Develop vocabulary by using proper tool names.

Student Activities / Assessments

- Use a variety of hammers and observe the differences.
- Laminate/nail together pieces of 2x4 lumber and then pull them apart using different tools.
- Identify and list advantages and disadvantages of each type of screwdriver.
- Identify various pliers.
- Demonstrate proficiency in the use of assembly tools.
- Select a tool from a toolbox that contains 25 to 30 hand tools common to the construction industry.
  - This activity is designed to be a 5 min. daily activity for each student until they have all gone through the entire tool box.
- Copy and complete a table like the one shown below:

<table>
<thead>
<tr>
<th>#</th>
<th>Name</th>
<th>Use</th>
<th>Drawing</th>
<th>Location in Shop</th>
<th>Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Claw Hammer</td>
<td>Pounding and Pulling Nails</td>
<td></td>
<td>Tools Locker #3 Top Right</td>
<td>Never strike two hammers together.</td>
</tr>
</tbody>
</table>

**Enrichment / Research Activities**

- Develop a list of hand tools for an apprentice's tool box.
- Make a custom toolbox.

Resources

**Texts/Teacher Resources**
Alberta Module 020103a
*Hand Tools* pp. 1-62

Trade catalogues and magazines

**SAS Resources**

**Visuals.Handouts/Tests**
- selected videos at provincial library
- Power Tool Institute CD

**Internet**
- Tool manufacturers’ sites
- Retail tool sites
Portable Power Tools
(~2 hours Classroom Component)

Introduction
Portable power tools are used every day by carpenters to improve efficiency and reduce the effort required to complete construction-related tasks. Portable power tools can be hazardous and cause injury if they are not used or maintained properly. The apprentice must become familiar with many portable power tools, demonstrating effective use and care, while always working in a safe manner.

Specific Curriculum Outcome

4. Students will be able to identify and describe the safe operation and maintenance of portable power tools.

SCO - Delineations
Students will be expected to
4.1 identify and describe the safe operation of portable saws
4.2 identify and describe the safe operation of portable planing and shaping equipment
4.3 identify and describe the safe operation of portable drilling and fastening equipment
4.4 identify and describe the safe operation of portable abrasive tools
4.5 demonstrate tool proficiency through selected shop projects using a variety of building materials

Assessment Strategies
Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources
Alberta Module 020103b, Portable Power Tools
### Portable Power Tools (~ 2 hours Classroom Component)

**SCO 4.** Students will be able to identify and describe the safe operation and maintenance of portable power tools.

<table>
<thead>
<tr>
<th>SCO - Delineations</th>
<th>Student Knowledge, Abilities, and Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Students will be expected to</strong></td>
<td></td>
</tr>
<tr>
<td><strong>4.1</strong> identify and describe the safe operation of portable saws</td>
<td></td>
</tr>
<tr>
<td>Topic: <strong>Power Saws</strong></td>
<td></td>
</tr>
<tr>
<td>- Identify various portable power saws used in the carpentry trade.</td>
<td></td>
</tr>
<tr>
<td>- Operate the following portable saws in a safe and proper manner:</td>
<td></td>
</tr>
<tr>
<td>- circular saw</td>
<td></td>
</tr>
<tr>
<td>- power mitre saw</td>
<td></td>
</tr>
<tr>
<td>- sliding compound mitre saw</td>
<td></td>
</tr>
<tr>
<td>- jigsaw</td>
<td></td>
</tr>
<tr>
<td>- reciprocating saw</td>
<td></td>
</tr>
<tr>
<td>- Maintain power saws and accessories, including</td>
<td></td>
</tr>
<tr>
<td>- extension/power cords</td>
<td></td>
</tr>
<tr>
<td>- blades</td>
<td></td>
</tr>
<tr>
<td>- guards.</td>
<td></td>
</tr>
<tr>
<td>- Demonstrate an understanding of the safety issues specific to each power tool.</td>
<td></td>
</tr>
<tr>
<td>- Demonstrate the proper use and safety precautions to be taken with each of the above power tools.</td>
<td></td>
</tr>
</tbody>
</table>

| **4.2** identify and describe the safe operation of portable planing and shaping equipment |
| Topic: **Power Planers and Routers** |
| - Identify portable planing and shaping equipment and recognize the safety issues involved with the use of each: |
| - routers |
| - laminate trimmers |
| - rotary cut out tools |
| - power hand planes |
| - various accessories |
| - Describe the use and function of portable planing and shaping tools. |
| - Demonstrate an understanding of the safety issues specific to each power tool. |
| - Demonstrate the use of the appropriate PPE. |
| - Demonstrate the proper use and safety precautions to be taken with each of the above power planing and shaping tools. |
| - Maintain portable planing and shaping equipment. |
| - Develop proficiency in the proper use of the above power tools. |
| - Complete projects designed to build skills in the use of these power tools. |
Portable Power Tools (~ 2 hours Classroom Component)
SCO 4. Students will be able to identify and describe the safe operation and maintenance of portable power tools.

Teacher Lessons / Demonstrations

Topic: Power Saws
- Display and identify various portable power saws.
- Demonstrate how to safely use, handle, and care for portable power saws.
- Demonstrate the use of the appropriate saw for the following applications:
  - crosscutting operations
  - ripping
  - notching
  - plunge cutting
- Develop the following materials:
  - power tool use and safety information sheets
  - written test covering operation and safety
  - practical user operation tests

Topic: Power Planers and Routers
- Identify various routers, spiral saws, and planers.
- Demonstrate how to safely use, handle, and care for portable routers, spiral saws, and planing tools.
- Develop the following materials:
  - power tool use and safety information sheets
  - written test covering operation and safety
  - practical, user operation tests

Student Activities /Assessments
- Identify the different saws, planers, and routers, with their various components and accessories.
- Select the appropriate tools for specific tasks.
- Demonstrate the proper, safe use of each tool.
- Complete a tool identification quiz on saws, planers, and routers.
- Demonstrate the proper storage and maintenance of each tool.
- Develop skill proficiency through projects designed around each tool.

