INSTRUCTOR NOTES
Door Order Sheet
Skill Builders: Entry Forms, Technical Drawings

During the activity pre/apprentices will:

- Interpret and produce technical drawings
- Locate information in complex forms

Skill Focus

- **Key Skill:** Numeracy (measurement & calculation)
- **Supporting Skill(s):** Document Use

Handouts

- Questions and Document Set (2 pages)

Talking Points

- Paperwork – either paper or digital – is part of most tradesperson's work.
- Contractors, estimators, builders and tradespersons all rely on technical drawings for the information they need to construct and/or manufacture a product.
- Basic math errors can result in costly materials and lost-time time mistakes.
- Need more help? Use the Skill Builders identified in the Handout.

Distribute the Handout.

ANSWER KEY: Door Order Sheet
Skill Builders: Entry Forms, Technical Drawings

1. What 2 purposes is the form used for? **Recording a quote or completing an order.**
2. What measurement system does the form use? **Imperial (inches).**
3. How many gauges of metal door are always available? What are they? **18 gauge and 16 gauge are always available. (14 gauge may not be available.)**
4. What do the abbreviations PO and QUAN mean**? PO = purchase order, QUAN = quantity.**
5. In addition to hinges, latch, edge seam and prime, what 3 features of door construction must be selected to complete an order? **Metal gauge, metal material and core.**
6. Measure all of the doorways in the room you are in. Enter that information in the form in the columns: quan, net width, net length and thickness. **Figures will vary.**
7. Draw and label a door using the dimensions from one of the doors you just measured. Include height, width, and depth measurements. Show hinge locations, door knob and any windows in the door. Use the graph paper provided and the scale 1 square = 3 inches. **Drawings will vary.**

HANDOUT: Door Order Sheet (2 pages)
Skill Builders: Entry Forms, Technical Drawings

IN THE WORKPLACE: Contractors, estimators, builders and tradespersons must be able to accurately interpret a wide range of documents including technical drawings and order forms.

Use the **Door Order Sheet** on the next page to locate the answers to the following questions.

1. What 2 purposes is the form used for?

   ___

2. What measurement system does the form use?

   ___

3. How many gauges of metal door are always available? What are they?

   ___

4. What do the abbreviations PO and QUAN stand for?

   ___

5. In addition to hinges, latch, edge seam and prime, what 3 features of door construction must be selected to complete an order?

   ___

6. Measure all the doorways in the room you are in. Enter that information in the form in the columns: quan, net width, net length and thickness.

   ___

7. Draw and label a door using the dimensions from one of the doors you just measured. Include height, width, and depth measurements. Show hinge locations, door knob, and any windows in the door. Use the graph paper provided and the scale 1 square = 3 inches.

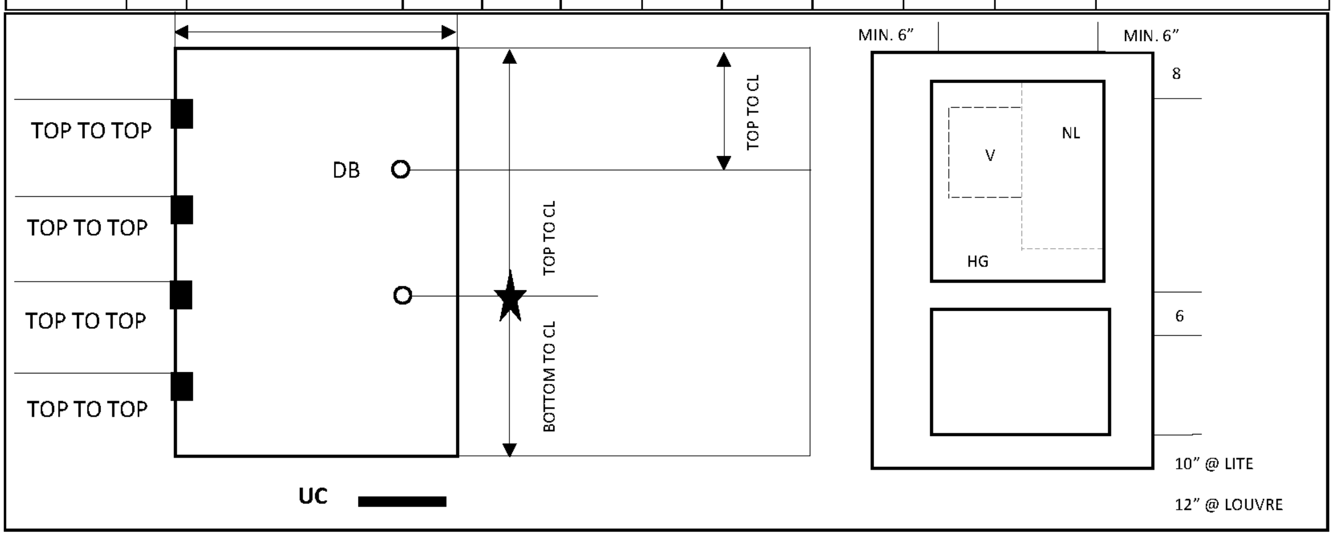
BV METAL FRAMES PHONE # (403) 455 – 9161 FAX # (403) 455-9152	DOOR SHEET	☐ QUOTE ☐ ORDER PAGE ______ OF ________
CUSTOMER:	SHIPPING: ☐ STANDARD ☐ QUICK SHIP ☐ OTHER	
ORDERED BY:	SHIP DATE NEEDED:	
DATE ORDERED:	SHIPPING ADDRESS:	
PO #		
QUOTE #		
CUSTOMER PHONE #		
ALL DIMENSIONS ARE IN INCHES AND ARE EXACT	CONTACT & PHONE #	
NOTE: STANDARD IS 18 GA A-40		

METAL:	GAUGE: ☐ 18 ☐ 16 ☐ 14 (CALL FOR AVAILABILITY)	MATERIAL: ☐ A-40 ☐ A-60 ☐ G-90

CORE:	☐ HC ☐ POLY ☐ SS ☐ SSTF ☐ T-650 ☐ LEAD LINED	PRIME	YES	NO
HINGES:	☐ 4 ½" ☐ 4 ½ " HW ☐ 5" ☐ 5" HW ☐ OTHER	BACKSET:		
LATCH:	☐ 161 ☐ 161 W/TB ☐ 86 EDGE ☐ ML ☐ BLANK ☐ DB ☐ FB ☐ REINF SVR ☐ CON VR ☐ ASA ☐ OTHER	BACKSET:		
EDGE SEAM:	☐ VISABLE SEAM ☐ SEAMLESS ☐ TOP CAP ☐ BOTTOM CAP			

MISC NOTES:	ALL TEMPLATES MUST BE INCLUDED TEMPLATES:

QUAN	UC	TAG	NET WIDTH		NET LENGTH		THICK	HAND	LABEL	CLOSER REINF	OTHER
			FT	INCH	FT	INCH					



Ref: Bow Valley College. (2020). Metal door frame order sheet. [Form]. Calgary, Canada: Author.

INSTRUCTOR NOTES
Heating Systems
Skill Builders: Key Words & Phrases, Charts & Graphs, Tables & Lists

During the activity pre/apprentices will:

- Compare key features of different systems
- Display information in charts and tables
- Locate information in complex forms

Skill Focus

- **Key Skill:** Numeracy (measurement & calculation)
- **Supporting Skill(s):** Document Use

Handouts

- Questions and Document Set (3 pages)

Talking Points

- Contractors and journeypersons are often required to provide advice on the benefits of multiple systems so that their clients can make informed choices.
- Numerical calculations, related to costs, may be a significant factor in making decisions and small errors can lead to financial losses.
- Using charts and tables in place of text is an efficient way to show detailed information at a glance.
- Need more help? Use the Skill Builders identified in the Handout.

  Distribute the Handout.

ANSWER KEY: Heating Systems
Skill Builders: Key Words & Phrases, Charts & Graphs, Tables & Lists

1. What is the main focus of the article? **The cost of different heating systems**

2. What systems are being compared? **Gas furnaces, heat pumps, wood stoves and solar panels**

3. What specific features are being compared? **The costs of installation and annual operating, and any available rebates**

4. Calculate for each system the total cost after each of the following.
   Calculation = install- rebate + [annual operating cost x # years]

   a.

	1 year
Heat Pump	**$6, 100**
Gas Furnace	**$6, 000**
Wood Stove	**$4,800**
Solar Panels	**$10,200**

   b.

	10 years
Heat Pump	**$9, 700**
Gas Furnace	**$22, 200**
Wood Stove	**$16,500**
Solar Panels	**$12,000**

   c.

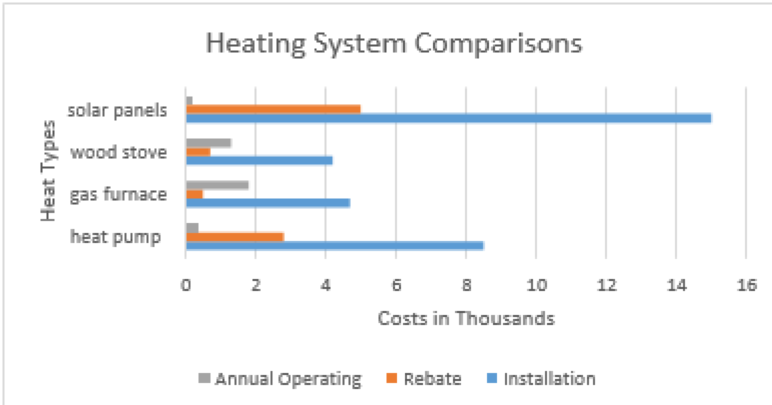
	20 years
Heat Pump	**$13, 700**
Gas Furnace	**$40, 200**
Wood Stove	**$29,500**
Solar Panels	**$14,000**

5. Organize the information in the article as a table. **Layout may vary.**

	Installation	Rebate	Annual Operating
Heat Pump	$8,500	$2,800	$400
Gas Furnace	$4,700	$500	$1,800
Wood Stove	$4,200	$700	$1,300
Solar Panels	$15,00	$5,000	$200

Bow Valley College

6. Organize the information in the article as a bar chart. **Layout may vary.**



7. Which layout do you think is easiest to understand? Why? **Answers will vary.**

HANDOUT: Heating Systems (3 pages)

Skill Builders: Key Words & Phrases, Charts & Graphs, Tables & Lists

IN THE WORKPLACE: The actual costs of different systems, such as electrical and heating, involve not just installation but operating and replacement over time. Understanding those complex costs is critical to ensuring overall project costs are accurate.

Refer to the **Heating Systems** article to locate the answers to the following questions.

1. What is the main focus of the article?

   ____

2. What systems are being compared?

   ____

3. What specific features are being compared?

   ____

4. Calculate for each system the total cost after each of the following:

   a. 1 year

   b. 10 years

   c. 20 years

5. Organize the information in the article as a table.

6. Organize the information in the article as a bar chart.

7. Which layout do you think is easiest to understand? Why?

____

Heating Systems: What's Best?

There are many things to consider when choosing the right heating system for your home. The following provides information on some of the most popular options available today.

Natural gas furnaces are still one of the most common systems especially in older homes. New furnaces cost about $4,700 to install. There might be a small rebate of $500 on energy efficient models. Annual operating runs about $1,800 a year.

Heat pumps provide not just heat but also cooling. Annual operating is less at about $400. There are rebates of about $2,800 because the systems are expensive to install at $8,500.

Traditionalists may prefer wood stoves. Not as many are sold so the rebate is under a thousand at $700. A quality stove costs about $4,200. Operating is about $1,300 assuming you can source some wood for free.

Finally, solar panels are expensive to install at $15,000 for a small house. The rebates though is usually a third of that price. Annual operating is about $200 mostly for maintenance.

Note: all figures are estimates and for demonstration purposes only.

Ref: Bow Valley College. (2020). Heating Systems: What's Best?. Calgary, Canada: Author.

INSTRUCTOR NOTES
House Front Measurement
Skill Builders: Calculating Area, Rounding, Technical Drawings

During the activity pre/apprentices will:

- Calculate the surface area of a large structure
- Interpret technical drawings

Skill Focus

- **Key Skill:** Numeracy (measurement & calculation)
- **Supporting Skill(s):** Document Use

Handouts

- Questions and Document Set (1 page)

Talking Points

- Calculating area on the job is often more complicated than just measuring one basic shape.
- Basic calculation errors made when ordering materials can result in costly mistakes when either too much material is ordered or not enough.
- While electronics can help with most calculations, it is important to be able to recognize when an answer does not look right, as information may have been inputted incorrectly.
- Need more help? Refer to the Skill Builders identified in the Handout.
- You may also use your phone or a calculator to help with the calculations.

Distribute the Handout.

ANSWER KEY: House Front Measurement
Skill Builders: Calculating Area, Rounding, Technical Drawings

1. The area of the wooden slatted front of the house is 48.7845 m^2**.** Rounding up, the answer is **49 m^2.**

Suggested steps for calculating the answer:

A. First, work out the area of the main shape of the house – that is the rectangle and triangle that make up the shape.

   a) The main rectangle (B × C) or 7.6 × 8.8 = 66.88 m^2.
   b) The height of the triangle is (A – B) or 9.7 – 7.6 = 2.1 m.
   c) The area of the triangle is therefore [(2.1 × C) ÷ 2] or [(2.1 × 8.8 = 18.48) ÷ 2].
   18.48 ÷ 2 = 9.24 m^2.
   d) The combined full area of the front of the house is the sum of the areas of the rectangle and triangle: 66.88 + 9.24 = 76.12 m^2.

B. Next, work out the areas of the windows and doors, so they can be subtracted from the full area.

   a. The area of the door and steps is (D × E) or 4.5 × 2.3 = 10.35 m^2.
   b. The area of one rectangular window is (G × F) or 1.2 × 2.7 = 3.24 m^2.
   c. There are five rectangular windows. Multiply the area of one window by 5.
   3.24 × 5 = 16.2 m^2.
   d. The round window has a diameter of 1m its radius is therefore 0.5 m.
   e. Using πr^2 work out the area of the round window. Use 3.142 for π.
   3.142 × 0.5 × 0.5 =.0.7855 m^2.

