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.
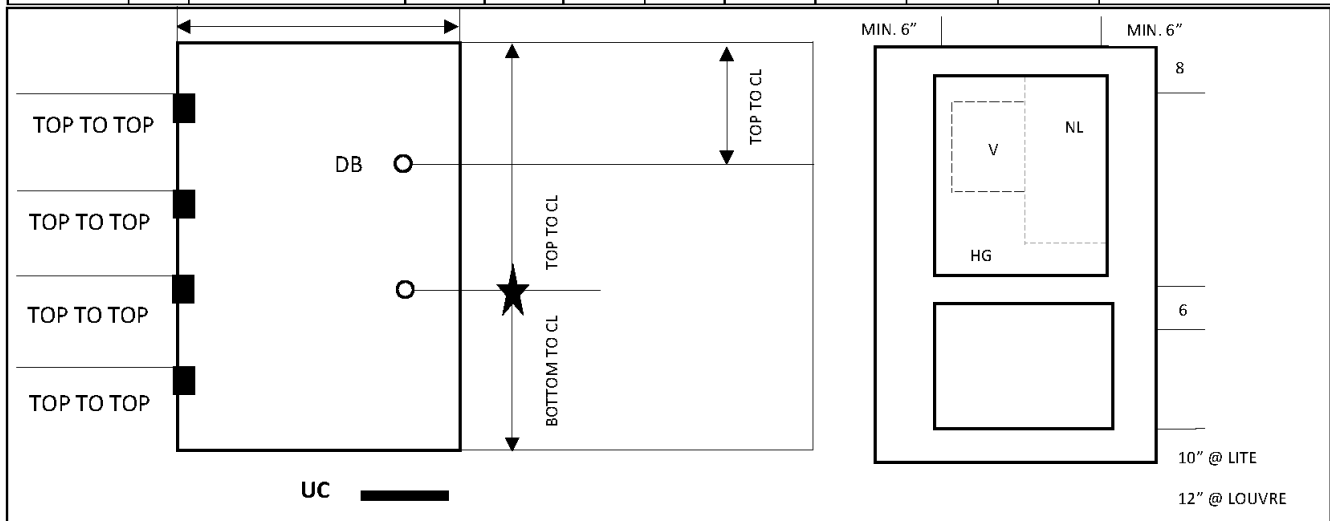
BV METAL FRAMES	**DOOR SHEET**	☐ QUOTE ☐ ORDER
PHONE # (403) 455 – 9161 FAX # (403) 455-9152		PAGE _____ OF _____

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.
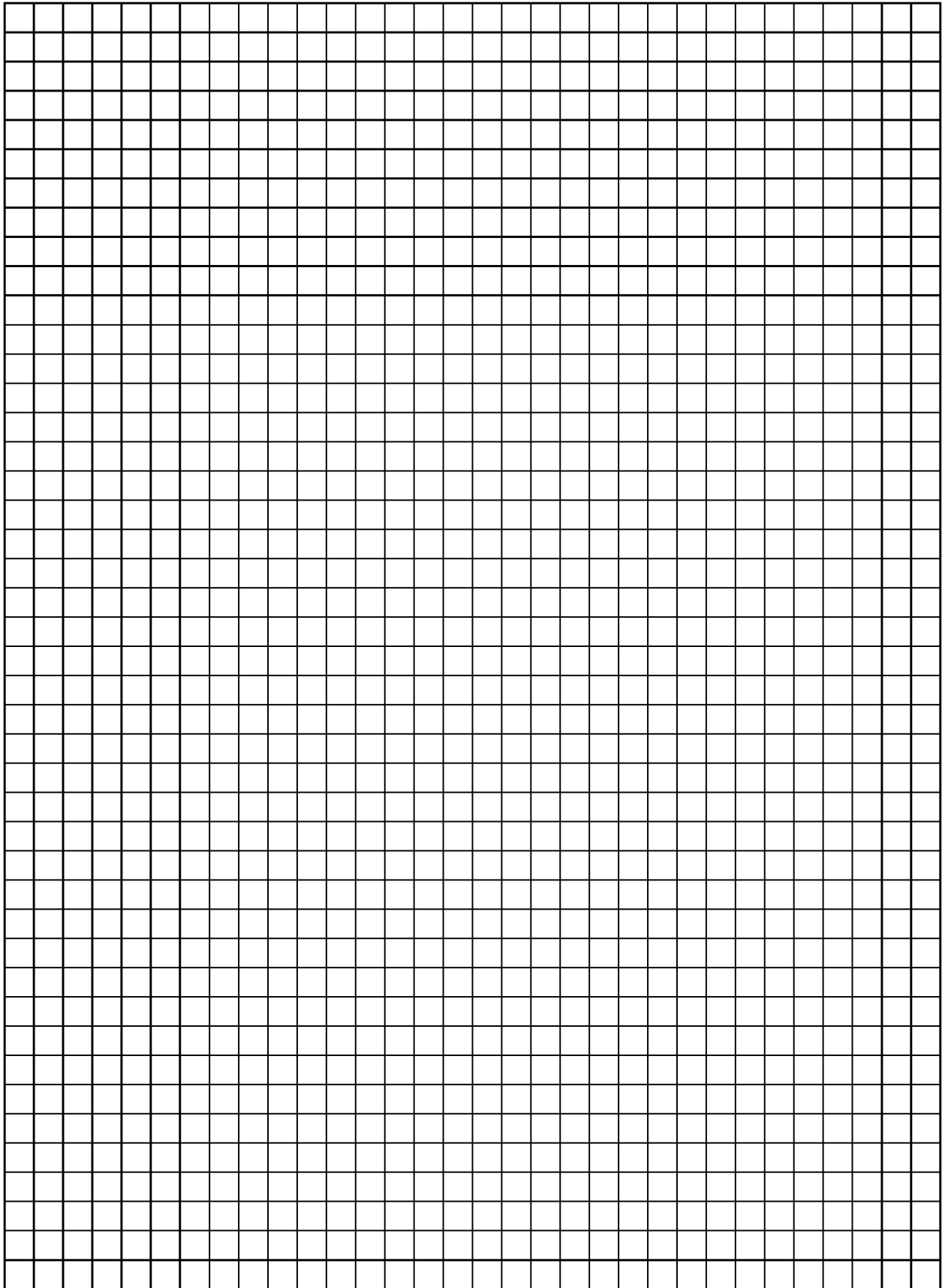
HANDOUT: Heating Systems (3 pages)
Skill Builders: Key Words & Phrases, Charts & Graphs, Tables & Lists

