

Name: \_\_\_\_\_

## UNIT 2 LEARNING GUIDE – MEASUREMENTS

## INSTRUCTIONS:

Using a pencil, complete the following questions as you work through the related lessons. Show ALL of your work as is explained in the lessons. Do your best and always ask questions if there is anything that you don't understand.

## 2.1 UNITS

1. Fill out the table below with the names and abbreviations of the units for distance for the metric and imperial measurement systems.

	Metric System	Abbr.	Imperial System	Abbr.
longest			mile	
↓		m		
↓				ft.
shortest	millimetre			

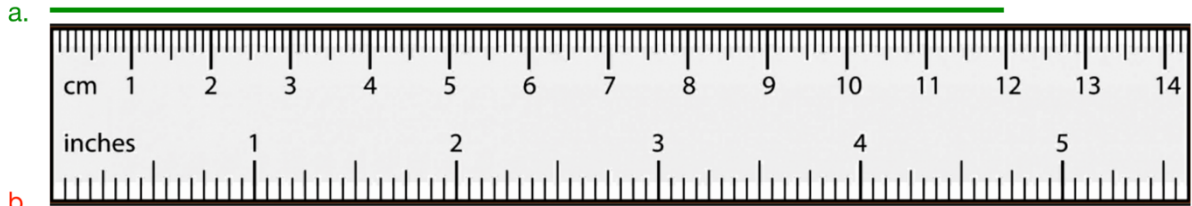
2. Determine the most appropriate unit to measure the following lengths. Use metric units only.

Ex. A football field    *metre*

- |  |   |
|--|---|
| <p>a. The distance between Vancouver and Calgary</p> <p>b. The height of a person</p> <p>c. The thickness of pencil lead</p> | <p>d. The length of a marathon</p> <p>e. The dimensions of a computer screen</p> <p>f. The length of an insect</p> <p>g. The height of a building</p> |
|--|---|

3. Measure the length of each line in centimetres, millimetres, and inches. *Reminder: Lengths smaller than an inch are measured in fractions of an inch. This ruler divides each inch into 16ths.*

Ex.



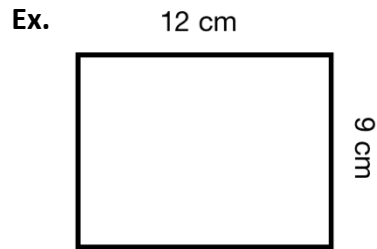
Ex. **4.3 cm, 43 mm,  $1\frac{11}{16}$  in.**

b. \_\_\_\_\_

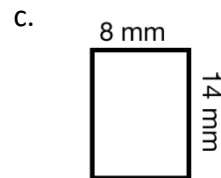
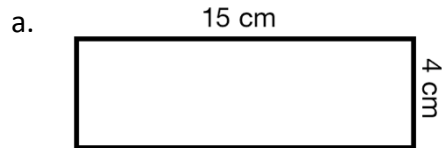
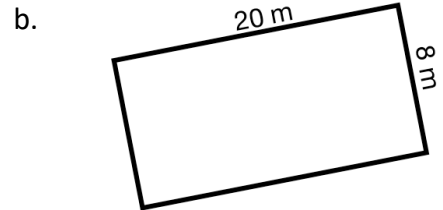
a. \_\_\_\_\_

c. \_\_\_\_\_

4. Calculate the area of the following rectangles. *Reminder: Always write out the formula for area for each question before you start to solve.  $A = l \times w$*



$A = l \times w$   
 $A = 12 \times 9$   
 $A = 108 \text{ cm}^2$



5. Calculate the area. Use the abbreviations for the units in your answer. *Reminder: When representing area, the units in the answer are always squared.*

a. A city block with length 38 metres and width 29 metres.

d. A square stamp with length 22 millimetres.

b. A farm with length 3.1 kilometre and width 2.3 kilometre.

e. A wall with length 13 feet and width 9.5 feet.

c. A piece of paper with length 11 inches and width 8.5 inches.

f. A square picture frame with length 45 centimetres.