Literacy
- Develop vocabulary by using proper tool names.
- Interpret tool information and safety sheets.

Enrichment / Research Activities
- As a carpenter or hobby woodworker you will be purchasing portable powered tools. Complete this consumer exercise in purchasing power tools:
  1. Select a tool that you would like to have (e.g., circular saw).
  2. Research three similar tools, listing their specifications and prices.
  3. Choose the one you would buy, giving reasons why.

Literacy
- Read and interpret the owners’ manuals for the various tools.
- Complete a one-page briefing sheet on a portable power tool.

Resources

Texts/Teacher Resources
Alberta Module 020103b
Portable Power Tools
pp. 1-42

SAS Resources

Videos
- Selected videos at provincial library

Visuals/Handouts/Tests
- Power tool information and safety sheets
- ILM Self-Test
  Portable Power Tools

Internet
- Retail suppliers
- Manufacturers’ sites
- Power Tool Institute, Inc.
- OHS, WorkSafe sites
Portable Power Tools (~ 2 hours Classroom Component)
SCO 4. Students will be able to identify and describe the safe operation and maintenance of portable power tools.

### SCO - Delineations

**Students will be expected to**

<table>
<thead>
<tr>
<th>SCO</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.3</td>
<td>identify and describe the safe operation of portable drilling and fastening equipment</td>
</tr>
<tr>
<td>4.4</td>
<td>identify and describe the safe operation of portable abrasive tools</td>
</tr>
<tr>
<td>4.5</td>
<td>demonstrate tool proficiency through selected shop projects using a variety of building materials</td>
</tr>
</tbody>
</table>

### Student Knowledge, Abilities, and Competencies

**Topic: Drills, Fastening Tools**
- Identify portable drilling and fastening equipment.
- Demonstrate an understanding of the safety issues and precautions to be taken with the following drilling and fastening tools:
  - drills
  - hammer drills
  - concrete and masonry tool bits
  - screw guns
  - biscuit joiners
  - electric/pneumatic powered nailers
- Describe the function and use of portable drilling and fastening equipment.
- Describe the advantages and disadvantages of corded and cordless power tools.

**Topic: Sanders, Grinders**
- Identify portable abrasive tools.
- Demonstrate safe work habits related to portable abrasive power tools:
  - belt sanders
  - finishing sanders
  - disc sanders
  - grinders
- Demonstrate the use of the appropriate PPE.
- Demonstrate the proper use and safety precautions to be taken with each of the above power planing and shaping tools.
- Maintain portable planing and shaping equipment.

**Topic: Portable Power Tool Skill Development**
- Develop proficiency in the proper use of the above power tools.
- Complete projects designed to build skills in the use of these power tools.
- Students will develop the knowledge, ability, and competency to:
  - use the hand tools listed in the ILM for construction projects using solid wood and manufactured materials
  - demonstrate the effective use of PPE
  - demonstrate safe practices
  - demonstrate the ability to read and follow plans and procedures
  - sharpen and maintain hand tools.
Portable Power Tools (~ 2 hours Classroom Component)
SCO 4. Students will be able to identify and describe the safe operation and maintenance of portable power tools.

Teacher Lessons / Demonstrations

Topic: Drills, Fastening Tools
- Demonstrate how to safely use, handle, and care for portable drilling and fastening tools.
- Demonstrate the safe and effective use of
  - drills
  - screw guns
  - biscuit joiners
  - pneumatic fastening tools.
- Develop the following materials:
  - tool use and safety information sheets
  - written test covering operation and safety

Topic: Sanders, Grinders
- Demonstrate how to safely use, handle, and care for portable abrasive sanding tools.
- Demonstrate the safe and effective use of
  - belt sanders
  - orbital sanders
  - grinders.
- Develop the following materials:
  - tool use and safety information sheet
  - written test covering operation and safety

Student Activities / Assessments
- Identify various drills and fastening tools.
- Demonstrate the safe and effective use of:
  - drills, screw guns, fastening tools, biscuit joiner, pneumatic nailers
- Demonstrate the safe and effective use of portable powered sanders and grinders.
- Complete a quiz to identify the various tools, their components and accessories.
- Demonstrate the proper storage and maintenance of each tool.
- Develop skill proficiency through projects designed around each tool.

Literacy
- Develop vocabulary by using proper tool names.
- Interpret tool information and safety sheets.

Enrichment / Research Activities
- As a carpenter or hobby woodworker you will be purchasing portable power tools. Complete this consumer exercise in purchasing power tools:
  1. Select a tool that you would like to have (e.g., circular saw).
  2. Research three similar tools, listing their specifications and prices.
  3. Choose the one you would buy, giving reasons why.

Literacy
- Read and interpret owner/operator manuals.
- Complete a one-page briefing sheet on a portable power tool.