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.

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.

> 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

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.

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)

© 2002. Her Majesty the Queen in Right of Canada, Natural Resources Canada.
Sa Majesté la Reine du chef du Canada, Ressources naturelles Canada.

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

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?

   _____

Bow Valley College

Thermometers

Thermometer A   Thermometer B   Thermometer C   Thermometer D

Thermometer E   Thermometer F   Thermometer G   Thermometer H

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

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.
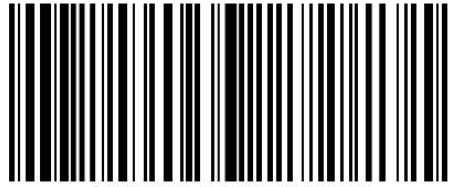
(00)123456789101112133

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.

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.

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-inch² 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

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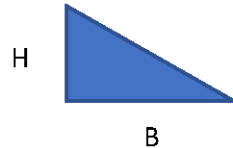
Recall: Volume of triangular prism = B (base) x L (length)

- 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.
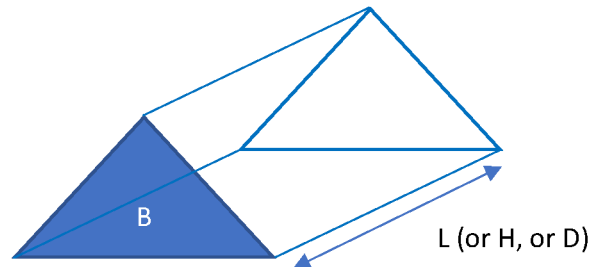
5. Assume the patio is a rectangle and the shortest side of the garden is 1/6 of the width of the finished patio. The longest side of the patio is 1.5 times the length of the shortest side. Using the graph paper on the next page, draw and label the patio including the new garden. Include information on the scale you use.
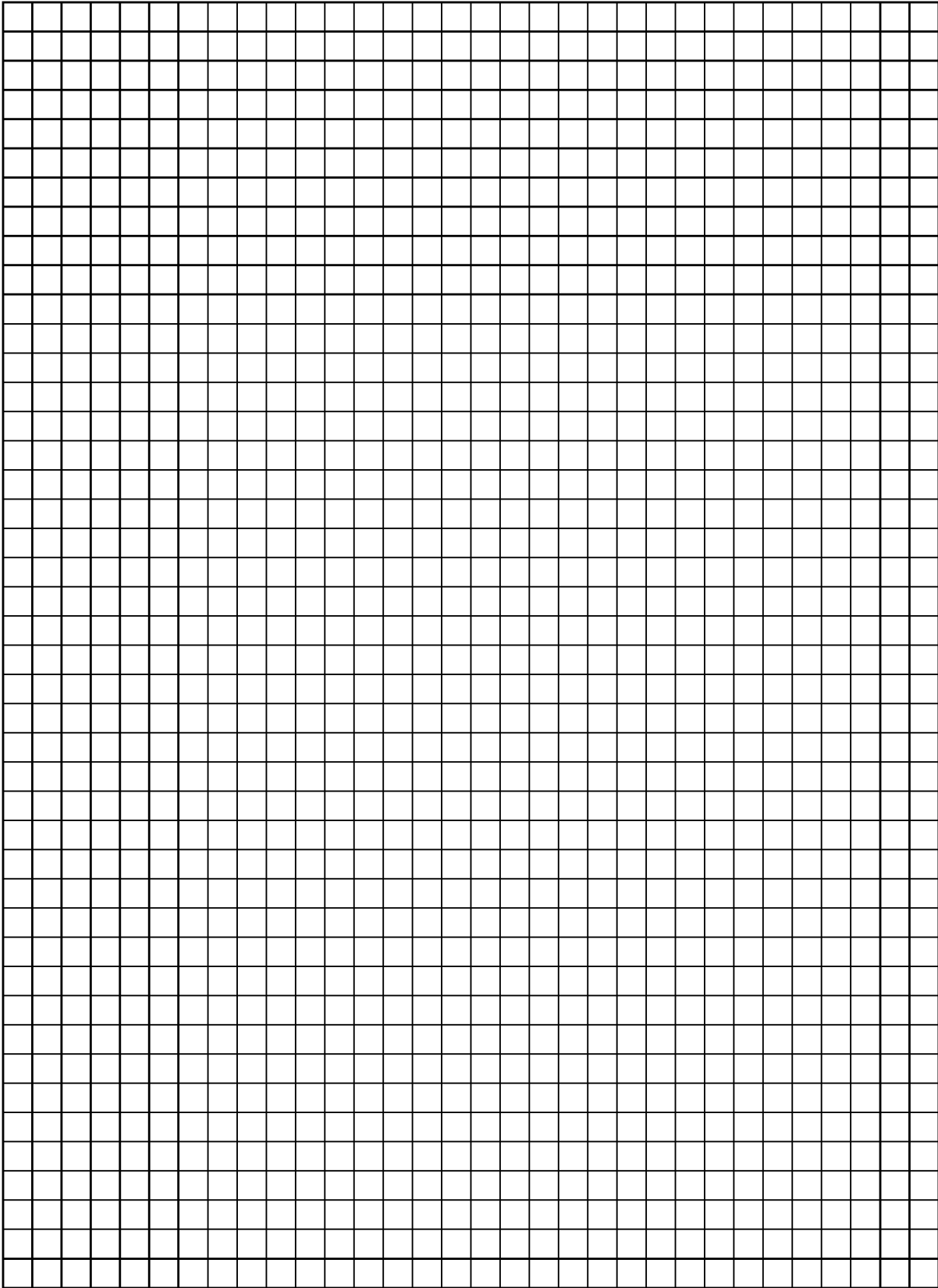
HANDOUTS: Pay Statements (3 pages)

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,

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

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. _____
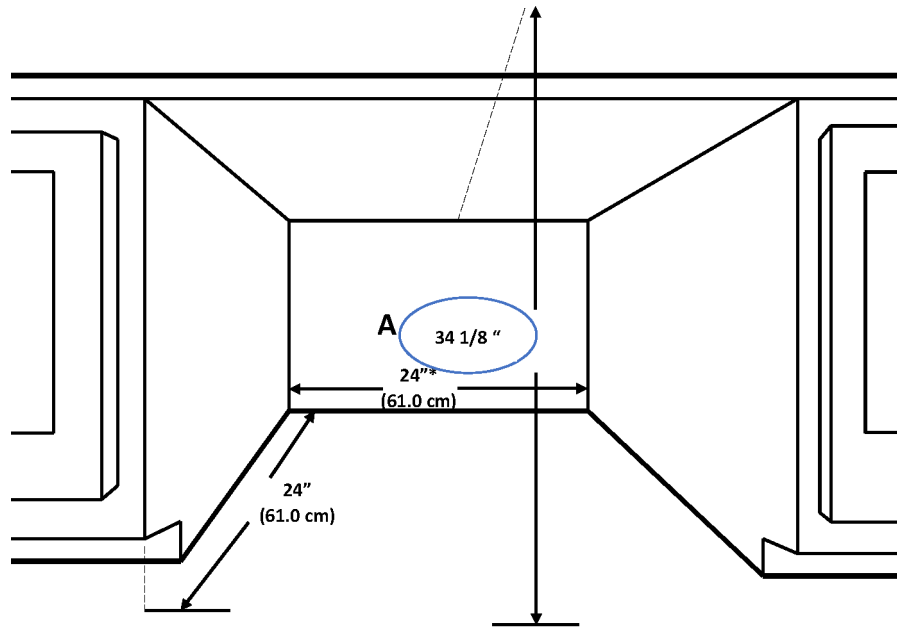
   B. _____