6. In your own words, describe the difference between perimeter and area.

7. Calculate the perimeter of the rectangles in Question 4. *Reminder: Perimeter is measured in units (rather than units squared) as it is a measurement of distance.*

Ex.  $P = 12 + 12 + 9 + 9$   
 $P = 42 \text{ cm}$

b.

a.

c.

8. During a renovation, a home will get new carpets and new baseboards. Calculate the length of baseboard and area of carpet needed for each room. *Hint: Baseboard runs around the perimeter of the room.*

**Ex.** Living Room: This room measures 5.3 metres by 4.5 metres.

**Baseboard:**  $P = 5.3 + 4.5 + 5.3 + 4.5$

$$P = 19.6 \text{ m}$$

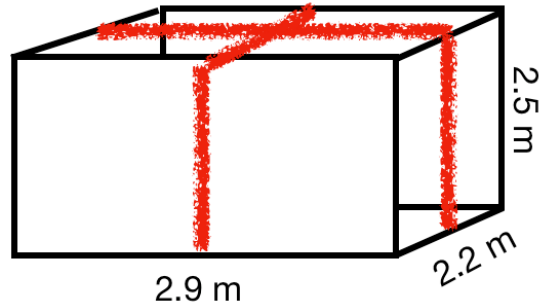
**Carpet:**  $A = l \times w$

$$A = 5.3 \times 4.5$$

$$A = 23.85 \text{ m}^2$$

- a. Master Bedroom: Measures 4.7 metres by 3.8 metres
- b. Office: Measures 3 metres by 2.4 metres
- c. What is the total amount of carpet and baseboard needed for the renovation of the living room, master bedroom, and office?
- d. The baseboard comes in 3 metre lengths. How many pieces of baseboard will need to be purchased for all three rooms?
- e. The carpet comes in rolls that can cover  $60 \text{ m}^2$ . Will one roll be enough for this renovation?

9. For a contest, a car dealership wants to wrap up a car like a gift. They will create a cardboard box to go around the car (even underneath). Use their plans for the box to answer the questions below.



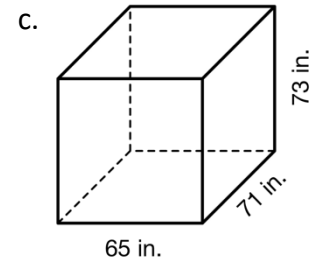
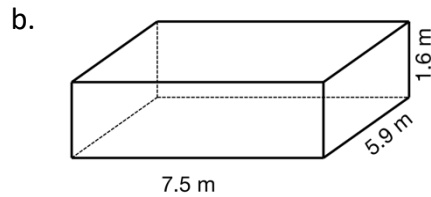
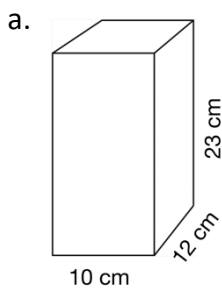
- a. Figure out how much cardboard is needed to accomplish this. *Hint: You will need to figure out the area for each side of the box.*
- b. The person doing the wrapping would like to add some ribbon. The ribbon will go all the way around the box (even on the bottom) as shown on the diagram. How much ribbon is needed?
- c. The ribbon comes in spools containing 8 metres of ribbon. How many spools will be needed?

10. Categorize the following terms under each diagram.

$V = l \times w \times h$	<b>1D</b>	$cm^3$	<b>Measured in units</b>
<b>Measured in <math>units^2</math></b>	<b>Flat Surface</b>	<b>2D</b>	<b><math>km</math></b>
<b>Volume</b>	<b>Measured in <math>units^3</math></b>	<b>Line</b>	<b><math>A = l \times w</math></b>
<b>3D</b>	<b>centimetres squared</b>	<b>Area</b>	<b><math>ft.</math></b>

	<i>Area</i>	

11. Calculate the volume of the following rectangular prisms. Reminder: The formula for calculating volume is  $V = l \times h \times w$



12. Calculate the volume of the following rectangular prisms. Use the abbreviations for the units in your answer. Round your answers to the nearest tenth. *Reminder: When representing volume, the units in the answer are always cubed.*

- a. A storage container with length 6 metres, width 2 metres and height 2.3 metres.
- b. A cistern with length 18 feet, width 13 feet and depth 9 feet.
- c. A microwave with length 20.75 inches, width 14.5 inches, and height 13.25 inches.
- d. A gas tank with length 48.8 cm, width 46.3 cm, and height 32.7 cm.