C. Next add up the areas of the door and windows.

   (door area) 10.35 + (rectangle windows area) 16.2 + (round window area) 0.7855
   = 27.3355 m^2

D. Finally, subtract the total area for the windows and doors from the full area.

   76.12 – 27.3355 = 48.7845 m^2

E. Round the full area to the nearest whole number.

   4$\underline{8}$.**7**845 m^2 = **49 m^2**

HANDOUTS: House Front Measurement (1 page)
Skill Builders: Calculating Area, Rounding, Technical Drawings

IN THE WORKPLACE: Calculations of area are often used to determine amounts of material required to cover surface of various shapes, such as paint or siding on a house. Accurate calculations minimize waste and save time and money.

1. Use the measurements and information given below to **calculate the total area** of the wooden slatted part of the house front – excluding the door and windows. Round your answer to the nearest whole number.

A: 9.7 m	B: 7.6 m	C: 8.8 m	D: 4.5 m
E: 2.3 m	F: 2.7 m	G: 1.2 m	H: 1.0 m

- All measurements are approximate.
- Assume all rectangular windows are the same size.
- The round window measurement is the diameter of the window.
- The measurement for the door includes the steps.
- Use 3.142 for π if you do not have your phone or scientific calculator.

This is the Ruben M. Benjamin House in Bloomington Illinois, listed on The United States National Register of Historic Places (Record Number: 376599).

Ref: Adapted by skillsyouneed.com. From: A. Mcmurray (Photographer). (March 16, 2007). Ruben M. Benjamin House [Photograph]. https://commons.wikimedia.org/wiki/File:Bloomington_Il_Benjamin_House2.JPG (CC By-SA 3.

INSTRUCTOR NOTES
Invoice 1
Skill Builders: Entry Forms, Tables & Lists

During the activity pre/apprentices will:

- Review common elements of invoices
- Calculate costs and taxes

Skill Focus

- **Key Skill:** Numeracy (money math, measurement & calculation)
- **Supporting Skill(s):** Document Use

Handouts

- Questions and Document Set (2 pages)

Talking Points

- Paperwork – either paper or digital – is part of most tradesperson's work.
- Basic calculation errors made in order forms, invoices and log books can result in costly errors.
- While electronics can help with most calculations, it is important to be able to recognize when an answer does not look right as information may have been inputted incorrectly.
- Need more help? Refer to the Skill Builders identified in the Handout.
- You may also use your phone or a calculator to help with the calculations.

Distribute the Handout.

ANSWER KEY: Invoice 1
Skill Builders: Entry Forms, Tables & Lists

Questions 1 and 2. **See the entries in the invoice below.**

CROWN TOOLS & CONTRACTING

We treat you like royalty!

INVOICE

TO:

Alicia Wu
LANDER CORP.
1234 Main Street
Anytown, AB, T1T 1T1
(403) 888-8888

Salesperson	Invoice #	Payment Terms	Due Date
R. Johnson	0019-23	Due on receipt	Oct 27, 2019

Qty	Description	Unit Price	Line Total
5	Deluxe tool set (121 pieces)	79.00	395.00
1	Featherweight industrial ladder	156.00	156.00
3	Heavy duty 6080N fire extinguisher	99.99	299.97
1	Workshop wet-dry vac	139.00	139.00
3.5	Site Visit	127.00	444.50
	Taxes:		
	Labour @ 5% =	22.23	22.23
	Items and materials @ 11% =	108.90	108.90
		Subtotal	1,434.47
		Sales Tax	131.13
		Total	$1,565.60

Thank you for your business!

Crowns Tools & Contracting, Warehouse CC. 23rd Street E, Anytown, AB

3. Crown Tools & Contracting offers a 15% discount on items and materials (not labour) for returning customers. The calculation is made before taxes are added. Recalculate the invoice to apply the discount. What is the new total? **$1,400.76.**

   One way to calculate the answer:

   a. **Calculate the total of the items and materials (not labour): 989.97**
   b. **Multiply by 0.85: 841.47**
   c. **Calculate the tax on the new amount: 841.47 x .11 = 92.56**
   d. **Add the items and materials and tax costs: 841.47 + 92.56 = 934.03**
   e. **Add the labour and tax costs: 934.03 + 444.50 + 22.23 = 1,400.76**
   f. **New total: = $ 1,400.76**

HANDOUT: Invoice 1 (2 pages)
Skill Builders: Entry Forms, Tables & Lists

IN THE WORKPLACE: Accurately calculating information in complex forms such as invoices and work orders is a common task across trades. Errors in billings including hours worked and materials costs can result in significant losses to the company in time and hours worked

Use the **Crown Tools & Contracting Invoice** to complete the following tasks.

1. Enter the information below to complete the invoice for the following items and services.
   a. Deluxe tool set (121 pieces) @ $79 x 5 units
   b. Featherweight Industrial ladder @ $156
   c. Heavy duty 6080N fire extinguisher @ $99.99 x 3 units
   d. Workshop wet-dry vac @ $139
   e. Site visit: labour 3.5 hours @ $127

2. Calculate the subtotal, taxes, and final total and enter the information on the invoice. Use 5% GST for labour and 11% for items and materials.

3. Crown Tools & Contracting offers a 15% discount on items and materials (not labour) for returning customers. The calculation is made before taxes are added. Recalculate the invoice to apply the discount. What is the new total?

CROWN TOOLS & CONTRACTING

We treat you like royalty!

INVOICE

TO:

Alicia Wu
LANDER CORP.
1234 Main Street
Anytown, AB, T1T 1T1
(403) 888-8888

Salesperson	Invoice #	Payment Terms	Due Date
R. Johnson	0019-23	Due on receipt	Oct 27, 2019

Qty	Description	Unit Price	Line Total
	Taxes:		
	Labour @ 5% =		
	Items and materials @ 11% =		
		Subtotal	
		Sales Tax	
		Total	

Thank you for your business!

Crowns Tools & Contracting, Warehouse CC. 23rd Street E, Anytown, AB

INSTRUCTOR NOTES
Invoice 2
Skill Builders: Conversion, Entry Forms, Tables & Lists

During the activity pre/apprentices will:

- Review common elements of invoices
- Convert between imperial and metric systems.
- Calculate costs and taxes

Skill Focus

- **Key Skill:** Numeracy (money math, measurement & calculation)
- **Supporting Skill(s):** Document Use

Handouts

- Questions and Document Set (2 pages)

Talking Points

- Paperwork – either paper or digital – is part of most tradesperson's work.
- Basic calculation errors made in order forms, invoices and log books can result in costly errors.
- While electronics can help with most calculations, it is important to be able to recognize when an answer does not look right as information may have been inputted incorrectly.
- Need more help? Refer to the Skill Builders identified in the Handout.
- You may also use your phone or a calculator to help with the calculations.

Distribute the Handout.

ANSWER KEY: Invoice 2
Skill Builders: Conversion, Entry Forms, Tables & Lists

Questions 1 and 2. **See the entries in the invoice below.**

ABC Pro Supplies

INVOICE

Qty	Description	Unit Price	Line Total
5	Apprentice tool set (11 pieces; Klein)	314.00	1570.00
3	27.94 cm Rubber gloves	66.50	199.50
3	Heavy duty 6080N fire extinguisher	99.99	299.97
1	Pull-it 4-pack	38.95	38.95
2	2.27 kg carton of cast iron rods, 6.35 mm (0.635 cm) diameter and 609.6 mm (60.96 cm) in length	37.00	74.00
1	81.28 cm mechanical pick-up tool	39.54	39.54
		Subtotal	$2221.96
		Sales Tax	$244.42
		Total	$2466.38

3. ABC Pro Supplies offers a 7% discount on items and materials for returning customers. The calculation is made before taxes are added. Recalculate the invoice to apply the discount. What is the new total?

New subtotal: $2,221.96 x 0.93 = $2,066.42
New taxes: $2,066.42 x 0.11 =$227.31
New total: $2,066.42 + $227.31 = $2,293.73

HANDOUT: Invoice 2 (2 pages)
Skill Builders: Conversion, Entry Forms, Tables & Lists

IN THE WORKPLACE: Accurately calculating information in complex forms such as invoices and work orders is a common task across trades. Errors in billings including hours worked and materials costs can result in significant losses to the company in time and hours worked.

Use the **ABC Pro Supplies Invoice** to complete the following tasks.

1. Enter the information below to complete the invoice for the following items and services. Convert any items shown in imperial to metric measurements before entering.
   a. Apprentice tool set (11 pieces: Klein) @ $314 x 5 units
   b. 11 inch insulated rubber gloves @ $66.50 x 3 units
   c. Heavy duty 6080N fire extinguisher @ $99.99 x 3 units
   d. Pull-it 4-pack @ $38.95
   e. 5 lbs. carton of cast iron rods, ¼ in diameter and 24 in length @ $37 x 2 units
   f. 32 inch mechanical pick-up tool @ $39.54

2. Calculate the subtotal, taxes (at 11%) and final total and enter the information on the invoice.

3. ABC Pro Supplies offers a 7% discount on items and materials for returning customers. The calculation is made before taxes are added. Recalculate the invoice to apply the discount. What is the new total?

____

ABC Pro Supplies

INVOICE

Qty	Description	Unit Price	Line Total
		Subtotal	
		Sales Tax	
		Total	

Ref: Bow Valley College. (2020). ABC Pro Supplies Invoice Sheet. [Form]. Calgary, Canada: Author.

INSTRUCTOR NOTES
Map Reading: Estimation
Skill Builders: Key Words & Phrases, Rounding, Technical Drawings

During the activity pre/apprentices will:

- Compare estimated and calculated distances.

Skill Focus

- **Key Skill:** Numeracy (estimation & calculation)
- **Supporting Skill(s):** Document Use

Handouts

- Questions and Document Set (3 pages)

Talking Points

- Whether travelling between job sites, making deliveries, or driving long haul, the ability to accurately read maps is part of almost every trade.
- GPS systems while generally accurate, have some limitations. They can malfunction, may not show the most up to date routes, and do not provide details of private land or land that is under development and does not yet show on a map.
- Need help? Use the Skill Builders identified in the Handout.

Distribute the Handout.

ANSWER KEY: Map Reading: Estimation
Skill Builders: Key Words & Phrases, Rounding, Technical Drawings

1. Based on information provided in the map legend, what is the main difference between Lake Michigan and the other Great Lakes?
   All of Lake Michigan is in the United States. The international border runs through all the other lakes.

2. What geographical feature defines the southern part of the Ontario – Quebec border?
   The Ottawa River.

3. If the scale on the map is is 4 cm long, how many centimetres represent 200 km?
   200 km = 2 cm.

4. Using the scale as a reference, complete the following table. Estimate the distances and assume driver drives an average of 80 km an hour. Round your answers up to the nearest 30 minutes.
   Estimates may vary, but should be close to those shown below. Note: time answers should be rounded up to the hour or half hour.

Travel From	To	Km	Time
Ottawa	North Bay	**360 km**	**4.5 hours**
Toronto	Ottawa	**450 km**	**6 hours**
Sault Ste Marie	Pembroke	**650 km**	**8.5 hours**

5. There are 2 possible routes from North Bay to Thunder Bay: one goes north; the other south. Estimate the distance of, and the time it would take to travel, each route, driving an average of 80 km an hour. **Estimates may vary.**
   Northern route: 1,110 km at 80 km/h: 13 hours, 53 mins.
   Southern route: 1,140 km at 80 km/h: 14 hours, 15 mins.

6. You are driving from Toronto to Kenora.

   a) Estimate, using the scale, what you think the total distance is.
   Approximately 1900 km. Estimate should follow available driving route options and should not be estimated as a straight-line route from point to point.

   b) You want to drive approximately the same number of hours each day and will drive an average of 100 km an hour. Complete the following table to show where you would stop each night. **Answers are approximations.**

Days	Travel From	To	Km	Time
1	Toronto	**Elliot Lake**	**633**	**6:20**
2	**Elliot Lake**	**Marathon**	**633**	**6:20**
3	**Marathon**	Kenora	**633**	**6:20**

HANDOUT: Map Reading: Estimation (3 pages)
Skill Builders: Key Words & Phrases, Rounding, Technical Drawings

IN THE WORKPLACE: Map reading is a key skill whether getting to and from a job or doing the work required by the job. Maps usually have a scale (in km and/or miles), a grid, and a key or legend containing symbols.

Refer to the **Map of Ontario** to complete the tasks below. Write the answers in the space provided or highlight them on the map.

1. Based on information provided in the map legend, what is the main difference between Lake Michigan and the other Great Lakes?

   ____

2. What geographical feature defines the southern part of the Ontario – Quebec border?

   ____

3. If the scale on the map is 4 cm long, how many centimeters represent 200 km?

   ____

4. Using the scale as a reference, complete the following table. Estimate the distances and assume driver drives an average of 80 km an hour. Round your answers up to the nearest 30 minutes.

Travel From	To	Km	Time
Ottawa	North Bay		
Toronto	Ottawa		
Sault Ste Marie	Pembroke		

5. There are 2 possible routes from North Bay to Thunder Bay: one goes north; the other south. Estimate the distance of, and the time it would take to travel, each route, driving an average of 80 km an hour. Check your answers using your phone or a maps app.

6. You are driving from Toronto to Kenora.

   a) Estimate, using the scale, what you think the total distance is. ____________

   b) You want to drive approximately the same number of hours each day and will drive an average of 100 km an hour. Complete the following table to show where you would stop each night. Verify your calculations using your phone or GPS.

Days	Travel From	To	Km	Time
1	Toronto			
2				
3		Kenora		

Map of Ontario
(South of Moosonee)

Ref: Natural Resources Canada. (2002). Map of Ontario. [Map]. Ottawa, Canada: Queens Printer

INSTRUCTOR NOTES
Measuring Temperature
Skill Builders: Conversion

During the activity pre/apprentices will:
- Interpret thermometer readers
- Convert from Celsius to Fahrenheit

Skill Focus
- **Key Skill:** Numeracy (measurement & calculation)
- **Supporting Skill(s):** Document Use

Handouts
- Questions and Document Set (2 pages)

Talking Points
- Accurately taking and interpreting measures of temperature is a fundamental skill across the trades.
- Measuring and maintaining accurate temperature is commonly required in the automotive trade, in maintaining air conditioning, by chefs, in manufacturing, and in natural resource processing.
- Errors in interpreting and reporting measurements can result in significant losses to the company in product lost or equipment damaged.
- Industrial thermometers may display as a traditional home thermometer (with a rising bar) or on a gauge or a digital readout.
- While most thermometers work automatically, it is important to be able to recognize when an answer does not look right as there may be a malfunction.
- Need help? Use the Skill Builders identified in the Handout.