   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.
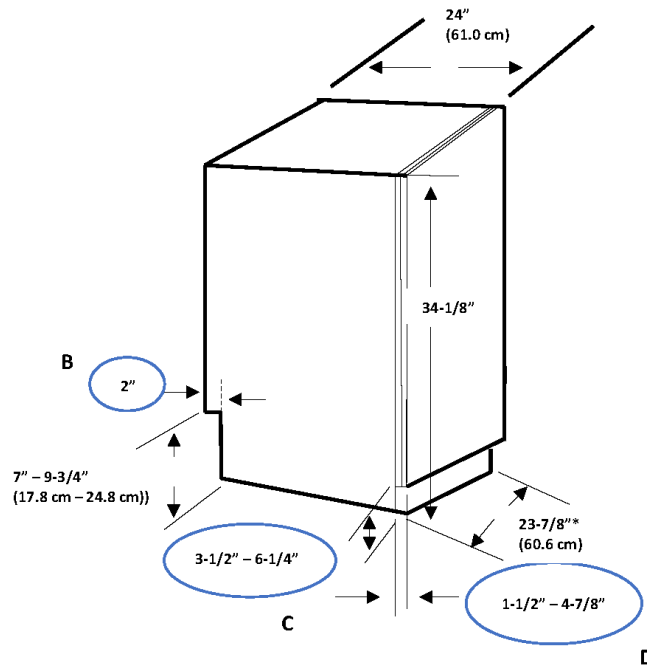
   _____

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

A 34 1/8 ”

24”*
(61.0 cm)

24”
(61.0 cm)

BASIC DIMENSIONS

24”
(61.0 cm)

34-1/8”

B 2”

7” – 9-3/4”
(17.8 cm – 24.8 cm))

3-1/2” – 6-1/4”

C

23-7/8”*
(60.6 cm)

1-1/2” – 4-7/8”

D

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

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

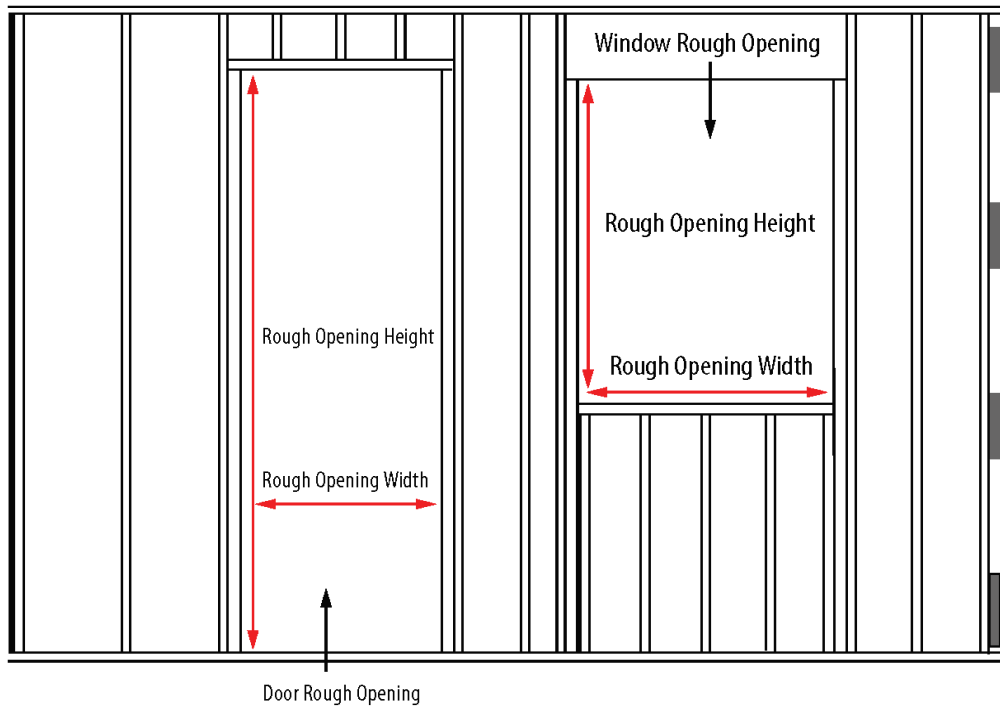   _____

   c) 84 ½" in feet

   _____

Bow Valley College

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 height for 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.