13. An in-ground pool is being built in the Hanner's backyard. The pool will be a rectangular prism with the following measurements: length 6.7 m, width 4.9 metres, and depth 1.8 m. Round your answers to the nearest hundredth.

- a. Draw a diagram of the pool.
- b. Calculate the total capacity of the pool.
- c. Calculate the amount of liner needed for the bottom and sides of the pool.

- d. Calculate the perimeter of the edge of the pool for rope light installation.
  
  
  
  
  
  
  
  
  
  
- e. Calculate the surface area of the water for the pool cover.
  
  
  
  
  
  
  
  
  
  
- f. In order to install the pool, the hole being dug needs to be 0.5 metres bigger than the pool dimensions under the bottom and around each of the sides of the pool. Calculate the approximate volume of dirt that will need to be removed from the site. Hint: Add to your diagram first.
  
  
  
  
  
  
  
  
  
  
- g. The pool will be filled to 0.15 metres from the top. Calculate the amount of water needed to fill the pool. Hint: Add to your diagram first.



<b>2.2 METRIC CONVERSIONS</b>
-------------------------------

1. Fill in the table.

Abbreviation	Mnemonic	Prefix	Example: <b>Metres</b>	Example: <b>Litres</b>	Example: <b>Grams</b>
<b>K</b>		Kilo-			
<b>H</b>					
<b>D</b>			Decametre (dam)		
<b>Base Unit</b>	—	none			Gram (g)
<b>D</b>			Decimetre (dm)		
<b>C</b>	Chase				
<b>M</b>				Millilitre (ml)	

2. Use the diagram below to answer the following questions.



- When converting from larger units to smaller units, the decimal moves to the \_\_\_\_\_ (right or left).
  - When converting from smaller units to larger units, the decimal moves to the \_\_\_\_\_ (right or left).
  - To convert millilitres to litres, move the decimal \_\_\_\_ place(s) to the \_\_\_\_\_.
  - To convert kilometres to metres, move the decimal \_\_\_\_ place(s) to the \_\_\_\_\_.
3. Convert. These questions all go from smaller units to bigger units. *Reminder: Move the decimal the number of required spaces, according to the mnemonic. You may have to add zeros as place holders.*
- 540 g = \_\_\_\_ kg
  - 78 mm = \_\_\_\_ cm
  - 422 cl = \_\_\_\_ L
  - 1575 mm = \_\_\_\_ m
  - 1800 mg = \_\_\_\_ g
  - 675.5 dl = \_\_\_\_ kL

4. Move the decimal of each quantity **three spaces to the right**. Write out the new amount and unit. Use the abbreviation for the unit.

a. 40 kg = \_\_\_\_\_

d. 7 hL = \_\_\_\_\_

b. 0.61 L = \_\_\_\_\_

e. 3.5 km = \_\_\_\_\_

c. 15.25 m = \_\_\_\_\_

f. 0.538 g = \_\_\_\_\_

5. Match each quantity with its equivalent.

a. **1540.7 L** \_\_\_\_\_ **15.407 dam**

b. **15 407 cm** \_\_\_\_\_ **1.5407 hm**

c. **1.5407 km** \_\_\_\_\_ **15.407 kg**

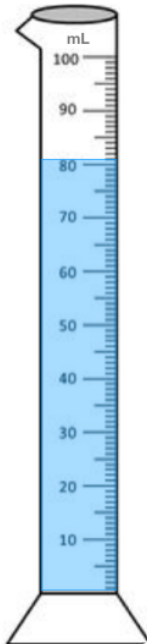
d. **1540.7 mL** \_\_\_\_\_ **154070 cm**

e. **15 407 g** \_\_\_\_\_ **15407 dL**

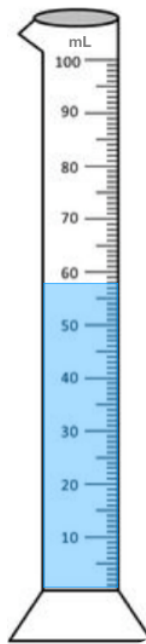
f. **0.15407 km** \_\_\_\_\_ **1.5407 L**