Resources

Texts/Teacher Resources
Alberta Module 020103b
Portable Power Tools
pp. 1-42

SAS Resources

Videos
- selected videos at provincial library

Visuals/Handouts/Tests
- power tool information and safety sheets
- ILM Self-Test
  Portable Power Tools

Internet
- Retail suppliers
- Manufacturers’ sites
- Power Tool Institute
- OHS, WorkSafe sites
Stationary Power Tools
(~2 hours Classroom Component)

Introduction
Stationary power tools may be found on some larger job sites, or in wood manufacturing workshops. Carpenters must become familiar with the operation of the various stationary power tools and the basic operations of wood product manufacturing. The apprentice must develop skills in wood product manufacturing and machine operations. The safe and effective use of machines and personal protective equipment must be applied at all times.

Specific Curriculum Outcome
5. Students will be able to identify and describe the safe operation and maintenance of stationary power tools and demonstrate tool proficiency through selected projects.

SCO - Delineations
Students will be expected to
5.1 identify and describe the safe operation and regular maintenance of stationary saws
5.2 identify and describe the safe operation and regular maintenance of stationary planing tools
5.3 identify and describe the safe operation and regular maintenance of stationary drilling, grinding, and sanding tools

Assessment Strategies
Paper/Pencil
Self/Peer Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources
Alberta Module 020103c, Stationary Power Tools
Stationary Power Tools (~2 hours Classroom Component)

SCO 5. Students will be able to identify and describe the safe operation and maintenance of stationary power tools and demonstrate tool proficiency through selected shop projects.

**SCO - Delineations**

*Students will be expected to*

- identify and describe the safe operation and regular maintenance of stationary saws

**Student Knowledge, Abilities, and Competencies**

*Topic: Stationary Saws*

- Identify and describe the main parts of a table saw, radial arm saw, and band saw.
- Describe the proper and safe operation of stationary saws:
  - table saw (rip, crosscut, bevel, angles, mitre)
  - radial arm, or sliding compound mitre saw (crosscutting, mitre, single angles, compound angles)
  - band saw (curves, angles, relief cuts)
- Demonstrate safety procedures needed when using stationary saws:
  - set saw blade height and angle
  - proper installation and functioning of guards
  - proper set-up and use of mitre gauge and fence
- Demonstrate lock-out/tag-out procedures while performing maintenance on stationary power tools.
- Practise basic maintenance:
  - table saw (change blades, clean)
  - band saw (set blade tension and track, set guides)
  - radial arm saw (change blades, check alignment, set height, change fence)
- Demonstrate and practise safe operation of stationary saws.
  - Maintain a clear working area around saw.
  - Do not talk to operator.
  - Follow safety rules.
  - Wear appropriate PPE.
- Develop proficiency in the proper use of the above power tools.
- Complete projects designed to build skills in the use of these power tools.
- Demonstrate the proper cleaning and maintenance of stationary saws.
Stationary Power Tools (~2 hours Classroom Component)

SCO 5. Students will be able to identify and describe the safe operation and maintenance of stationary power tools and demonstrate tool proficiency through selected shop projects.

Teacher Lessons / Demonstrations

**Topic: Stationary Saws**

- Identify the various stationary saws.
- Demonstrate the use of appropriate PPE.
- Demonstrate the proper machine set-up, including the use of all safety equipment and machine guards.
- Present a lesson and demonstration on the safe operation of each of the following machines:
  - Identify the parts of the saw
  - Demonstrate the proper and safe operation to perform
    - crosscuts with mitre gauge
    - ripping with the fence
    - various angle cuts
  - Identify the parts of the saw
  - Demonstrate the proper and safe operation to perform
    - crosscuts
    - single angle cuts
    - compound angle cuts
  - Identify the parts of the saw
  - Demonstrate the proper and safe operation to perform
    - relief cuts
    - cutting curves
    - angle cuts
  - Prepare a demonstration lesson on proper maintenance procedures for each of the machines, including proper lock-out/tagout procedures.

Student Activities / Assessments

- Demonstrate the use of appropriate PPE.
- Demonstrate use of guards and push sticks.
- Demonstrate the safe operation and maintenance of the tools listed above.
- Perform the cutting operations listed above.
- Label the parts of the following stationary power tools and describe their functions: table saw, radial arm saw, sliding compound mitre saw, and band saw.
- Perform maintenance, and change and set blades.
- Demonstrate the proper use of the above tools while working on shop projects.
- Construct a push stick for the table saw.

Enrichment / Research Activities

- Select a stationary tool and write the specifications for the purchase of the tool through a tender process.
- Investigate publications that compare stationary tools.

Resources

**Texts/Teacher Resources**
Alberta Module 020103c
*Stationary Power Tools*
pp. 1-42

**SAS Resources**

**Videos**
- selected videos at provincial library

**Visuals/Handouts/Tests**
- Machine safety sheets
- ILM Self-Test
  *Stationary Power Tools*, pp. 38-40

**Internet**
- Retail suppliers
- Manufacturers’ sites
- Power Tool Institute
- OHS, WorkSafe sites
Stationary Power Tools (~2 hours Classroom Component)

SCO 5. Students will be able to identify and describe the safe operation and maintenance of stationary power tools and demonstrate tool proficiency through selected shop projects.