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 Outswing	Inswing Outswing

Bow Valley College

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.

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?

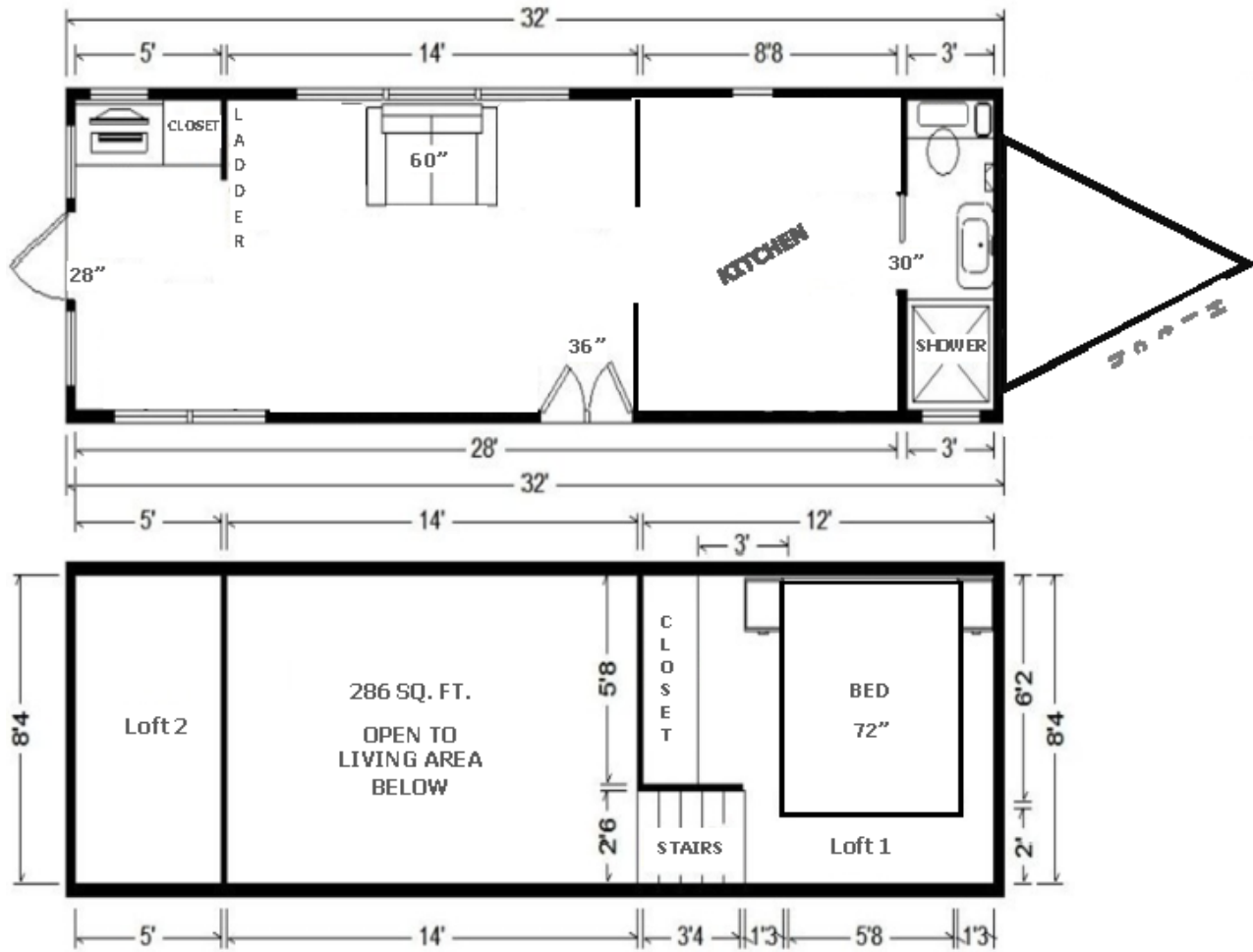5. What are the dimensions of the staircase?

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

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 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.

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 m³) and (1 L = 1000 mL)

h = 140 mm

d = 200 mm

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) Marshall Greg Topher	Lesley (Lead) Frank Ralf Jean	Joe (Lead) Toni Kim Steve Hester

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