Distribute the Handout.

ANSWER KEY: Measuring Temperature
Skill Builders: Conversion

1. Compare measurements A and B. Which mixture is hotter? **B**
2. What is the temperature in degrees Celsius of the mixture measured in C? **20^0 C**
3. Calculate the temperature in degrees Fahrenheit of the mixture measured in E. Round your answer to the nearest whole degree. **162^0 F** (161.6^0 F = 72^0 C**)**
4. Which is the coolest mixture? **A**
5. The temperature measurements were taken, in the order presented, from the same site over the course of one day. Any sudden changes in temperature need to be reported. Which measurement(s) signal a sudden change? **C to D**
6. Review all the temperature measurements taken. Describe the trend that occurred over the day. **Answers may vary. Suggested answer: Temperatures were constant for the first 3 readings. At reading 4 they jumped and slowly increased for the rest of the day.**
7. To safely measure the temperature and other properties of the mixture workers need to wear appropriate PPE. The available heat-resistant gloves are recommended for use with temperatures over 110 degrees F. For which measurement(s) should heat resistant gloves be worn? **(110^0 F = 43.3^0 C) Therefore the gloves should be worn for measurements D through H.**

HANDOUT: Measuring Temperature (2 pages)

Skill Builders: Conversion

IN THE WORKPLACE: Accurately taking and interpreting measurements are fundamental skills across the trades. Errors in interpreting and reporting measurements can result in significant losses to the company in product lost or equipment damaged. In the oil and gas industry, mud mixtures need to be maintained at constant temperatures between 15 and 20 degrees Celsius OR between 70 and 80 degrees Celsius.

Refer to the **Thermometers** on the next page to answer the following questions.

1. Compare measurements A and B. Which mixture is hotter?

   ____

2. What is the temperature in degrees Celsius of the mixture measured in C?

   ____

3. Calculate the temperature in degrees Fahrenheit of the mixture measured in E. Round your answer to the nearest whole degree.

   ____

4. Which is the coolest mixture?

   ____

5. The temperature measurements were taken, in the order presented, from the same site over the course of one day. Any sudden changes in temperature need to be reported. Which measurement(s) signal a sudden change?

   ____

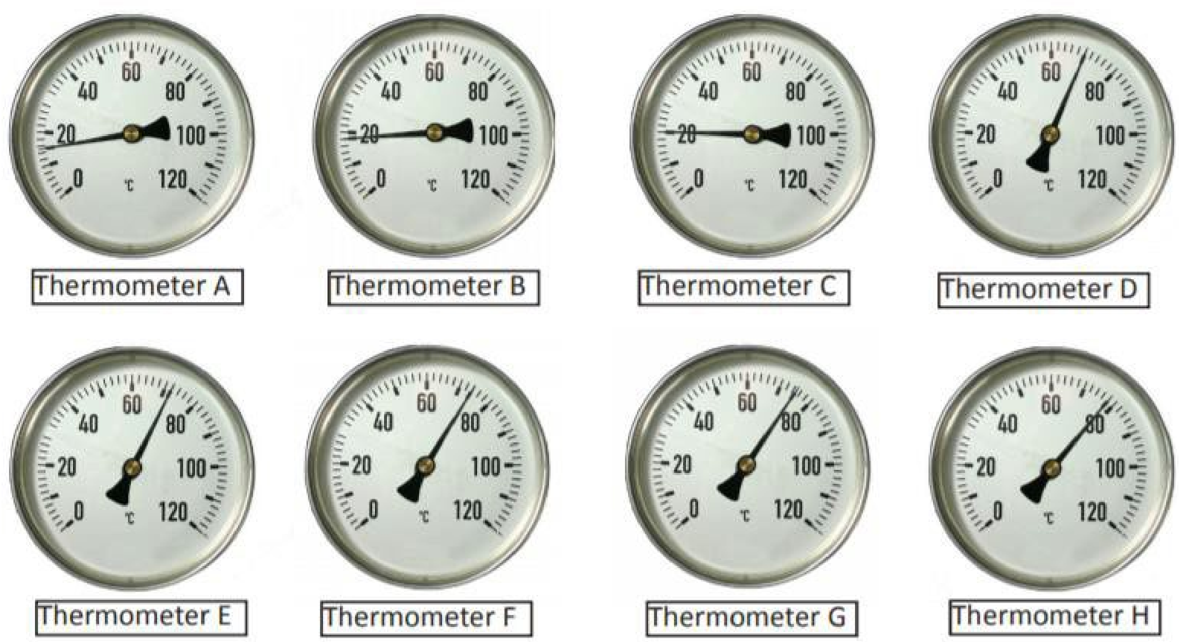
6. Review all the temperature measurements taken. Describe the trend that occurred over the day.

   ____

7. To measure the temperature and other properties of the mud mixture safely workers need to wear appropriate PPE. The available heat-resistant gloves are recommended for use with temperatures over 110 degrees F. For which measurement(s) should heat resistant gloves be worn?

   ____

Thermometers



Ref: Bow Valley College. (2020). Thermometers. Calgary, Canada: Author.

INSTRUCTOR NOTES
Mixing Cement
Skill Builders: Conversion, Percentages

During the activity pre/apprentices will:

- Calculate ratios
- Convert between imperial and metric systems

Skill Focus

- **Key Skill:** Numeracy (measurement & calculation)
- **Supporting Skill(s):** Document Use

Handouts

- Questions and Document Set (2 pages)

Talking Points

- Tradespersons perform basic math calculations every day using digital tools, and in their heads.
- Trades in Canada use both imperial and metric systems of measurement.
- Construction materials in Canada are labelled in both imperial and metric.
- Calculation and measurement errors cost companies in lost time and wasted materials.
- Need more help? Refer to the Skill Builders identified in the Handout.

  Distribute the Handout.

ANSWER KEY: Mixing Cement
Skill Builders: Conversion, Percentages

1. Convert the packet size to grams.

   2.1 x 28.35 = 59.54 g

2. Convert 50-70 pounds to metric.

   Conversion factor is 1 kg =2.2 lb.

   50 lb. = 22.73 kg

   70 lb. = 31.82 kg

   22.73 – 31.82 kg

3. What is the recommended ratio of packets to kilos?

   4 per 22.73 kg – 31.82 kg bag

   OR

   1 per 5.68 kg – 7.96 kg bag

4. You have 160 kg of cement product. How many packets of QuickSET are needed?

   20 – 28.

   Since you cannot exceed 4 packets of QuickSET per 50 lb.-70 lb. (22.73 kg-31.82 kg) bag of cement product, you must round down to the nearest whole number (i.e., you cannot add more packets of QuickSET to the mixture than specified).

5. The cement mixer has a 3.5 cubic foot capacity and will hold two 90 pounds bags of mix with water. To the nearest whole number, how many loads do you need to mix to use the 160 kg of cement product?

   2 loads

HANDOUTS: Mixing Cement (2 pages)
Skill Builders: Conversion, Percentages

IN THE WORKPLACE: Errors in conversion can result in significant costs to a company in lost time and product. Accurately taking, interpreting and converting measurements between imperial and metric systems are fundamental skills across the trades.

Refer to the **Product Label** below to complete the tasks and answer the following questions. Show your calculations.

1. Convert the packet size to grams.

2. Convert 50-70 pounds to metric.

3. What is the recommended ratio of packets to kilos?

4. You have 160 kg of cement product. How many packets of QuickSET are needed?

5. The cement mixer has a 3.5 cubic foot capacity and will hold two 90 pounds bags of mix with water. To the nearest whole number, how many loads do you need to mix to use the 160 kg of cement product?

QuickSET WATER REDUCING ADDITIVE www.QuickSET.ca Made in Canada. (00)123456789101112133	Directions: Place desired amount of water into mixing container. Add half cement product into mixing container and mix with mechanical mixer. Continue mixing while adding **QuickSET** powder to mixing container. Add remaining cement product into mixing container. DO NOT exceed 4 packets per 50 lb. to 70 lb. bag of cement product. Too much water in the mixture may cause aggregate segregation which can reduce strength. 1 packet contains 2.1 ounces.

Ref: Bow Valley College. (2020). QuickSET Product Label. Calgary, Canada: Author.

INSTRUCTOR NOTES
Noise Levels
Skill Builders: Charts & Graphs, Rounding, Tables & Lists

During the activity pre/apprentices will:

- Discuss the risk of noise-induced hearing loss
- Review common elements of charts and graphs

Skill Focus

- **Key Skill:** Numeracy (measurement & calculation)
- **Supporting Skill(s)**: Document Use, Reading

Handouts

- Questions and Document Set (3 pages)

Talking Points

- It is every worker's responsibility to stay safe on the job.
- When hazardous noise cannot be reduced by other means, appropriate hearing protection (such as ear plugs or ear muffs) should be worn to minimize long term damage.
- Using charts in place of text is a quick way to show detailed information at a glance.
- Need more help? Use the Skill Builders identified in the Handout.

Distribute the Handout.

ANSWER KEY: Noise Levels
Skill Builders: Charts & Graphs, Rounding, Tables & Lists

1. If the information in Table 1 was displayed as a chart, what would the title, and the labels of the x and y axes be? **Suggested answers. Title: noise levels. X axis (horizontal): noise sources. Y axis (vertical): dBA levels**

2. Create a table to represent the following text. Give the table a title that helps describe the information in the table. Label the columns. Include all data points between 85 and 115 dBA. Round times up to nearest 0.5 of a minute.

> Extreme noise can have serious negative effects on an individual's hearing. At 85 dBA the maximum recommended exposure is 8 hours. At 88 it is reduced to 4 hours.
> According to the generally-accepted "dBA exchange rate", for every 3 dBA over 85, the permissible exposure is cut in half.

Sample Answer.

Title: Noise Levels by Maximum Recommended Exposure Time

Noise Level (dBA)	Maximum Recommended Exposure Time
85	8 hours
88	4 hours
91	2 hours
94	1 hour
97	30 minutes
100	15 minutes
103	7.5 minutes
106	4 minutes (3.75 minutes)
109	2 minutes (1.875 minutes)
112	1 minute (0.9375 minutes)
115	0.5 minutes (0.46845 minutes)

3. Complete the following table for each of the tools shown in column 3 of Table 1 on the next page. Show the dBA for each tool and, using the data in the table you created, how many minutes of exposure is considered safe. Round down the tool dBA to ensure the exposure is safe. The first one is done for you.

TOOL	dBA	Minutes
Arc welder	90	240 minutes (4 hours) *rounded down to 88 dBA
Belt sander	**95**	**60 minutes (1 hour)**
Handheld drill	**100**	**15 minutes**
Table saw	**105**	**7.5 minutes**
Jackhammer	**110**	**2 minutes**
Riveter	**115**	**0.5 minutes**
Oxygen torch	**120**	**No acceptable exposure**

Handouts: Noise Levels (3 pages)
Skill Builders: Charts & Graphs, Rounding, Tables & Lists

IN THE WORKPLACE: In many industrial settings, hearing protection is vital to ensuring worker health and safety. Workers who are exposed to high levels of noise should limit their time in that environment so that the overall average noise exposure, in an eight-hour day, does not exceed 85 decibels (dBA).

Refer to **Table 1** to locate the answers to the following question.

1. If the information in Table 1 was displayed as a chart, what would the title, and the labels of the x and y axes be?

2. Create a table to represent the following text. Give the table a title that helps describe the information in the table. Label the columns. Include all data points between 85 and 115 dBA. Round times to nearest 0.5 of a minute.

   Extreme noise can have serious negative effects on an individual's hearing. At 85 dBA the maximum recommended exposure is 8 hours. At 88 it is reduced to 4 hours.
   According to the generally-accepted "dBA exchange rate", for every 3 dBA over 85, the permissible exposure is cut in half.

3. Complete the following table for each of the tools shown in column 3 of Table 1 on the next page. Show the dBA for each tool and, using the data in the table you created, how many minutes of exposure is considered safe. Round down the tool dBA to ensure the exposure is safe. The first one is done for you.

TOOL	dBA	Minutes
Arc welder	90	240 minutes (4 hours) *rounded down to 88 dBA

Table 1

dBA	Example	Home & Yard Appliances	Workshop & Construction
0	healthy hearing threshold		
10	a pin dropping		
20	rustling leaves		
30	whisper		
40	babbling brook	computer	
50	light traffic	refrigerator	
60	conversational speech	air conditioner	
70	shower	dishwasher	
75	toilet flushing	vacuum cleaner	
80	alarm clock	garbage disposal	
85	passing diesel truck	snow blower	
90	squeeze toy	lawn mower	arc welder
95	inside subway cart	food processor	belt sander
100	motorcycle (riding)		handheld drill
105	sporting event		table saw
110	rock band		jackhammer
115	emergency vehicle siren		riveter
120	thunderclap		oxygen torch
125	balloon popping		
130	peak stadium crowd noise		
135	air raid siren		
140	jet engine at takeoff		

Ref: Bow Valley College. (2020). Noise Levels. [Table]. Calgary, Canada: Author.

INSTRUCTOR NOTES
On the Job Calculations
Skill Builders: Conversion, Rounding, Percentages, Decimals & Fractions

During the activity pre/apprentices will:

- Calculate metric and imperial conversion and round numbers

Skill Focus

- **Key Skill:** Numeracy (measurement & calculation)

Handouts

- Questions Set (2 pages)

Talking Points

- Tradespersons perform basic math calculations every day using digital tools, and in their heads.
- Trades in Canada use both imperial and metric systems of measurement Calculation and measurement errors cost companies in lost time and wasted materials.
- In some circumstances, rounding may be appropriate, however in others where greater accuracy is required, rounding up or down may result in costly errors.
- In one extreme example, in 1999, NASA used metric units and their sub-contractor used imperial units on the same project. This resulted in an undetected calculation error that led to the loss of a $125 million satellite that was destroyed by travelling too close to Mars.
- Need more help? Refer to the Skill Builders identified in the Handout.

Distribute the Handout.