6. Measure the amount of liquid in each cylinder. State the amount in millilitres and litres.

*Reminder: The abbreviation for litres is a capital L, to avoid it looking like the number 1.*



a. \_\_\_\_\_  
\_\_\_\_\_



b. \_\_\_\_\_  
\_\_\_\_\_



c. \_\_\_\_\_  
\_\_\_\_\_



d. \_\_\_\_\_  
\_\_\_\_\_

## 2.3 OTHER CONVERSIONS

1. Circle the correct conversion factor to use for each of these conversions, then complete the conversion.

**Ex. 209 feet = 63.53 metres**

$$209 \text{ ft.} \times \frac{3.29 \text{ ft.}}{1 \text{ m}} \quad \text{or} \quad \left( 209 \text{ ft.} \times \frac{1 \text{ m}}{3.29 \text{ ft.}} \right) \quad \frac{209 \times 1}{3.29} = 63.53 \text{ m}$$

a. **17 metres = \_\_\_\_\_ feet**

$$17 \text{ m} \times \frac{1 \text{ m}}{3.28 \text{ ft.}} \quad \text{or} \quad 17 \text{ m} \times \frac{3.28 \text{ ft.}}{1 \text{ m}}$$

b. **1255 grams = \_\_\_\_\_ pounds**

$$1255 \text{ g} \times \frac{454 \text{ g}}{1 \text{ lb.}} \quad \text{or} \quad 1255 \text{ g} \times \frac{1 \text{ lb.}}{454 \text{ g}}$$

c. **5 gallons = \_\_\_\_\_ litres**

$$5 \text{ gal.} \times \frac{3.79 \text{ L}}{1 \text{ gal.}} \quad \text{or} \quad 5 \text{ gal.} \times \frac{1 \text{ gal.}}{3.79 \text{ L}}$$

2. Use a conversion factor to convert these units. Round your answers to the nearest hundredth. *Reminder: Set-up the conversion factor so that the units you don't want get cancelled out.*

$$1 \text{ in.} = 2.54 \text{ cm} \quad 1 \text{ mi.} = 1.61 \text{ km} \quad 1 \text{ kg} = 2.2 \text{ lbs.} \quad 1 \text{ oz.} = 29.57 \text{ mL}$$

**Ex.** 65 centimetres to inches

$$65 \text{ cm} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} = 35.59 \text{ in.}$$

d. 500 millilitres to fluid ounces

a. 18 centimetres to inches

e. 24 inches to centimetres

b. 13 miles to kilometres

f. 1 pound to kilograms

c. 118 pounds to kilograms

g. 100 kilometres to miles

3. Use dimensional analysis to confirm these calculations.

Ex. 1 day = 86 400 seconds **Correct**

$$1 \text{ day} \times \frac{24 \text{ hours}}{1 \text{ day}} \times \frac{60 \text{ min}}{1 \text{ hour}} \times \frac{60 \text{ sec}}{1 \text{ min}} = 86400 \text{ s}$$

a. 19 weeks = 3192 hours

b. 325 000 minutes = 0.62 years

c. 336 hours = 98 weeks

4. Use Question 3. c. to answer the following questions.

a. Determine the mistake that was made in the calculation below when converting 336 hours to weeks.

$$336\text{h} \times \frac{1\text{d}}{24\text{h}} \times \frac{7\text{d}}{1\text{w}} = 98 \text{ weeks}$$

b. Calculate the correct answer. (336 hours = ? weeks)

5. Density is often used as a conversion factor between mass and volume. For example, at room temperature, olive oil has a density of 0.91 grams per millilitre.  $\frac{0.91 \text{ g}}{1 \text{ mL}}$

a. What is the volume, to the nearest mL, of 150 grams of olive oil?

b. What is the mass, to the nearest gram, of 1 litre of olive oil?