<table>
<thead>
<tr>
<th>SCO - Delineations</th>
<th>Student Knowledge, Abilities, and Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students will be expected to</td>
<td>Topic: Jointers and Planers</td>
</tr>
<tr>
<td>5.2 identify and describe the safe operation and regular maintenance of stationary planing tools</td>
<td>Jointer</td>
</tr>
<tr>
<td></td>
<td>• Identify and describe the parts of a stationary jointer.</td>
</tr>
<tr>
<td></td>
<td>• Describe the function and use of a jointer.</td>
</tr>
<tr>
<td></td>
<td>• Describe the cutting action of a jointer.</td>
</tr>
<tr>
<td></td>
<td>• Demonstrate jointing a face.</td>
</tr>
<tr>
<td></td>
<td>• Demonstrate jointing an edge.</td>
</tr>
<tr>
<td></td>
<td>• Describe special cuts (e.g., rabbet, chamfer, angle).</td>
</tr>
<tr>
<td></td>
<td>• Practise basic maintenance (e.g., replacing blades and setting tables).</td>
</tr>
<tr>
<td></td>
<td>• Ensure guards are working properly.</td>
</tr>
<tr>
<td>Planer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Identify and describe the parts of a stationary planer.</td>
</tr>
<tr>
<td></td>
<td>• Describe the function and use of a planer.</td>
</tr>
<tr>
<td></td>
<td>• Describe the cutting action of a planer.</td>
</tr>
<tr>
<td></td>
<td>• Demonstrate planing a board.</td>
</tr>
<tr>
<td></td>
<td>• Practise basic maintenance (e.g., replacing blades and checking tables).</td>
</tr>
<tr>
<td></td>
<td>• Ensure guards are working properly.</td>
</tr>
<tr>
<td></td>
<td>• Demonstrate and practise safe operation of jointers and planers:</td>
</tr>
<tr>
<td></td>
<td>- Maintain a clear working area around equipment.</td>
</tr>
<tr>
<td></td>
<td>- Do not talk to operator.</td>
</tr>
<tr>
<td></td>
<td>- Follow safety rules.</td>
</tr>
<tr>
<td></td>
<td>- Wear appropriate PPE.</td>
</tr>
<tr>
<td></td>
<td>• Develop proficiency in the proper use of the above power tools.</td>
</tr>
<tr>
<td></td>
<td>• Complete projects designed to build skills in the use of these power tools.</td>
</tr>
<tr>
<td></td>
<td>• Demonstrate the proper cleaning and maintenance of jointers and planers.</td>
</tr>
</tbody>
</table>
Stationary Power Tools (~2 hours Classroom Component)

SCO 5. Students will be able to identify and describe the safe operation and maintenance of stationary power tools and demonstrate tool proficiency through selected shop projects.

**Teacher Lessons / Demonstrations**

*Topic: Jointers and Planers*
- Demonstrate the proper use of PPE.
- Demonstrate use of push sticks and blocks.
- Present a safety lesson and demonstration on the operation of each of the following machines:
  - jointer
    - planing a face
    - planing an edge
  - planer
    - planing to thickness
- Conduct a demonstration lesson on proper maintenance procedures for the jointer and thickness planer.

**Student Activities / Assessments**
- Demonstrate the safe operation and maintenance of the jointer and thickness planer.
- Square a piece of rough stock.
- Plane to a specified thickness.
- Label the parts of the following stationary power tools and describe their functions:
  - jointer
  - thickness planer
- Demonstrate the proper use of the above tools in building projects.

*Literacy*
- Read and interpret machine safety sheets and manuals.

**Enrichment / Research Activities**
- Investigate the purchase of a jointer or planer.
- Change and set the blades on a jointer or planer.

**Resources**

*Texts/Teacher Resources*
Alberta Module 020103c
*Stationary Power Tools*
pp. 1-42

*SAS Resources*

*Visuals/Handouts/Tests*
- Machine Safety Sheets
- ILM Self-Test
  *Stationary Power Tools*, pp. 38-40

*Internet*
- Manufacturers’ sites
Stationary Power Tools (≈2 hours Classroom Component)

SCO 5. Students will be able to identify and describe the safe operation and maintenance of stationary power tools and demonstrate tool proficiency through selected shop projects.

**SCO - Delineations**

Students will be expected to

5.3 identify and describe the safe operation and regular maintenance of stationary drilling, grinding, and sanding tools

**Student Knowledge, Abilities, and Competencies**

*Topic: Drills, Grinders, and Sanders*

- Identify and describe the parts of a stationary drill press, a grinder, and a sander.
- Describe the actions and application of the following tools:
  - drill press (boring holes, changing bits, drum sanding)
  - sander: disc and belt sanders
  - grinder: tool rest grinding wheels, guards
- Explain why one never grinds aluminum, brass, or copper.
- Practise basic sander maintenance (e.g., cleaning/changing belts and discs, setting tables, checking tracking of belt).
- Demonstrate and practise the safe operation of a stationary sander, grinder, and drill press.
  - Maintain a clear working area around equipment.
  - Do not talk to operator.
  - Follow safety rules.
  - Wear appropriate PPE.
- Develop proficiency in the proper use of the above power tools.
- Complete projects designed to build skills in the use of these power tools.
- Demonstrate the proper cleaning and maintenance of a drill press, grinder, and sander.
**Stationary Power Tools (~2 hours Classroom Component)**

**SCO 5.** Students will be able to identify and describe the safe operation and maintenance of stationary power tools and demonstrate tool proficiency through selected shop projects.

---

**Teacher Lessons / Demonstrations**

*Topic: Drills, Grinders, and Sanders*

- Prepare a demonstration on the proper operation and safety precautions to be taken with each of the following machines: drill press
  - boring holes
  - changing bits, changing speeds
  - setting tables and stops
  - drum sanding
  - identifying belts and discs
  - installing belts and discs
  - cleaning belts and discs
- sander
- grinder
  - locating the tool rest
  - sharpening procedures
  - changing a grinding wheel
  - truing a wheel
- Prepare a demonstration lesson on proper maintenance procedures for each of the following machines:
  - drill press
  - sander
  - grinder

**Student Activities / Assessments**

- Demonstrate the safe operation (including use of PPE) and maintenance of the tools listed above.
- Perform the operations listed above.
- Label the parts of the following stationary power tools and describe their functions:
  - drill press
  - sanders
  - grinders
- Demonstrate the proper use of the above tools in building projects.