ANSWER KEY: On the Job Calculations
Skill Builders: Conversion, Rounding, Percentages, Decimals & Fractions

1. Substrate needs to be 30.5 x 38 centimetres. How many square inches is that?
   Step 1: Convert metric to imperial for 30.5 cm
   (1 in. = 2.54 cm)

   $\frac{?\,in.}{30.5\,cm} = \frac{1\,in.}{2.54\,cm}$ >> ? in. = $\frac{30.5\,in.}{2.54}$ >> ? in. = 12.01 in.

   30.5 cm = 12.01 in.

   Step 2: Convert metric to imperial for 38 cm
   $\frac{?\,in.}{38\,cm} = \frac{1\,in.}{2.54\,cm}$ >> ? in. = $\frac{38\,in.}{2.54}$ >> ? in. = 14.96 in.

   38 cm = 14.96 in.

   Step 3: Calculate square inches
   12.01 in. x 14.96 in. = 179.67 in.^{2}

2. How many square centimetres are in a 4-in^2 piece of glass?
   Step 1: Convert imperial to metric
   (1 in.^{2} = 6.45 cm^2)

   $\frac{?\,cm^2}{4\,in.^2} = \frac{6.45\,cm^2}{1\,in.^2}$ >> $?\,cm^2 = \frac{6.45\,cm^2\,x\,4\,in.^2}{1\,in.^2}$ >> $?\,cm^2$ = 25.80 cm^2

   4 in.^{2} =25.80 cm^2

3. When cutting glass, the cutter should be 0.06 inches from the edge of the glass. How many millimetres is that?
   Step 1: Convert imperial to metric
   (1 in. = 25.4 mm)

   $\frac{?\,mm}{0.06\,in.} = \frac{25.4\,mm}{1\,in.}$ >> ? mm = $\frac{25.4\,mm\,x\,0.06\,in.}{1\,in.}$ >> ? mm = 1.52 mm

   0.06 in. = 1.52 mm

4. Calculate the area, in square centimetres, of a piece of glass that measures 6 feet x 3 inches.
   Step 1: Convert feet to inches
   (1 ft = 12 in.) >> 6 x 12 in. = 72 in.

   Step 2: Calculate square inches
   72 in. x 3 in. = 216 in.^{2}

   Step 3: Convert from imperial to metric
   (1 in.^{2} = 6.45 cm^2)

   $\frac{?\,cm^2}{216\,in.^2} = \frac{6.45\,cm^2}{1\,in.^2}$ >> $?\,cm^2 = \frac{6.45\,cm^2\,x\,216\,in.^2}{1\,in.^2}$ >> $?\,cm^2$ = 1,393.20 cm^2

   216 $in.^2$= 1,393.20 cm^2

5. A project requires 3.5 metres of electrode wire. Calculate the length in millimetres, centimetres and inches.
   (1 m = 1000 mm) > 3.5 m = 3500 mm
   (1 m = 100 cm) > 3.5 m = 350 cm

   Convert from metric to imperial
   (1m = 39.37 in.)
   $\frac{?\ in.}{3.5\ m} = \frac{39.37\ in.}{1\ m}$ >> ? in. = $\frac{39.37\ in.\ x\ 3.5\ m}{1\ m}$ >> ? in. = 137.80 in.
   3.5 m = 137.80 in.

6. An electrode wire stickout is 3/8 inch. Calculate the length in millimetres and centimetres
   Step 1: Change the fraction 3/8 to a decimal.
   3/8 in = 0.375 in.

   Step 2: Change from imperial to metric to find millimetres.
   (1 in. = 25.4 mm)
   $\frac{?\ mm}{0.375\ in.} = \frac{25.4\ mm}{1\ in.}$ >> ? mm= $\frac{25.4\ mm\ x\ 0.375\ in.}{1\ in.}$ >> ? mm= 9.525 mm
   0.375 in. = 9.525 mm = 9.53 mm

   Step 3: Convert from imperial to metric to find centimeters.
   (1 in. = 2.54 cm)
   $\frac{?\ cm}{0.375\ in.} = \frac{2.54\ cm}{1\ in.}$ >> ? cm= $\frac{2.54\ cm\ x\ 0.375\ in.}{1\ in.}$ >> ? cm= 0.9525 cm
   0.375 in. = 0.9525 cm = 0.95 cm

7. Convert the following quantities to the metric measurements provided.

a) 2 lbs. of flux	**0.91 kg** (1 kg = 2.2 lb.)
b) 4 quarts (US) of solution	**3.77 L** (1 L = 1.06 qt. (US))
c) 3/4 in. pipe	**1.19 cm** (1 in. = 2.54 cm)
d) 100 lbs. of fire brick	**45.45 kg** (1 kg = 2.2 lb.)
e) 18 in. welding rod	**45.72 cm** (1 in. = 2.54 cm)

HANDOUT: On the Job Calculations (2 pages)

Skill Builders: Conversion, Rounding, Percentages, Decimals & Fractions

IN THE WORKPLACE: Errors in conversion can result in significant costs to a company in lost time and product. Accurately taking, interpreting and converting measurements between imperial and metric systems are fundamental skills across the trades. Welders are one example of a trade that frequently works across both systems.

Calculate the answers to the following questions. Round all answers to 2 decimal places.

1. Substrate needs to be 30.5 x 38 centimetres. How many square inches is that?

2. How many square centimetres is a 4-inch^2 piece of glass?

3. When making a cut, the cutter should be 0.06 inches from the edge of the glass. How many millimetres is that?

4. Calculate the area in square of centimetres of a piece of glass that measures 6 feet x 3 inches.

5. A project requires 3.5 metres of electrode wire. Calculate the length in millimetres, centimetres and inches.

6. An electrode wire stickout is 3/8 inch. Calculate the length in millimetres and centimetres.

7. Convert the following quantities to the metric measurements provided.

a) 2 lbs. of flux	kg
b) 4 quarts (US) of solution	L
c) 3/4 in. pipe	cm
d) 100 lbs. of fire brick	kg
e) 18 in. welding rod	cm

INSTRUCTOR NOTES
Patio Layout
Skill Builders: Pythagorean Theorem, Volume, Calculating Area, Rounding

During the activity pre/apprentices will:

- Calculate feature placement to complete a technical drawing
- Review basic formulas

Skill Focus

- **Key Skill:** Numeracy (measurement & calculation)
- **Supporting Skill(s):** Document Use

Handouts

- Questions and Document Set (2 pages)

Talking Points

- Calculating area or volume on the job is often more complicated than just measuring one basic shape.
- Typically, one job will require the use of multiple formulas.
- Basic calculation errors made when ordering materials can result in costly mistakes when either too much material is ordered or not enough.
- While electronics can help with most calculations, it is important to be able to recognize when an answer does not look right as information may have been inputted incorrectly.
- Need more help? Refer to the Skill Builders identified in the Handout.
- You may also use your phone or a calculator to help with the calculations.

  Distribute the Handout.

ANSWER KEY: Patio Layout
Skill Builders: Pythagorean Theorem, Volume, Calculating Area, Rounding

1. A client wants a garden installed in one corner of her new patio. The corner is a right angle. One of the sides along the edge of the garden is to be 2 m and the other side along the edge of the garden is to be 1.5 m. How long will the third side of the garden be?

   ($a^2 + b^2 = c^2$)

   $1.5^2 + 2^2 = c^2$

   $c^2 = 6.25$
   $c = \sqrt{6.25}$
   c = 2.5 m

2. The client would like the garden framed with landscaping timbers. What is the total length of timbers that needs to be purchased?

   Sides 1.5 + 2 + 2.5 = 6 m
   Total length = 6 m

3. The timbers are sold in 8 ft. lengths. How many lengths will need to be purchased to frame the garden?

   Convert meters to feet.

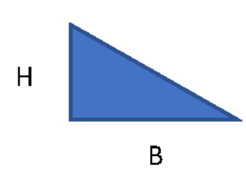
   Use conversion ratio (1 m = 3.28 ft.)

   $\frac{?\,ft.}{6\,m} = \frac{3.28\,ft.}{1\,m}$ >> ? ft. = $\frac{3.28\,ft.\ x\ 6\,m}{1\,m}$ >> ? ft. = 19.68 ft.

   6 m = 19.68 ft.
   Need to purchase three (3) lengths of 8 ft. timbers.

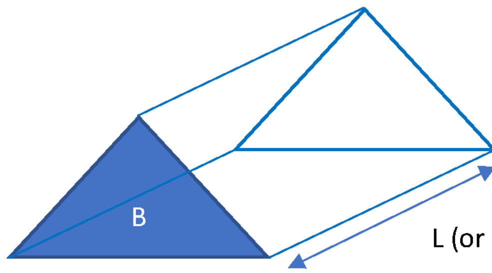
4. Steer manure needs to be ordered to fill the garden from the ground level to the top of the timbers. Manure is ordered in cubic metres. Assume the timbers are 4 x 4 inches and the manure needs to be level with the top of the timbers. How many cubic metres need to be ordered? *Round to the nearest hundredth. Recall the concept for area, volume and the conversion ratio provided (1 m = 39.37 in.).*

Recall: Area of a triangle = B (base) x H (height) ÷ 2



Recall: Volume of triangular prism = B (base) x L (length)

- where B = triangular area forming the base of a triangular prism;
- where L= the overall length (or height (H) or depth (D)) of the third dimension in the triangular prism.



Calculate the quantity of steer manure needed.

Step 1: Convert the 4x4s to metres.

(1 m = 39.37 in.).

$\frac{?\,m}{4\ in.} = \frac{1\ m}{39.37\ in.}$ >> ? m = $\frac{1\ m\ x\ 4\ in.}{39.37\ in.}$ >> ? m = 0.1016002 m

Step 2: Calculate volume of the triangular garden

V = B X D

V = [B = Area of triangle] x [D=Depth of Timbers]

V = [B = Area of triangle = base x height ÷ 2] x [Depth of timbers = 4 in. = 0.1016002 m]

V = [1.5 m x 2 m ÷ 2] x [0.1016002 m]

V = 0.1524003 m^3

Step 3: Round to the nearest hundredth.

V = 0.1524003 m^3

V = 0.15 m^3

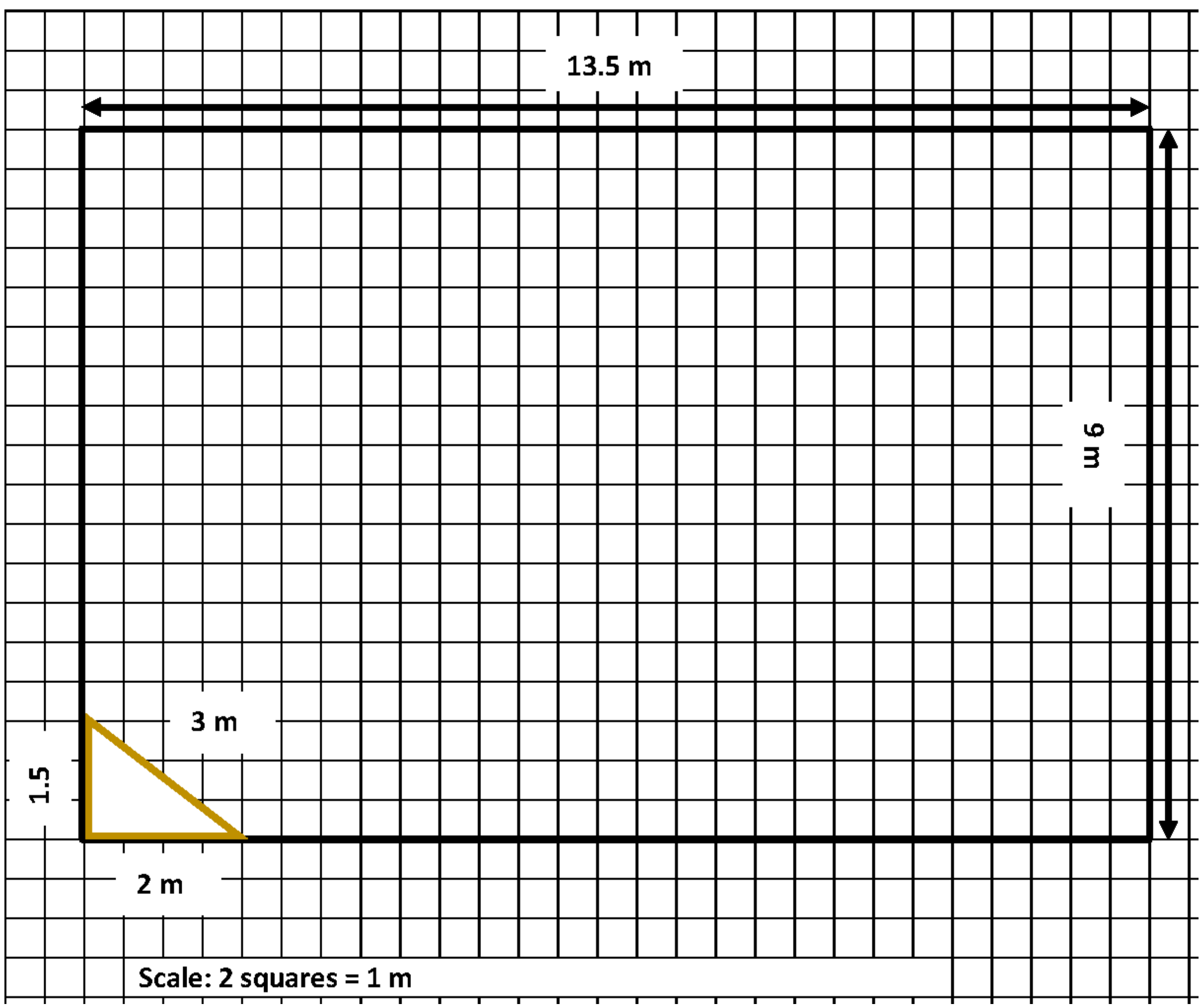
5. Assume the patio is a rectangle and the shortest side of the garden is 1/6 of the width of the finished patio. The longest side of the patio is 1.5 times the length of the shortest side. Using the graph paper on the next page, draw and label the patio including the new garden. Include information on the scale you use.

Shortest side of garden = 1.5 m

Width of patio ÷ 6 = shortest side of garden
Width of patio = shortest side of garden x 6
Width of patio = 1.5 m x 6 = 9 m
Width of patio = 9 m

Length of patio = 1.5 x shortest side of patio (patio width)
Length of patio = 1.5 x 9 m
Length of patio = 13.5 m

Patio dimensions (W X L) = 9 m x 13.5 m



HANDOUTS: Patio Layout (2 pages)
Skill Builders: Pythagorean Theorem, Volume, Calculating Area, Rounding

IN THE WORKPLACE: Formulas often used to determine amounts of material required to cover surface of various shapes, such as paint or lumber, or to fill various containers such as foundations and pipes. Accurate calculations minimize waste and save time and money.

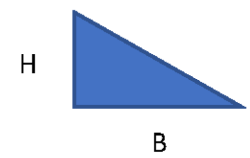
1. A client wants a garden installed in one corner of her new patio. The corner is a right angle. One of the sides along the edge of the garden is to be 2 m and the other side along the edge of the garden is to be 1.5 m. How long will the third side of the garden be?

2. The client would like the garden framed with landscaping timbers. What is the total length of timbers that needs to be purchased?

3. The timbers are sold in 8 ft. lengths. How many lengths will need to be purchased to frame the garden?

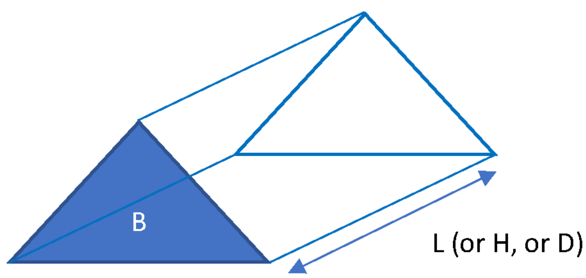
4. Steer manure needs to be ordered to fill the garden from the ground level to the top of the timbers. Manure is ordered in cubic metres. Assume the timbers are 4 x 4 inches and the manure needs to be level with the top of the timbers. How many cubic metres need to be ordered? *Round to the nearest hundredth. Recall the concept for area, volume and the conversion ratio provided (1 m = 39.37 in.).*

Recall: Area of a triangle = B (base) x H (height) ÷ 2



Recall: Volume of triangular prism = B (base) x L (length)

- where B = triangular area forming the base of a triangular prism;
- where L= the overall length (or height (H) or depth (D)) of the third dimension in the triangular prism.



5. Assume the patio is a rectangle and the shortest side of the garden is 1/6 of the width of the finished patio. The longest side of the patio is 1.5 times the length of the shortest side. Using the graph paper on the next page, draw and label the patio including the new garden. Include information on the scale you use.

INSTRUCTOR NOTES
Pay Statements
Skill Builders: Key Words & Phrases, Entry Forms, Percentages, Decimals & Fractions

During the activity pre/apprentices will:

- Interpret pay statements
- Calculate payroll deductions

Skill Focus

- **Key Skill:** Numeracy (money math)
- **Supporting Skill(s):** Document Use

Handouts

- Questions and Document Set (3 pages)

Talking Points

- Pay statements (also called pay stubs or pay slips) contain important information about your earnings and authorized deductions.
- Pay statements may be provided in paper or digital formats.
- Failure to accurately interpret and track pay statements can result in errors being missed that result in lost income (or overpayment) and generate work for payroll costing companies in lost time to correct.
- There is a great variety in tracking systems and forms used in different workplaces.
- Need more help? Refer to the Skill Builders identified in the Handout.

  Distribute the Handout.

ANSWER KEY: Pay Statements
Skill Builders: Key Words & Phrases, Entry Forms, Percentages, Decimals & Fractions

1. Refer to **Pay Statements 1** and **2** to complete the following table.

	Pay Statement 1	Pay Statement 2
Worker name	**John Smith**	**Joseph Mayer**
Cheque number	**321654**	**0044853**
Pay period end date	**2013/11/25**	**2018/11/25**
Pay date	**2013/11/20**	**2018/12/03**
Total hours worked	**85**	**75**
Gross pay	**$1,725.00**	**$1200.00**
Net pay	**$1,294.66**	**$968.09**
Year to date gross	**$39,675.00**	**$30,000.00**
Current EI deduction	**$28.62**	**$22.56**
Year to date CPP deduction	**$1,495.69**	**$1,318.50**

2. What do CPP, EI and YTD stand for? **Canada Pension Plan, Employment Insurance, and Year to Date**

3. What type of employee ID does each company use? **Pay statement 1 uses company issued ID numbers. Pay Statement 2 uses company issued employee numbers.**

4. Calculate the CPP and EI rates on Pay Statement 1.

65.03/1725 = 0.0376985
0.0376985 x 100 = 3.76985
CPP = 3.77%

28.62/1725 =0.0165913
0.0165913 x 100 = 1.65913
EI = 1.66%

5. If the rate of deduction for CPP goes up 1%, calculate the new deduction amounts for each employee for this pay period.

   Pay Statement 1
   Original CPP is 3.77%. Increase = 4.77%.
   New CPP = 1725 x 0.0477 = 82.2825
   New CPP = $82.28

   Pay Statement 2
   Original CPP is 4.40%. Increase = 5.40%.
   New CPP = 1200 x 0.0540 = 64.80
   New CPP = $64.80

6. Calculate the total percentage of the deductions for this pay period for each employee.

   Pay Statement 1
   430.34/1725 = 0.2494724
   0.2494724 x 100 = 24.94724
   = 24.95%

   Pay Statement 2
   231.91/1200 = 0.1932583
   0.1932583 x 100 = 19.32583
   = 19.33%

HANDOUTS: Pay Statements (3 pages)
Skill Builders: Key Words & Phrases, Entry Forms, Percentages, Decimals & Fractions

IN THE WORKPLACE: As a pre/apprentice and as a journeyperson, tracking your income is important. Understanding required deductions and the difference between gross and net earnings provides an accurate picture of your finances.

1. Refer to **Pay Statements 1** and **2** to complete the following table.

	Pay Statement 1	**Pay Statement 2**
Worker name		
Cheque number		
Pay period end date		
Pay date		
Total hours worked		
Gross pay		
Net pay		
Year to date gross		
Current EI deduction		
Year to date CPP deduction		

2. What do CPP, EI and YTD stand for?

____

3. What type of employee ID does each company use?

____

4. Calculate the CPP and EI rates on Pay Statement 1.

____

____

5. If the rate of deduction for CPP goes up 1%, calculate the new deduction amounts for each employee for this pay period.

____

____

6. Calculate the total percentage of the deductions for this pay period for each employee.

____

____

Pay Statement 1

Thompson Construction, 123 Home Street, WINNIPEG MB CANADA, R2W 2Y8						EARNINGS STATEMENT
John Smith						
EMPLOYEE ID		**PERIOD ENDING**		**PAY DATE**		**CHECK NUMBER**
123456		2013/11/25		2013/11/20		321654
INCOME	**RATE**	**HOURS**	**CURRENT TOTAL**	**DEDUCTIONS**	**CURRENT TOTAL**	**YEAR TO DATE**
REGULAR	20	80	1,600.00	CPP	65.03	1,495.69
OVERTIME	25	5	125.00	EI	28.62	658.26
				INCOME TAX	305.90	7,035.70
				UNION DUES	10.84	249.32
				LIFE INSURANCE	4.94	113.62
				LONG TERM DISABILITY	7.01	161.23
				CANADA SAVINGS BOND	8.00	184.00
YTD GROSS	**YTD DEDUCTIONS**		**YTD NET PAY**	**CURRENT TOTAL**	**DEDUCTIONS**	**NET PAY**
39,675.00	9,897.82		29,777.18	1,725.00	430.34	1,294.66

Pay Statement 2

Joseph Mayer	Employee #: 0032344589		Employer #: 11–36	Pay from: 2018/11/12	To: 2018/11/25	Date: 2018/12/03
STATEMENT OF EARNINGS				DEDUCTIONS		
EARNINGS	HOURS	RATE	CURRENT AMOUNT	WITHOLDINGS	CURRENT AMOUNT	YEAR-TO-DATE
001 BASIC PAY	75.00	16.00/hr	1,200.00	EI	22.56	564.00
				CPP/QPP	52.74	1,318.50
				INCOME TAX	156.61	3,915.25
SUMMARY		GROSS PAY	DEDUCTIONS	NET PAY	CHEQUE #	
CURRENT		1,200.00	231.91	968.09	0044853	
YEAR-TO-DATE		30,000.00	5,797.75	24,202.25		

Ref. Pay Statement 1: Adapted from Canada Online Pay Stub Generator. (2018). Sample Pay Stub (Earnings Statement). Canada: [www.canadapaystubs.com,](http://www.canadapaystubs.com)

Ref. Pay Statement 2: Canada Revenue Agency. (2019). Sample-Statement of earnings (pay stub). Ottawa, Canada:https://www.canada.ca/en/revenue-agency/services/tax/individuals/educational-programs/student-worksheets/statement-earnings.html

INSTRUCTOR NOTES
Product Installation
Skill Builders: Conversion, Technical Drawings, Rounding & Percentages, Decimals & Fractions

During the activity pre/apprentices will:

- Convert between imperial and metric systems
- Interpret technical drawings

Skill Focus

- **Key Skill:** Numeracy (measurement & calculation)
- **Supporting Skill(s):** Document Use

Handouts

- Questions and Document Set (2 pages)

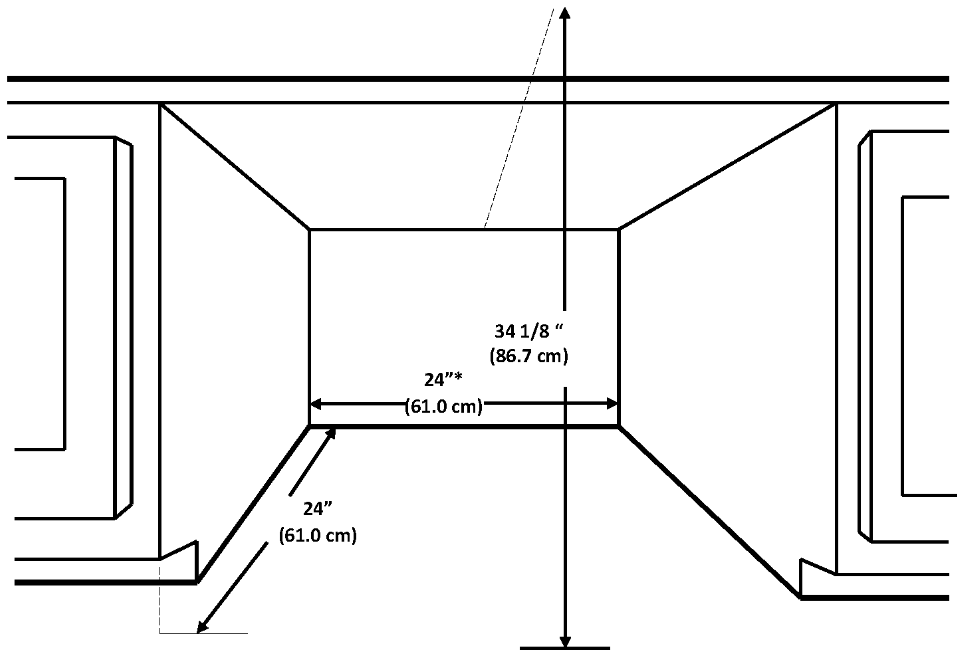
Talking Points

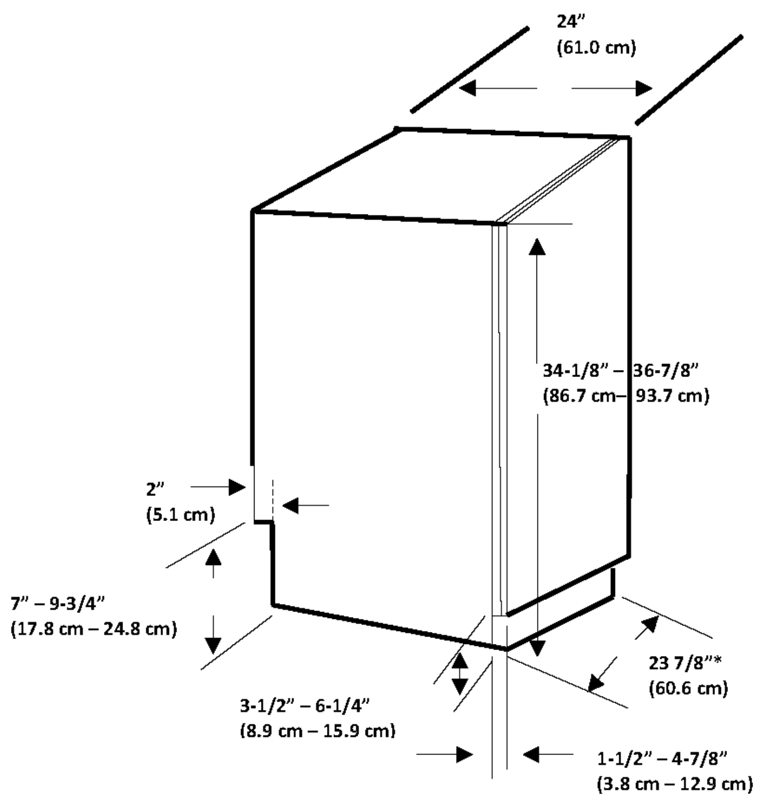
- Contractors, estimators, builders and tradespersons all rely on technical drawings for the information they need to construct and/or manufacture a product.
- Basic math errors in can result in costly materials and lost-time time mistakes.
- While electronics can help with most calculations, it is important to be able to recognize when an answer does not look right as information may have been inputted incorrectly.
- Need more help? Refer to the Skill Builders identified in the Handout.
- You may also use your phone or a calculator to help with the calculations.

  Distribute the Handout.

ANSWER KEY: Product Installation
Skill Builders: Conversion, Technical Drawings, Rounding & Percentages, Decimals & Fractions

1. **Answers shown in the technical drawings below.**





1. The technical drawings include both metric and imperial measurements. Calculate the correct conversion to centimetres for the four measurements that are circled and lettered on the drawing. Round to the nearest tenth. (1 inch = 2.54 cm)

   A. 34-1/8" = 86.7 cm

   $\frac{?\,cm}{34.125\,in.} = \frac{2.54\,cm}{1\,in.}$ >> ? cm = $\frac{2.54\,cm\ x\ 34.125\,in.}{1\,in.}$ >> ? cm = 86.$\underline{6}$775 in.