**Literacy**

- Read and interpret machine safety sheets and manuals.

**Enrichment / Research Activities**

- Investigate the purchase of a drill press, grinder, or sander.
- Set up and produce mortise joints on the drill press.
- Change the grinder wheel.
- Change the sander disc or belt (under supervision).

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**Resources**

**Texts/Teacher Resources**

Alberta Module 020103c
*Stationary Power Tools*
pp. 1-42

Manufacturers’ manuals

**SAS Resources**

**Visuals/Handouts/Tests**

- Machine Safety Sheets
- ILM Self-Test
  *Stationary Power Tools*, pp. 38-40

**Internet**

- Investigate Manufacturers sites
Drafting Basics
(~4 hours Classroom Component)

Introduction
Drawing is one of the most effective methods of communication, and drawings are an integral part of the everyday work of a carpenter. An apprentice must be familiar with the instruments used and the procedures followed for creating effective and meaningful drawings.

Specific Curriculum Outcome

6. Students will be able to identify and demonstrate the use of basic drawing instruments.

SCO - Delineations
Students will be expected to
6.1 describe the function of basic drawing equipment
6.2 use drafting equipment to complete geometric exercises
6.3 describe the applications of geometry in trade situations
6.4 practise producing shapes, angles, and drawing to scale with the basic drafting instruments

Assessment Strategy
Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources
Alberta Module 020107a, Drafting Basics - Part A
Alberta Module 020107b, Drafting Basics - Part B
Drafting Basics (~4 hours Classroom Component)

SCO 6. Students will be expected to identify and demonstrate the use of basic drawing instruments.

SCO - Delineations

Students will be expected to

6.1 describe the function of basic drawing equipment

Student Knowledge, Abilities, and Competencies

Topic: Drafting Tools

- List various sizes of paper and describe their intended use.
- Identify the following drawing instruments and describe their intended use:
  - pencils (various grades)
  - t-square
  - set squares: 30-60°, 45°
  - scale rules
  - protractor
  - compass/dividers
  - templates
  - drafting board

Topic: Sheet Layout

- Demonstrate how to properly mount a sheet of paper in preparation for drawing.
- Demonstrate sheet layout with border and title block.
- Demonstrate the proper method for drawing horizontal, vertical, and angular lines.

Topic: Measuring and Scale

- Read and interpret a metric scale rule.
- Read and interpret an imperial scale rule.
- Compare and contrast a metric and imperial scale.

Topic: Geometric Construction

- Demonstrate the proper use of set squares to determine standard angles.
- Perform the following basic geometric procedures:
  - Bisect an angle at 90°.
  - Draw a line at 90° to a baseline.
  - Bisect an angle.
  - Draw the following angles: 60°, 30°, 45°, 22.5°, 15°.
  - Find the centre of a circle or arc.
  - Draw a hexagon within a circle.
  - Draw an octagon within a square.
  - Draw parallel lines.
  - Divide lengths into equal spaces.
  - Divide a line into equal spaces.
  - Find the centre of a line or space.
Drafting Basics (~4 hours Classroom Component)

SCO 6. Students will be able to identify and demonstrate the use of basic drawing instruments.

Teacher Lessons / Demonstrations

**Topic: Drafting Tools**
- Identify basic drawing tools.
- Demonstrate how to properly use the drawing equipment.

**Topic: Sheet Layout**
- Demonstrate the proper method of setting up a sheet.
- Demonstrate a sheet layout, including borderlines and title block.

**Topic: Measuring and Scale**
- Create overheads/slides to help explain how to read a ruler.
- Create overheads/slides to help explain how to read a scale.
- Demonstrate measuring with both metric and imperial scales.

**Topic: Geometric Construction**
- Demonstrate the proper use of set squares.
- Demonstrate the proper use of the compass.
- Demonstrate basic geometric constructions.

Student Activities / Assessments

- Identify all drawing equipment on a component ID table.
- Complete a worksheet on reading metric and imperial rulers.
- Complete a worksheet on reading scales.
- Complete selected activities as described in the ILM.
- Demonstrate sheet set-up and layout.
- Demonstrate basic geometric constructions.

Enrichment / Research Activities

**CBL**
- Participate in a field trip to a drafting, design, engineering, or survey firm.

Resources

**Texts/Teacher Resources**
Alberta Module 020107a
*Drafting Basics - Part A*
pp. 1-49
Drafting Basics (~4 hours Classroom Component)

SCO 6. Students will be able to identify and demonstrate the use of basic drawing instruments.

<table>
<thead>
<tr>
<th>SCO - Delineations</th>
<th>Student Knowledge, Abilities, and Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>6.3</strong> describe the applications of geometry in trade situations</td>
<td><strong>Topic: Geometry for Carpenters</strong></td>
</tr>
<tr>
<td><em>Students will be expected to</em></td>
<td>• Demonstrate how to properly square a frame using a measuring tape.</td>
</tr>
<tr>
<td></td>
<td>• Demonstrate how to use a framing square to determine common angles (e.g., 90°, 45°, 30°, 60°).</td>
</tr>
<tr>
<td></td>
<td>• Demonstrate the proper method of marking a 90° angle using the Pythagorean theorem (3-4-5 triangle).</td>
</tr>
<tr>
<td></td>
<td>• Demonstrate how to use two tape measures to bisect a line at 90°.</td>
</tr>
<tr>
<td></td>
<td>• Demonstrate how to lay out a mitre for an unusual angle.</td>
</tr>
<tr>
<td></td>
<td>• Demonstrate how to check the following tools for accuracy:</td>
</tr>
<tr>
<td></td>
<td>- framing square</td>
</tr>
<tr>
<td></td>
<td>- levels</td>
</tr>
<tr>
<td><strong>6.4</strong> practise producing shapes and angles, and drawing to scale with basic drafting instruments</td>
<td><strong>Topic: Drawing Practice</strong></td>
</tr>
<tr>
<td></td>
<td>• Draw lines to scale.</td>
</tr>
<tr>
<td></td>
<td>• Draw an octagon centred on the page.</td>
</tr>
<tr>
<td></td>
<td>• Draw a solid wooden door.</td>
</tr>
</tbody>
</table>
Drafting Basics (~4 hours Classroom Component)

SCO 6. Students will be able to identify and demonstrate the use of basic drawing instruments.

Teacher Lessons / Demonstrations

*Topic: Geometry for Carpenters*
- Demonstrate checking for square by using a tape measure.
- Demonstrate checking for square by using calculations.
- Demonstrate marking 45°, 30°, and 60° angles using a framing square.
- Demonstrate the 3-4-5 triangle method to obtain a 90° angle.
- Demonstrate using two tape measures to bisect a line at 90°.
- Demonstrate how to lay out a mitre for unusual angles.
- Demonstrate how to check levels and squares for accuracy.

*Topic: Drawing Practice*
- Demonstrate the importance of measuring and drawing with accuracy.
- Demonstrate the use of construction lines.
- Demonstrate the construction of an octagon.
- Demonstrate the construction of a hexagon.

Student Activities / Assessments

- Complete selected activities to support the above geometric constructions.
- Complete a “tricks of the trade” worksheet to support the use of these geometric constructions on the work site.
- Demonstrate accuracy in measuring and drawing lines.
- Demonstrate the construction of an octagon.
- Demonstrate the drawing of the wood door in the ILM.
- Demonstrate drawing cleanliness.

Enrichment / Research Activities

- Provide additional drafting exercises for advanced students.

Resources

*Texts/Teacher Resources*
Alberta Module 020107b
*Drafting Basics - Part B*
pp. 1-17
Basic Math Concepts
(~4 hours Classroom Component)

Introduction

Carpenters are constantly using basic math skills to measure lengths, estimate materials, and calculate quantities. Measuring and layout skills are arguably the most important skills that a professional carpenter can possess. Developing the apprentices basic math and geometry skills will prove to be invaluable on the work site. Practice in the use of fractions and decimals are very important in the ability to work in both the imperial and metric systems.

Specific Curriculum Outcome

7. Students will be able to use a calculator and apply basic math concepts to solve trade-related math problems in both metric and imperial systems of measurement.

SCO - Delineations

Students will be expected to

7.1 describe basic math concepts and operations
7.2 describe the basic calculator functions and operations
7.3 describe the metric measurement system (SI)
7.4 describe the imperial measurement system
7.5 describe calculations involving fractions
7.6 convert measurements between metric and imperial systems
7.7 working with equations
7.8 describe calculations using the Pythagorean theorem

Assessment Strategies

Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources

Alberta Module 020108a, Basic Math Concepts - Part A
Alberta Module 020108b, Basic Math Concepts - Part B
Basic Math Concepts (~4 hours Classroom Component)
SCO 7. Students will be able to use a calculator and apply basic math concepts to solve trade-related math problems using both metric and imperial systems of measurement.

### SCO - Delineations

**Students will be expected to**

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1</td>
<td>describe basic math concepts and operations</td>
</tr>
<tr>
<td>7.2</td>
<td>describe the basic calculator functions and operations</td>
</tr>
<tr>
<td>7.3</td>
<td>describe the metric measurement system (SI)</td>
</tr>
<tr>
<td>7.4</td>
<td>describe the imperial measurement system</td>
</tr>
</tbody>
</table>

### Student Knowledge, Abilities, and Competencies

**Topic: Number Sense**
- Read and interpret large numbers.
- Demonstrate an understanding of the concept of whole numbers.
- Demonstrate an ability to read decimal numbers (as separate numbers).
- Round numbers.
- Demonstrate the proper order of operations in completing mathematical operations (BEDMAS).

**Topic: Calculator Use**
- Demonstrate the operation of a calculator, and the proper order of operations:
  - addition and subtraction
  - multiplication and division
  - squaring and cubing a number
  - square root
  - memory function

**Topic: Metric System**
- Demonstrate effective use of the metric system (SI).
- Explain that the basic unit of linear measurement is the metre (m).
- Demonstrate the ability to measure to the nearest millimetre.
- Demonstrate the ability to covert within the metric system (metres, millimetres, centimetres, kilometres).
- Demonstrate the ability to complete calculations relating to area and volume.

**Topic: Imperial System**
- Demonstrate the effective use of the imperial system.
- Demonstrate the ability to convert within the imperial system (inches, feet, yards, fractions).
- Demonstrate the ability to measure to the nearest 1/16th of an inch.
- Demonstrate the ability to complete calculations relating to area and volume.
Basic Math Concepts (~4 hours Classroom Component)

SCO 7. Students will be able to use a calculator and apply basic math concepts to solve trade-related math problems using both metric and imperial systems of measurement.