   B. 2" = 5.1 cm

   $\frac{?\,cm}{2\,in.} = \frac{2.54\,cm}{1\,in.}$ >> ? cm = $\frac{2.54\,cm\ x\ 2\,in.}{1\,in.}$ >> ? cm = 5.$\underline{0}$8 in.

   C. 3-1/2" – 6-1/4" = 8.9 cm – 15.9 cm

   $\frac{?\,cm}{3.5\,in.} = \frac{2.54\,cm}{1\,in.}$ >> ? cm = $\frac{2.54\,cm\ x\ 3.5\,in.}{1\,in.}$ >> ? cm = 8.$\underline{8}$9 in.

   $\frac{?\,cm}{6.25\,in.} = \frac{2.54\,cm}{1\,in.}$ >> ? cm = $\frac{2.54\,cm\ x\ 6.25\,in.}{1\,in.}$ >> ? cm = 15.$\underline{8}$75 in.

   D. 1-1/2" – 4-7/8" = 3.8 cm – 12.4 cm

   $\frac{?\,cm}{1.5\,in.} = \frac{2.54\,cm}{1\,in.}$ >> ? cm = $\frac{2.54\,cm\ x\ 1.5\,in.}{1\,in.}$ >> ? cm = 3.$\underline{8}$1 in.

   $\frac{?\,cm}{4.875\,in.} = \frac{2.54\,cm}{1\,in.}$ >> ? cm = $\frac{2.54\,cm\ x\ 4.875\,in.}{1\,in.}$ >> ? cm = 12.$\underline{3}$825 in.

2. If the dishwasher requires a half inch clearance on all 3 sides, and a half inch at the top, what are the dimensions of the largest dishwasher that will fit in the opening? Include width, depth, and height. Show your answers in imperial and metric.
   23-1/2 in. (w) x 23-1/2 in. (d) x 33-5/8 in. (h)
   59.69 cm (w) x 59.69 cm (d) x 85.41 cm (h)

3. Calculate the cubic volume of the opening, as shown in the Cutout Dimensions technical drawing. Show the dimensions in imperial.
   24 in. x 24 in. x 34.125 in. = 19,656 in.^{3}

4. Trim pieces are provided with the unit to fit the opening shown in the drawing. Without side trims, the unit width and depth is 59.7 cm. Without top trim, the unit height is 85.7 cm. Calculate the difference in volume between the unit with trim and without trim. Show your answer in imperial units. Round volume to the nearest whole number. (1 in.^{3} = 16.39 cm^3).
   Step 1: Calculate unit volume without trim.
   59.7 cm. x 59.7 cm. x 85.7 cm. = 305,442.51 cm^3

   Step 2: Convert unit volume from metric to imperial.
   $\frac{?\,in.^3}{305{,}442.51\,cm^3} = \frac{1\,in.^3}{16.39\,cm^3}$ >> $?\,in.^3 = \frac{1\,in.^3\ x\ 305{,}442.51\,cm^3}{16.39\,cm^3}$ >> $?\,in.^3$ = 18,635.91 $in.^3$ = 18,636 $in.^3$

   305,442.51 cm^3 = 18,636 in.^{3}

   Step 3: Subtract volume without trim from volume with trim.
   19,656 in.^{3} – 18,636 in.^{3} = 1,020 in.^{3}

HANDOUTS: Product Installation (2 pages)
Skill Builders: Conversion, Technical Drawings, Rounding & Percentages, Decimals & Fractions

IN THE WORKPLACE: Contractors, estimators, builders and tradespersons all rely on technical drawings for the information they need to safely and accurately build, repair or install a product such as a dishwasher as shown below.

Use the **Basic and Cutout Dimensions** technical drawings to complete the following tasks.

1. The technical drawings include both metric and imperial measurements. Calculate the correct conversion to centimetres for the five measurements that are circled and lettered, on the drawing. Round to the nearest tenth. (1 inch = 2.54 cm)

   A. ______________________________

   B. ______________________________

   C. ______________________________

   D. ______________________________

2. If the dishwasher requires a half inch clearance on all 3 sides, and a half inch at the top, what are the dimensions of the largest dishwasher that will fit in the opening? Include width, depth, and height. Show your answers in imperial and metric.

   ____

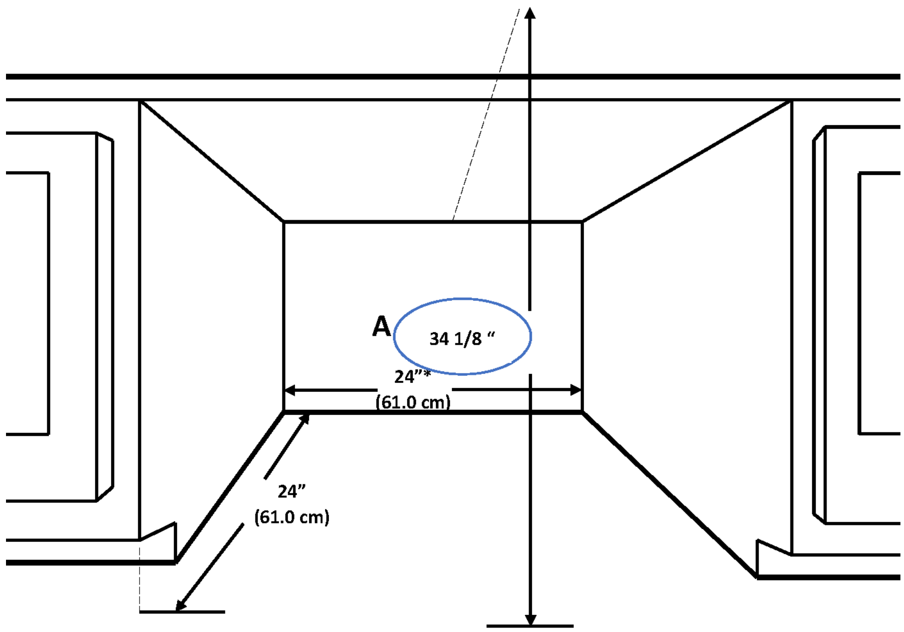
3. Calculate the cubic volume of the opening in imperial. Use the Cutout Dimensions technical drawing.

   ____

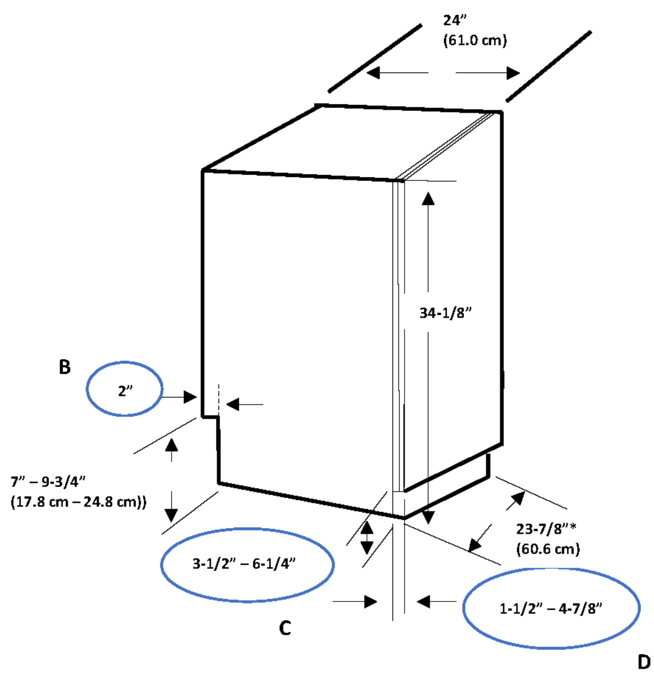
4. Trim pieces are provided with the unit to fit the opening shown in the drawing. Without side trims, the unit width and depth is 59.7 cm. Without top trim, the unit height is 85.7 cm. Calculate the difference in volume between the unit with trim and without trim. Show your answer in imperial units. Round volume to the nearest whole number. (1 in.^{3} = 16.39 cm^3).

   ____

CUTOUT DIMENSIONS



BASIC DIMENSIONS



Ref: Bow Valley College. (2020). Basic Dimensions. [image]. Calgary, Canada: Author.

INSTRUCTOR NOTES
Rough Openings: Calculation
Skill Builder: Tables & Lists, Technical Drawings

During the activity pre/apprentices will:

- Review the concepts of rough and finished openings
- Make basic calculations
- Locate information in complex documents

Skill Focus

- **Key Skill:** Numeracy (measurement & calculation)
- **Supporting Skill(s):** Document Use

Handouts

- Questions and Document Set (3 pages)

Talking Points

- Tradespersons perform basic math calculations every day using digital tools and in their heads.
- Calculation and measurement errors cost companies in lost time and wasted materials.
- While relying on digital tools is usually safe, they are not perfect. It is also important when performing calculations to have a rough sense in your head of what the correct answers should be.
- Need more help? Refer to the Skill Builder identified in the Handout.

Distribute the Handout.

ANSWER KEY: Rough Openings: Calculation
Skill Builder: Tables & Lists, Technical Drawings

1. Locate the following:

   a) Frame width for a 5′ door. **62″**

   b) Opening height for the tallest 2′10″ outswing door. **85 ¼″**

   c) Minimum rough opening width for the smallest double door available. **58 ½″**

   d) Maximum opening height for 5′ 8″ door. **86″**

2. Calculate the following:

   a) 80″ in feet. **6.67″ or 6′8″**

   b) 63 ¼″ in feet: **5.27′ or 5′ 3 ¼ ″**

   c) 84 ½″ in feet: **7.04′ or 7′ ½ ″**

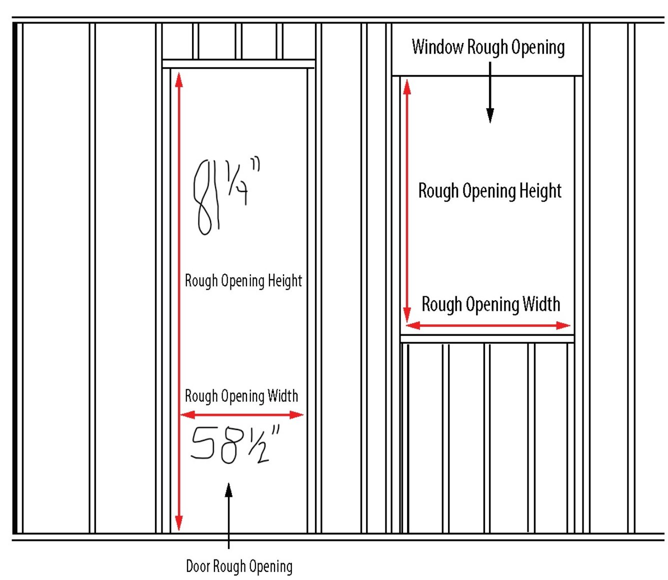
3. The rough opening was made for a 2′8″ single door and should have been for a 4′8″ double. Using the minimum rough opening dimensions for both, how much larger does the opening need to be? **24.5″ or 24 ½″**

4. What is the difference between the largest opening height for a 2′6″ inswing door and a 5′4″ double outswing door? **¾″**

5. Label the illustration showing the rough opening measurement for the smallest double door shown in the chart. **Label should be 58-1/2″.**

6. Label the illustration showing the shortest rough opening height measurement for a 6′ 0″ double outswing door. **Label should be 81 ¼ ″**

7. Refer to your textbook, or search online, to locate the rough opening width and height for a common window and door size. Label the illustration with those dimensions. **Answers will vary.**



HANDOUT: Rough Openings: Calculation (3 pages)
Skill Builder: Tables & Lists, Technical Drawings

IN THE WORKPLACE: To ensure that doors and windows fit tight enough to prevent water and air leaks, rough openings must be made larger than the item to be installed. The added space allows for variations such as headers or floors that are out of level and openings that are slightly out of square.

Refer to the **Rough Openings** documents to complete the tasks and locate answers to the questions. Write the answers in the space provided or highlight the information on the blueprint.

1. Locate the following:

   a) Frame width for a 5′ door:

   ____

   b) Opening height for the tallest 2′10″ outswing door

   ____

   c) Minimum rough opening width for the smallest double door available

   ____

   d) Maximum opening height for 5′ 8″ door

   ____

2. Calculate the following:

   a) 80″ in feet

   ____

   b) 63 ¼″ in feet

   ____

   c) 84 ½″ in feet

   ____

3. The rough opening was made for a 2'8" single door and should have been for a 4'8" double. Using the minimum rough opening dimensions for both, how much larger does the opening need to be?

____

4. Calculate the difference between the largest opening height for a 2'6" inswing door and a 5'4" double outswing door.

____

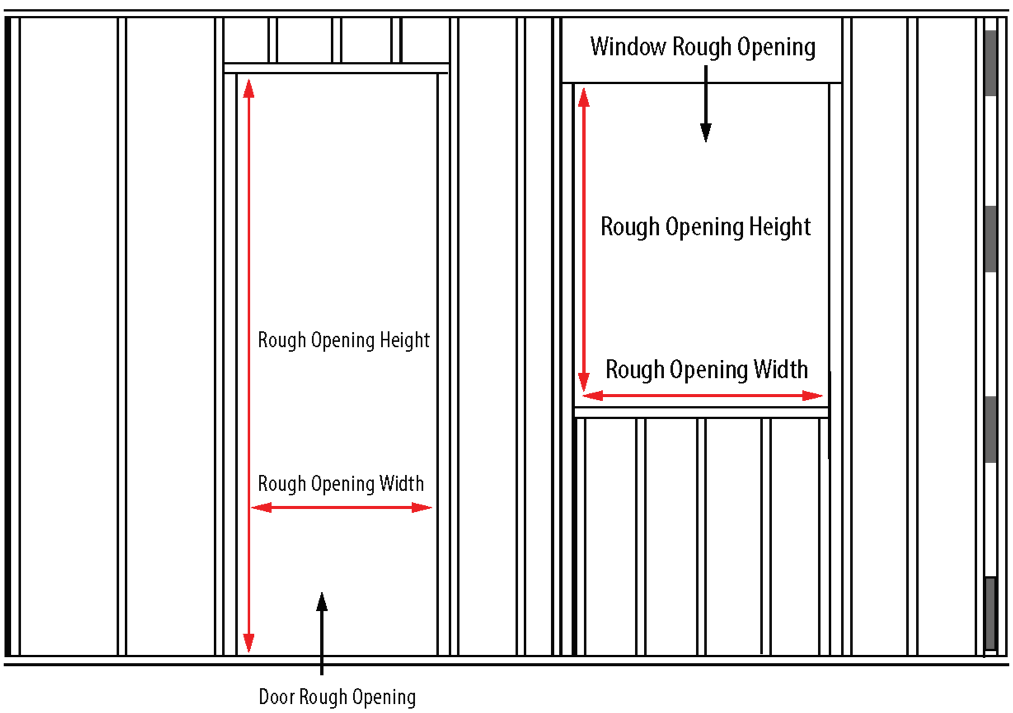
5. Label the illustration showing the rough opening measurement for the smallest double door shown in the chart.