### Teacher Lessons / Demonstrations

**Topic: Number Sense**
- Introduce the number value chart (figure 1 in ILM).
- Describe whole numbers and arrange them in groups of three, with commas or spaces between the groups.
- Describe decimals and the places to the right of the decimal point.
- Read decimals as separate numbers.
- Demonstrate the rounding of numbers.
- List and review the rules for rounding numbers.
- Integrate the rounding of numbers to estimate building materials (e.g., plywood, concrete, shingles).
- Demonstrate the order of operations (BEDMAS).

**Topic: Calculator Use**
- Demonstrate calculator use and common functions.
  - addition, subtraction
  - multiplication, division
  - exponents (square and cubed), square root, memory function

**Topic: Metric System**
- Introduce the history of the SI (System International) system of measurement (base of 10, using decimals).
- Link linear measurements to area, volume, and mass measurements (using water as the base unit—1 cc H₂O = 1 gram = 1 mL).
- Explain linear measures: metre (m); kilometre (km); centimetre (cm).
- Explain volume measures: litre (L); millilitre (mL); cubic metre (m³).
- Explain mass (weight): gram (g); kilogram (kg); tonne (t).

**Topic: Imperial System**
- Ensure that students have a basic understanding of the history of the imperial system. They should also know how we are still influenced by the use of the imperial system in the United States.
- Explain linear measures: foot (ft.); inch (in.); yard (yd.); mile (mi.).
- Convert between units of measurement. (in - ft - yd - mi).
- Introduce measures of area, volume, and mass.
- Emphasize the importance of understanding fractions.

### Numeracy
- Stress the importance of using proper units in all calculations.
- Develop a pre-test strategy which could be used in a KWL.

**Student Activities / Assessments**
- Complete examples and exercises in the ILM.
- Complete a number value chart (figure 1 in ILM).
- Practise rounding numbers and relate this to estimating materials.
- Practise the order of operations (BEDMAS).
- Demonstrate the use of a calculator to complete basic operations and use the common functions.
- Practise measuring, demonstrating accuracy to 1/16 in. and 1 mm.
- Complete various activity sheets to support basic math concepts (identify math concepts throughout all of the ILMs).

### Resources

**Texts/Teacher Resources**
Alberta Module 020108a  
Basic Math Concepts - Part A  
pp. 1-36

**SAS Resources**

**Visuals/Handouts/Tests**
- Activity sheets
- Material estimate sheets
- ILM Self-Test  
  Basic Math Concepts - Part A,  
  pp. 38-40

**Math in CTE**
Review and integrate the 7-Step Pedagogical Model for teaching embedded math concepts in technical education.

See Appendix
Basic Math Concepts (~4 hours Classroom Component)

SCO 7. Students will be able to use a calculator and apply basic math concepts to solve trade-related math problems using both metric and imperial systems of measurement.

<table>
<thead>
<tr>
<th>SCO - Delineations</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Students will be expected to</strong></td>
<td><strong>Topic: Working with Fractions</strong></td>
</tr>
<tr>
<td>7.5 describe calculations involving fractions</td>
<td>- Explain the concept of fractions.</td>
</tr>
<tr>
<td>7.6 convert measurements between metric and imperial systems</td>
<td>- Explain why a good knowledge of fractions is important to carpenters.</td>
</tr>
<tr>
<td></td>
<td>- Define the basic fraction terminology:</td>
</tr>
<tr>
<td></td>
<td>- numerator</td>
</tr>
<tr>
<td></td>
<td>- denominator</td>
</tr>
<tr>
<td></td>
<td>- common denominator</td>
</tr>
<tr>
<td></td>
<td>- Find common denominators in calculations.</td>
</tr>
<tr>
<td></td>
<td>- Define the term &quot;mixed number&quot; (give examples).</td>
</tr>
<tr>
<td></td>
<td>- Define the term &quot;improper fraction&quot;, and give examples. (Improper fractions may be used to describe board thickness, such as 5/4&quot;, 8/4&quot;).</td>
</tr>
<tr>
<td></td>
<td>- Demonstrate the addition of fractions.</td>
</tr>
<tr>
<td></td>
<td>- Add mixed numbers.</td>
</tr>
<tr>
<td></td>
<td>- Subtract fractions.</td>
</tr>
<tr>
<td></td>
<td>- Multiply fractions.</td>
</tr>
<tr>
<td></td>
<td>- Divide fractions.</td>
</tr>
<tr>
<td></td>
<td>- Convert between fractions and decimals.</td>
</tr>
<tr>
<td></td>
<td>- Convert feet and inches to decimals.</td>
</tr>
<tr>
<td></td>
<td>- Convert decimals to feet and inches.</td>
</tr>
<tr>
<td></td>
<td>- Demonstrate rounding answers to an accuracy of 1/16th&quot;.</td>
</tr>
</tbody>
</table>

**Topic: Converting Between Metric and Imperial Systems**

- Convert linear measurements between metric and imperial (table 2).
- Convert area measurements between metric and imperial (table 3).
- Convert volume measurements between metric and imperial (table 4).
- Convert mass measurements between metric and imperial (table 5).
- Demonstrate the use of “soft conversions” in simple calculations and in the use of building code tables.
Basic Math Concepts (~4 hours Classroom Component)
SCO 7. Students will be able to use a calculator and apply basic math concepts to solve trade-related math problems using both metric and imperial systems of measurement.