6. Label the illustration showing the shortest rough opening height measurement for a 6' 0" double outswing door.

7. Refer to your textbook, or search online, to locate the rough opening width and heightfor a common window and door size. Label the illustration with those dimensions.

Rough Openings

Door Description	Opening Width		Opening Height	
	Actual Frame Width Size	Stud to Stud Rough Opening Minimum	6′ 8″	7′ 0″
2′ 0″ Single	25 ½ ″	26 ″	Inswing 82″ Outswing 81 ¼″	Inswing 86″ Outswing 85 ¼″
2′ 4″ Single	29 ½ ″	30″		
2′ 6″ Single	31 ½ ″	32 ″		
2′ 8″ Single	33 ½ ″	34 ″		
2′ 10″ Single	35 ½ ″	36 ″		
3′ 0″ Single	37 ½ ″	38 ″		
4′ 8″ Double	58″	58 ½ ″	Inswing 82″ Outswing 81 ¼″	Inswing 86″ Outswing 85 ¼″
5′ 0″ Double	62 ″	62 ½ ″		
5′ 4″ Double	66 ″	66 ½ ″		
5′ 8″ Double	70″	70 ½ ″		
6′ 0″ Double	74″	74 ½ ″		



Ref: Bow Valley College. (2020). Rough Openings. [table]. Calgary, Canada: Author.

INSTRUCTOR NOTES
Rough Openings: Conversion
Skill Builders: Conversion, Rounding, Tables & Lists

During the activity pre/apprentices will:

- Review the concept of rough and finished openings
- Calculate metric and imperial conversion and round numbers
- Enter information in complex documents

Skill Focus

- **Key Skill:** Numeracy (measurement & calculation)
- **Supporting Skill(s):** Document Use

Handouts

- Questions and Document Set (3 pages)

Talking Points

- Tradespersons perform basic math calculations every day using digital tools and in their heads.
- Trades in Canada use both imperial and metric systems of measurement.
- Calculation and measurement errors cost companies in lost time and wasted materials.
- Need more help? Refer to the Skill Builders identified in the Handout.

Distribute the Handout.

ANSWER KEY: Rough Openings: Conversion
Skill Builders: Conversion, Rounding, Tables & Lists

1. Convert the following from inches to mm. Calculate to 2 decimal places. Include the unit in your answer. (1 in. = 25.4 mm)

   a) 27 ¾ " **704.85 mm**

   $\frac{?\,mm}{27.75\,in.} = \frac{25.4\,mm}{1\,in.}$ >> ? mm = $\frac{25.4\,mm\,x\,27.75\,in.}{1\,in.}$ >> ? mm = 704.85 mm

   b) 84" **2133.60 mm**

   $\frac{?\,mm}{84\,in.} = \frac{25.4\,mm}{1\,in.}$ >> ? mm = $\frac{25.4\,mm\,x\,84\,in.}{1\,in.}$ >> ? mm = 2133.60 mm

   c) 71 ¼ " **1809.75 mm**

   $\frac{?\,mm}{71.25\,in.} = \frac{25.4\,mm}{1\,in.}$ >> ? mm = $\frac{25.4\,mm\,x\,71.25\,in.}{1\,in.}$ >> ? mm = 1809.75 mm

2. Convert the following from mm to inches. Calculate to the closest 1/8 inch. Include the unit in your answer. (1 in. = 25.4 mm)

   a) 2032 mm **80"**

   $\frac{?\,in.}{2032\,mm} = \frac{1\,in.}{25.4\,mm}$ >> ? in. = $\frac{1\,in.\;x\,2032\,mm}{25.4\,mm}$ >> ? in. = 80 in.

   b) 915 mm **36"**

   $\frac{?\,in.}{915\,mm} = \frac{1\,in.}{25.4\,mm}$ >> ? in. = $\frac{1\,in.\;x\,915\,mm}{25.4\,mm}$ >> ? in. = 36.02 in.

   c) 1000 mm **39-3/8"**

   $\frac{?\,in.}{1000\,mm} = \frac{1\,in.}{25.4\,mm}$ >> ? in. = $\frac{1\,in.\;x\,1000\,mm}{25.4\,mm}$ >> ? in. = 39.37 in.

3. Complete the following table of popular door sizes. Include the unit in your answers. Calculate all metric measurements to the nearest whole number.

Metric mm	Imperial feet & inches	Imperial inches
1830 mm x 610 mm	6' 0" x 2' 0"	***72" x 24"***
1981 mm x 457 mm	6' 6" x 1' 6"	78" x 18"
1981 mm x 762 mm	**6' 6" x 2' 6"**	78" x 30"
2038 mm x 613 mm	6' 8-1/4" x 2'-1/8"	80-1/4" x 24-1/8"
2040 mm x 721 mm	6' 8-5/16" x 2' 4-3/8"	***80-5/16" x 28-3/8"***

4. Recreate the Opening Height sub-headings and the first 2 lines of the **Rough Openings** table using metric instead of imperial measurements. Calculate to the nearest whole number. Include the unit in your answers.

Rough Openings

Door Description	Opening Width		Opening Height	
	Actual Frame Width Size	Stud to Stud Rough Opening Minimum	2032 mm	2134 mm
610 mm	648 mm	661 mm	Inswing **2083 mm** Outswing **2064 mm**	Inswing **2184 mm** Outswing **2165 mm**
711 mm	749 mm	762 mm		

HANDOUT: Rough Openings: Conversion (3 pages)
Skill Builders: Conversion, Rounding, Tables & Lists

IN THE WORKPLACE: To ensure that doors and windows fit tight enough to prevent water and air leaks, rough openings must be made larger than the item to be installed. The added space allows for variations such as headers or floors that are out of level and openings that are slightly out of square.

1. Convert the following from inches to mm. Include the unit in your answer. (1 in. = 25.4 mm)

   a) 27 ¾ ″

   ____

   b) 84″

   ____

   c) 71 ¼ ″

   ____

2. Convert the following from mm to inches. Calculate to the closest 1/8″. Include the unit in your answer. (1 in. = 25.4 mm)

   a) 2032 mm

   ____

   b) 915 mm

   ____

   c) 1000 mm

   ____

3. Complete the following table of popular door sizes. Include the unit in your answers. Calculate all metric measurements to the nearest whole number.

Metric mm	Imperial feet & inches	Imperial inches
1830 mm x 610 mm	6' 0" x 2' 0"	
	6' 6" x 1' 6"	78" x 18"
1981 mm x 762 mm		78" x 30"
	6' 8-1/4" x 2' -1/8"	80-1/4" x 24-1/8"
2040 mm x 721 mm	6' 8-5/16" x 2' 4-3/8"	

4. Recreate the Opening Height sub-headings and the first 2 lines of the **Rough Openings** table using metric instead of imperial measurements. Calculate to the nearest whole number. Include the unit in your answers.

Rough Openings

Door Description	Opening Width		Opening Height	
	Actual Frame Width Size	Stud to Stud Rough Opening Minimum		
			Inswing	Inswing
			Outswing	Outswing

Rough Openings

Door Description	Opening Width		Opening Height	
	Actual Frame Width Size	Stud to Stud Rough Opening Minimum	6′ 8″	7′ 0″
2′ 0″ Single	25 ½ ″	26 ″	Inswing 82″ Outswing 81 ¼″	Inswing 86″ Outswing 85 ¼″
2′ 4″ Single	29 ½ ″	30″		
2′ 6″ Single	31 ½ ″	32 ″		
2′ 8″ Single	33 ½ ″	34 ″		
2′ 10″ Single	35 ½ ″	36 ″		
3′ 0″ Single	37 ½ ″	38 ″		
4′ 8″ Double	58″	58 ½ ″	Inswing 82″ Outswing 81 ¼″	Inswing 86″ Outswing 85 ¼″
5′ 0″ Double	62 ″	62 ½ ″		
5′ 4″ Double	66 ″	66 ½ ″		
5′ 8″ Double	70″	70 ½ ″		
6′ 0″ Double	74″	74 ½ ″		

Ref: Bow Valley College. (2020). Rough Openings. [table]. Calgary, Canada: Author.

INSTRUCTOR NOTES
Tiny House
Skill Builders: Calculating Area, Technical Drawings

During the activity pre/apprentices will:

- Calculate the surface area of a large structure
- Interpret technical drawings

Skill Focus

- **Key Skill:** Numeracy (measurement & calculation)
- **Supporting Skill(s):** Document Use

Handouts

- Questions and Document Set (2 pages)

Talking Points

- Contractors, estimators, builders and tradespersons all rely on technical drawings for the information they need to construct and/or manufacture a product.
- Calculating area on the job is often more complicated than just measuring a single basic shape.
- Basic math errors in can result in costly materials and lost-time time mistakes.
- While electronics can help with most calculations, it is important to be able to recognize when an answer does not look right as information may have been inputted incorrectly.
- Need more help? Refer to the Skill Builders identified in the Handout.
- You may also use your phone or a calculator to help with the calculations.

Distribute the Handout.

ANSWER KEY: Tiny House
Skill Builder: Calculating Area, Technical Drawings

1. Is the structure intended to be fixed in place or movable? How do you know?**Movable. There is a trailer hitch.**

2. How many stories is the structure? **1 ½** (**1 + a loft and bedroom on the second level with an open ceiling above the LR).**

3. What is the exterior perimeter of the structure? **80 ft. 8 in.**

4. What is the total square footage of the bedroom (including the closet)?
   (5 ft. 8 in. x 12 ft.) + (2 ft. 6 in. x 8 ft. 2 in.)

   (5.67 ft. x 12 ft.) + (2.5 ft. x 8.17 ft.) = 68 ft.^{2} + 20.4167 ft.^{2} = 88.42 ft.^{2}

5. What are the dimensions of the staircase? **2 ft. 6in. x 3 ft. 4 in.**

6. How many exits are there? Where are they? **Two. 1 at the end opposite the hitch and 1 to the left of the kitchen.**

7. What is the total square footage of the developed spaces on the second level?
   (answer from 4) + (8 ft. 4 in. x 5 ft.)
   88.42 ft.^{2} + (8.33 ft. x 5) = 130.08 ft.^{2}

8. What is the square footage of the kitchen?
   8 ft. 4 in. x 8 ft. 8 in.
   8.33 ft. x 8.67 ft. = 72.22 ft. ^{2}

9. What are the dimensions of the bathroom? **3 ft. x 8 ft. 4 in.**

10. If a city bylaw permits tiny houses that occupy no more than ½ of the existing backyard, how large must the yard be to accommodate this structure? **The backyard must be equal to or greater than 16 ft. 8 in. x 32 ft. OR, 8 ft. 4in. x 64 ft.**

    OR

    The backyard dimensions must have an area of at least 533.12 sq. ft. (the square footage of the mail level of the house x 2).
    8 ft. 4 in. x 32 ft.
    8.33 ft. x 32 ft. = 266.56 ft.^{2}
    266.56 ft.^{2} x 2 = 533.12 ft.^{2}

HANDOUTS: Tiny House (2 pages)
Skill Builders: Calculating Area, Technical Drawings

IN THE WORKPLACE: Contractors, estimators, builders and tradespersons all rely on technical drawings for the information they need to build safely and accurately.

Use the **Technical Drawing** on the next page to locate the answers to the following questions.

1. Is the structure intended to be fixed in place or movable? How do you know?

____

2. How many stories is the structure?

____

3. What is the exterior perimeter of the structure?

____

4. What is the total square footage of the sleeping area?

____

5. What are the dimensions of the staircase?

____

6. How many exits are there? Where are they?

____

7. What is the total square footage of the loft space?

____

8. What is the square footage of the kitchen?

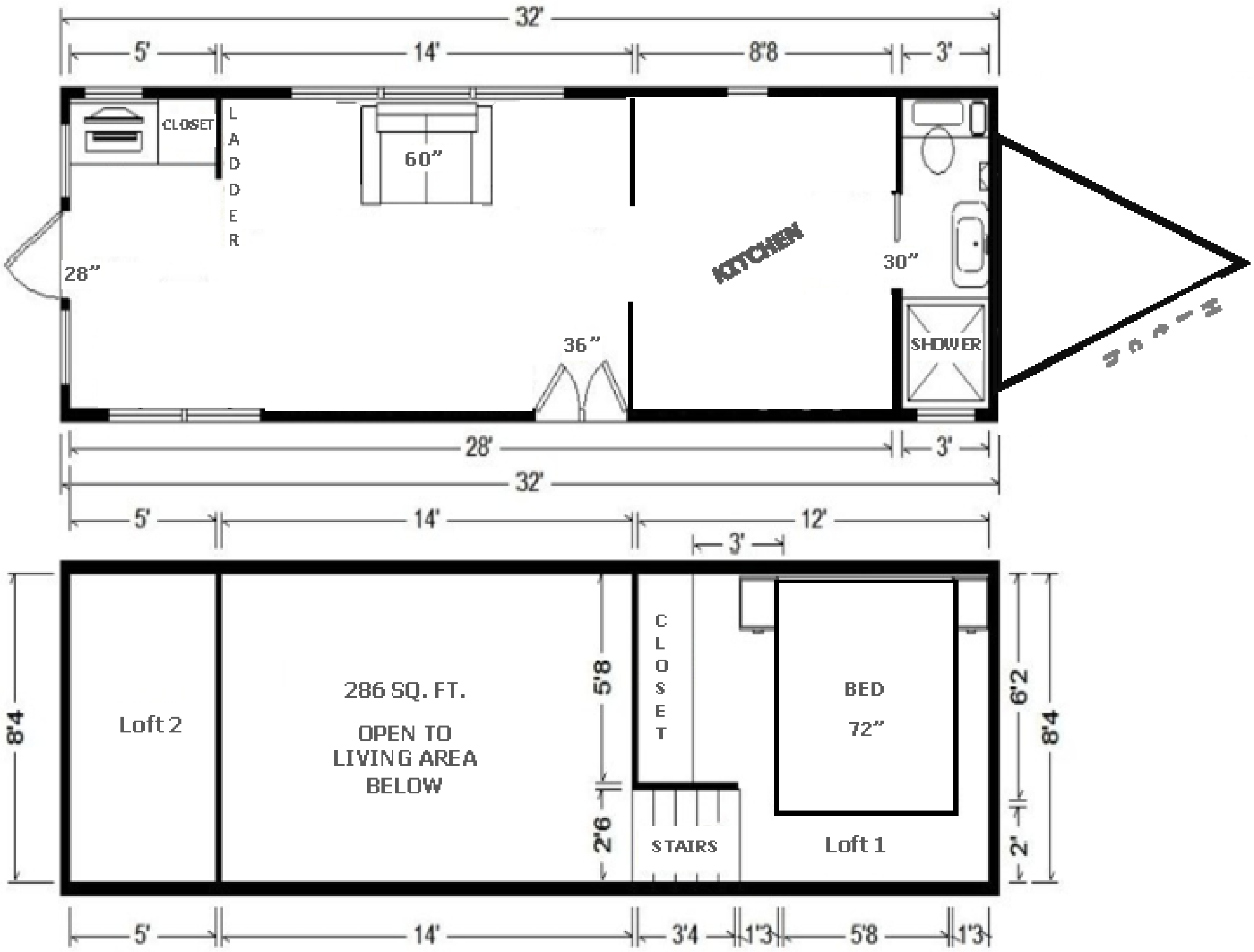
____

9. What are the dimensions of the bathroom?

____

10. If a city bylaw permits tiny houses that occupy no more than ½ of the existing backyard, how large must the yard be to accommodate this structure?

____



Ref: Bow Valley College. (2020). Tiny house. [Floor Plan]. Calgary, Canada: Author

INSTRUCTOR NOTES
Volume of Cylinders and Cones
Skill Builder: Volume, Rounding

During the activity pre/apprentices will:

- Calculate the volume of frequently used curved-sided objects such as cylinders, cones and round containers

Skill Focus

- **Key Skill:** Numeracy (measurement & calculation)

Handouts

- Questions and Document Set (2 pages)

Talking Points

- Basic and advanced math are used by all tradespersons working in the field or in the office.
- Trades in Canada use both imperial and metric systems of measurement.
- Calculation and measurement errors cost companies in lost time and wasted materials.
- The volume of three-dimensional curved shapes such as cylinders is calculated as pi x radius squared x height or **$V = \pi r^2 \times H$**
- The volume of three dimensional shapes such as cones is pi x radius squared x height ÷ 3 or **$V = [\pi r^2 \times H] \div 3$**
- Need more help? Use the Skill Builder identified in the Handout.
- You may also use your phone or a calculator to help with the calculations.

  Distribute the Handouts.

ANSWER KEY: Volume of Cylinders and Cones
Skill Builders: Volume, Rounding

1. A cylindrical septic tank is 1.2m in diameter and 1.8m high. How many litres will it hold? Round to the nearest whole number. (1 m^3 = 1000 L)
   $V = \pi r^2 h$
   $V = \pi \times 0.6^2 \times 1.8$
   $V = 2.036\ m^3$
   $V = 2.036 \times 1000$
   V = 2036 litres

2. A rainwater downpipe is 30" high and 4" wide. Calculate the volume of the pipe, in litres. Round to the nearest hundredth. (1 L = 61.023 $in.^3$)
   $V = \pi r^2 h$
   $V = \pi \times 2^2 \times 30$ in.
   $V = 376.991\ in.^3$
   $V = \frac{?\,L}{376.991\ in.^3} = \frac{1\ L}{61.023\ in.^3}$ **>>** $V = \frac{1\ L\ x\ 376.991\ in.^3}{61.023\ in.^3}$ **>> V = 6.178 L**

   V = 6.18 litres

3. Residential sewer pipe, connected to a toilet, must have a diameter that is a minimum of 3". Using that standard, if the pipe is 20' long, calculate the volume of the pipe, in litres. Round to the nearest tenth. (1 L = 61.023 $in.^3$).
   Converted all measurements to inches. >> 20 ft. = 240 in.
   $V = \pi r^2 h$
   $V = \pi \times 1.5^2 \times 240$ in. = 1696.46 $in.^3$
   $V = \frac{?\,L}{1696.46\ in.^3} = \frac{1\ L}{61.023\ in.^3}$ **>>** $V = \frac{1\ L\ x\ 1696.46\ in.^3}{61.023\ in.^3}$ **>> V = 27.800 L**

   V = 27.8 litres

4. A storage tank is 13' in diameter and 3m high. How many gallons will it hold? There are 7.481 cubic feet in a US liquid gallon. Round to the nearest hundredth.
   (1 gal. (US) = 7.48 $ft.^3$ and (1 m =3.28 ft.)
   Converted all measurements to feet. >> 3m = 9.48 ft.
   $V = \pi r^2 h$
   $V = \pi \times 6.5^2 \times 9.84$ ft.
   $V = 1306.08573\ ft.^3$
   $V = \frac{?\ gal.\ (US)}{1306.08573\ ft.^3} = \frac{1\ gal.\ (US)}{7.48\ ft.^3}$ **>>** $V = \frac{1gal.\ (US)\ x\ 1306.08573\ ft.^3}{7.48\ ft.^3}$ **>> V = 9770.827345 gal. (US)**
   V = 9770.83 gallons (US)

5. A storm water pipe has an exterior dimension of 8" and the interior dimension is 1" smaller. Calculate the volume, of the pipe, in litres, per 50'. Round to the nearest hundredth. (1 L = 61.023 $in.^3$)
   Converted all measurements to inches. >> 50 ft. = 600 in.
   $V = \pi r^2 h$
   $V = \pi \times 3.5^2 \times 600$ in.
   $V = 23{,}090.706\ in.^3$

V = $\frac{?\,L}{23{,}090.706\ in.^3} = \frac{1\ L}{61.023\ in.^3}$ >> V = $\frac{1\ L\ x\ 23{,}090.706\ in.^3}{61.023\ in.^3}$ >> **V = 378.393 L**

V = 378.39 litres (per 50 ft.)

6. Once it is welded, the bottom cone for a grain hopper will have a height of 2.04 metres and the radius will be 1.57 metres. How much grain will the cone hold? Round to the nearest hundredth.
   V = π r² h ÷ 3
   V = π x 1.57^2 x 2.04 ÷ 3
   V = 15.79717193 m³ ÷ 3
   V = 5.265723978 m³
   V = 5.27 m³

7. By looking at the amount of fill dropped off at a construction site, the foreperson estimates that it is not going to be enough for the area that needs to be filled. The fill is piled in a cone shape on the edge of the site. The amount ordered was 100 m³. The pile of fill is 7.5 m high with a diameter of 7 m. Was enough fill delivered? Show your calculations. Round to the nearest tenth.
   V = π r² h ÷ 3
   V = π x 3.5^2 x 7.5 ÷ 3
   V = 288.633825 m³ ÷ 3
   V = 96.21127502 m³
   V = 96.2 m³

   No. The amount of fill delivered is about 4 cubic metres short.

8. Engine cleaner needs to diluted at 180 mL of liquid concentrate in 4 litres of water. Is the bucket below large enough to hold the mixture? Round to the nearest hundredth. (1 mL = 1000 m³) and (1 L = 1000 mL)
   Calculate volume in mm³
   V = π r² h
   V = π x 100^2 x 140 mm³
   V = 4,398,229.715 mm³

   V = $\frac{?\,mL}{4{,}398{,}229.715\ m^3} = \frac{1\ mL}{1000\ m^3}$ >> V = $\frac{1\ mL\ x\ 4{,}398{,}229.715\ m^3}{1000\ m^3}$ >> **V = 4,398.229715 mL**

   V = $\frac{?\,L}{4{,}398.229715\ mL} = \frac{1\ L}{1000\ mL}$ >> V = $\frac{1\ L\ x\ 4{,}398.229715\ mL}{1000\ mL}$ >> **V = 4.398229715 L**

   V = 4.40 L

   Yes. The bucket can hold almost 4.4 litres and the concentrate and water mixed together are only 4.18 litres.

HANDOUT: Volume of Cylinders and Cones (2 pages)
Skill Builder: Volume, Rounding

IN THE WORKPLACE: Plumbers and other tradespersons frequently work with materials that are round or curved to allow for the easy flow or storage of fluids. Calculating volume is done in both metric and imperial systems of measurement.

Calculate answers to the following questions. Include the units in your answers. Show your calculations.

1. A cylindrical septic tank is 1.2 m in diameter and 1.8 m high. How many litres will it hold? Round to the nearest whole number. (1 m^3 = 1000 L)

2. A rainwater downpipe is 30″ high and 4″ wide. Calculate the volume of the pipe, in litres. Round to the nearest hundredth. (1 L = 61.023 $in.^3$)

3. Residential sewer pipe, connected to a toilet, must have a diameter that is a minimum of 3″. Using that standard, if the pipe is 20′ long, calculate the volume of the pipe in litres. Round to the nearest tenth. (1 L = 61.023 $in.^3$).

4. A storage tank is 13′ in diameter and 3m high. How many gallons will it hold? There are 7.481 cubic feet in a US liquid gallon. Round to the nearest hundredth. (1 gal. (US) = 7.48 ft^3) and (1 m= 3.28 ft.)

5. A storm water pipe has an exterior dimension of 8″ and the interior dimension is 1″ smaller. Calculate the volume, of the pipe, in litres, per 50′. Round to the nearest hundredth. (1 L = 61.023 in.^{3})

6. Once it is welded, the bottom cone for a grain hopper will have a height of 2.04 metres and the radius will 1.57 metres. How much grain will the cone hold? Round to the nearest hundredth.

7. By looking at the amount of fill dropped off at a construction site, the foreperson estimates that it is not going to be enough for the area that needs to be filled. The fill is piled in a cone shape on the edge of the site. The amount ordered was 100 m^3. The pile of fill is 7.5 m high with a diameter of 7 m. Was enough fill delivered? Show your calculations. Round to the nearest tenth.

8. Engine cleaner needs to be diluted at 180 mL of liquid concentrate in 4 litres of water. Is the bucket below large enough to hold the mixture? Round to the nearest hundredth.
(1 mL = 1000 m^3) and (1 L = 1000 mL)

INSTRUCTOR NOTES
Work Schedules
Skill Builders: Key Words & Phrases, Tables & Lists

During the activity pre/apprentices will:

- Interpret shifts reported in a work schedule.

Skill Focus

- **Key Skill:** Numeracy (scheduling, budgeting & accounting)
- **Supporting Skill(s):** Document Use

Handouts

- Questions and Document Set (3 pages)

Talking Points

- Failure to accurately interpret work schedules can result in showing up at the wrong job site, lost wages and make extra work for payroll costing companies in lost time to correct.
- There is a great variety in tracking systems and forms used in different workplaces.
- Need more help? Refer to the Skill Builders identified in the Handout.

  Distribute the Handout.

ANSWER KEY: Work Schedules
Skill Builders: Key Words & Phrases, Tables & Lists

1. How many days a week does the company operate? **6 days.**
2. Which crew has the fewest working days this period? **Crew C (9 days)**
3. Crew B needs to add a day on Monday the 21. Which crew is available to assist? **Crew C**.
4. Which project are scheduled for the shortest period of time? **Main St. and Teal Trail are both scheduled for only 1 day.**
5. Kim is unable to work on the final day of the 42^{nd} Avenue project. What workers could be available to pick up the shift? **Anyone from Crew A.**
6. Which crew will be working at the Paper Street site on the June 25? **Crew B.**
7. Which crew works the fewest number of job sites this period? **Crew B (2 sites. Treesdale and Paper).**
8. On which day will work at 659 Treesdale Crt be completed? **Saturday June 19.**
9. Which crew does not work Saturdays? **Crew A.**
10. Each shift is 8.5 hours. How many hours will Hester work during this pay period? **76.5 hours.**

HANDOUTS: Work Schedules (3 pages)
Skill Builders: Key Words & Phrases, Tables & Lists

IN THE WORKPLACE: As a pre/apprentice and as a journeyperson, the ability to accurately follow a schedule is important: especially when working multiple projects. Arriving on time – and at the right location – either first thing in the morning or following any breaks is essential.

Refer to the **Crews and Schedule** form to locate the answers to the following questions.

1. How many days a week does the company operate?

____

2. Which crew has the fewest working days this period?

____

3. Crew B needs to add a day on Monday the 21. Which crew is available to assist?

____

4. Which projects are scheduled for the shortest period of time?

____

5. Kim is unable to work on the final day of the 42nd Avenue project. What workers could be available to pick up the shift?

____

6. Which crew will be working at Paper Street site on the June 25?

____

7. Which crew works the fewest number of job sites this period?

____

8. On which day will work at 659 Treesdale Crt be completed?

____

9. Which crew does not work Saturdays?

____

10. Each shift is 8.5 hours. How many hours will Hester work during this pay period?

____

Crews & Schedule

Pay period: June 13 – June 26

Constructua

	Week 1						Week 2					
	M 14	T 15	W 16	Th 17	F 18	S 19	M 21	T 22	W 23	Th 24	F 25	S 26
217 Brentley Dr		A	A									
18 Roman Cres				A	A		A	A				
10471 Main St S									C			
985 42nd Ave										C	C	C
659 Treesdale Crt		B	B	B	B	B						
287 Crawford Ave									A	A	A	
8215 Teal Trail	A											
36 Paper St		C	C	C	C	C		B	B	B	B	B

Crew A	Crew B	Crew C
Roger (Lead)	Lesley (Lead)	Joe (Lead)
Marshall	Frank	Toni
Greg	Ralf	Kim
Topher	Jean	Steve
		Hester

Ref: Bow Valley College. (2020). Work Schedule. [image]. Calgary, Canada: Author