Teacher Lessons / Demonstrations

Topic: Working with Fractions
- Explain the concept of fractions.
- Explain why a good understanding of fractions is important to carpenters.
- Develop a pre-test on fractions and decimals to determine the students’ prior knowledge.
- Review measurement in the imperial system to establish the trade related context for understanding fractions.
- Describe fractions, using the proper terminology.
- Demonstrate the four basic mathematical operations with fractions: addition, subtraction, multiplication, and division.
- Present examples of fractions being used in the trade.
- Demonstrate the relationship between fractions and decimals.
- Demonstrate conversion between fractions and decimals.
- Demonstrate conversion from decimals to feet and inches with fractions (develop accuracy to 1/16th”).

Topic: Converting Between Metric and Imperial Systems
- Convert linear measurements (table 2).
- Convert area, volume, and mass measurements.
- Introduce the soft conversions used in building codes.

Student Activities / Assessments
- Complete a pre-test to demonstrate prior knowledge.
- Identify the anatomy of a fraction, using proper terminology.
- Demonstrate the four basic mathematical operations with fractions.
- Demonstrate conversion between decimals and fractions (round to 1/16th”).
- Demonstrate conversion between fractions and decimals (round to three decimal places).
- Demonstrate various metric (SI) to imperial conversions.

Enrichment / Research Activities
- Develop a conversion table between fractions and decimals (completing the conversions in 1/16” increments).
  E.g.
  \[
  \begin{align*}
  1/16” &= 0.063” \\
  1/8” &= 0.125”
  \end{align*}
  \]
- Measure lumber samples to determine the metric sizes.
Basic Math Concepts (~4 hours Classroom Component)

SCO 7. Students will be able to use a calculator and apply basic math concepts to solve trade-related math problems using both metric and imperial systems of measurement.

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<tbody>
<tr>
<td><strong>Students will be expected to</strong></td>
<td><strong>Topic: Working with Equations</strong></td>
</tr>
<tr>
<td><strong>7.7</strong> working with equations</td>
<td>• Demonstrate an understanding that an equation must balance or be equal on both sides.</td>
</tr>
<tr>
<td></td>
<td>• Demonstrate an understanding that equations may be manipulated.</td>
</tr>
<tr>
<td></td>
<td>• Solve equations involving addition, subtraction, multiplication, and division.</td>
</tr>
<tr>
<td></td>
<td><strong>Topic: Pythagorean Theorem</strong></td>
</tr>
<tr>
<td></td>
<td>• Identify and describe a right triangle.</td>
</tr>
<tr>
<td></td>
<td>• Demonstrate the ability to square numbers and find the square root of numbers.</td>
</tr>
<tr>
<td></td>
<td>• State the Pythagorean theorem ( c^2 = a^2 + b^2 ).</td>
</tr>
<tr>
<td></td>
<td>• Identify the parts of a right triangle:</td>
</tr>
</tbody>
</table>
| | \( a = \text{height} \)
| | \( b = \text{base} \)
| | \( c = \text{hypotenuse} \)
| | \( 90^\circ \text{ angle} \)
| | • Solve problems using the Pythagorean theorem. |
| | • Demonstrate the 3-4-5 rule (6-8-10 works also). |
| | • Demonstrate the 3-4-5 rule to lay out and square framing members. |
| **7.8** describe calculations using the Pythagorean theorem | |
Basic Math Concepts (~4 hours Classroom Component)

SCO 7. Students will be able to use a calculator and apply basic math concepts to solve trade-related math problems using both metric and imperial systems of measurement.

Teacher Lessons / Demonstrations

**Topic: Working with Equations**
- Explain that an equation must balance, or be equal on both sides.
- Explain that equations may be manipulated (solved/transposed) by adding or subtracting the same value on each side.
- Explain that equations may be manipulated (solved/transposed) by multiplying or dividing the same value on each side.
- Demonstrate solution of examples on the board.
- Demonstrate the concept of balancing equations by using a science balance (or teeter-totter). If you add or subtract the same amount from each side, it will stay balanced.
- Develop trade-based examples and share on SAS.

**Topic: Pythagorean Theorem**
- Introduce the Pythagorean theorem as a simple formula for use in solving right angle triangles.
- Explain the importance of solving right triangles.
- Explain that the triangle is the most important geometric shape used in construction.
- Demonstrate where you find triangles in construction (e.g., roofs, trusses, ramps, bracing, diagonals for squaring).
- Demonstrate how to solve right triangle problems.
- Demonstrate how to manipulate the formula to solve (transpose) right triangle problems.
- Demonstrate solutions of examples on the board.
- Develop trade-based examples and share on SAS.

Student Activities / Assessments

- Demonstrate the ability to work with and balance equations.
- Demonstrate the ability to use the Pythagorean theorem to solve triangles.
- Demonstrate an understanding of the use of these mathematical skills in a trades context.
- Complete exercises in the ILM.
- Complete worksheets.
- Solve trade-based problems and estimates.

Enrichment / Research Activities

- Concrete weighs 150# per cubic foot. Create an equation to find the weight of concrete in a truck carrying 9 cubic yards of concrete.
- Find the length of one side of a gable roof if the house is 24’ wide with a 18” overhang. The roof slope is 5/12.

Resources

**Texts**
Alberta Module 020108b
Basic Math Concepts - Part B
pp. 1-34

**SAS Resources**

- Activity sheets
- Material estimate sheets
- ILM Self-Test
  Basic Math Concepts - Part B

**Math in CTE**
Review and integrate the 7-Step Pedagogical Model for teaching embedded math concepts in technical education.

See Appendix