2.4 APPLICATIONS
------------------

1. You need to fence a yard that measures 18 metres by 31 metres. The fencing you want is \$3/foot. What will the cost of the fencing be? The steps are outlined below.

$$1\text{ m} = 3.28\text{ ft.}$$

- a. Convert the measurements of the yard from metres to feet (round to the nearest foot).
  
  - b. Determine the measurement of the perimeter of the yard.
  
  - c. Determine cost of fencing.
2. You will be redoing the moulding around the windows and the door of your bedroom. You have 2 windows that measure  $110\text{ cm} \times 65\text{ cm}$ , and the door measures  $76\text{ cm} \times 198\text{ cm}$ . You do not install moulding along the base of the door. Moulding costs \$0.98 per foot. What will be the total cost of the moulding for this project? *Hint: Draw a diagram to begin solving.*

$$1\text{ m} = 3.28\text{ ft.}$$

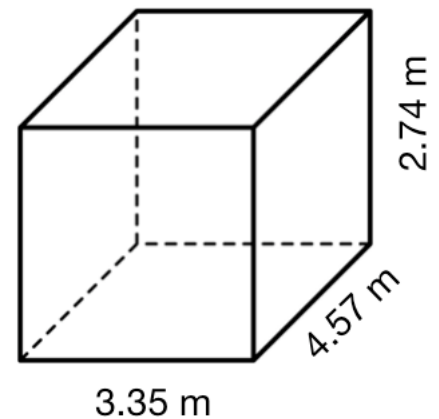
- a) What is the total amount of molding needed?
  
  
  
  
  
  
  
  
  
  
- b) What is the total cost?



4. A living room is being repainted and you need to determine how much paint to buy. The same colour will be used on all four walls and the ceiling and 2 coats will be applied to each surface. A 1-gallon can of paint will cover  $400 \text{ ft}^2$ . How many cans of paint need to be purchased?

$$1 \text{ m} = 3.28 \text{ ft.}$$

$$1 \text{ m}^2 = 10.76 \text{ ft}^2$$



5. A winemaker is making some adjustments to some wine that is fermenting in a large stainless-steel tank. She needs to add 35 grams of citric acid per 100 litres of wine. The tank is completely full and has the following dimensions: length 1.2 metres, depth 1.2 metres, and height 2 metres. How many grams of citric acid will she need to add in total?

$$1 \text{ m}^3 = 1000 \text{ L}$$

6. The wine in the tank from Question 5 comes out of the tap at a rate of 15 litres per minute. How long will it take to empty the tank when it is time to bottle the wine?



## UNIT 2 – ANSWER KEY

### SECTION 2.1

1.

	Metric System	Abbr.	Imperial System	Abbr.
longest	kilometre	km	mile	mi.
↓	metre	m	yard	yd.
↓	centimetre	cm	foot	ft.
shortest	millimetre	mm	inch	in.

2. a. km b. cm or m c. mm d. km e. cm f. mm g. m



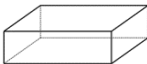
3. a. 12 cm, 120 mm,  $4\frac{3}{4}$  in. b. 7.3 cm, 73 mm,  $2\frac{7}{8}$  in. c. 9.7 cm, 97 mm,  $3\frac{13}{16}$  in.4. a.  $60\text{ cm}^2$  b.  $160\text{ m}^2$  c.  $112\text{ mm}^2$ 5. a.  $1102\text{ m}^2$  b.  $7.13\text{ km}^2$  c.  $93.5\text{ in.}^2$  d.  $484\text{ mm}^2$  e.  $123.5\text{ ft.}^2$  f.  $2025\text{ cm}^2$ 

6. The perimeter is the distance around the edges of something; whereas area is the amount of surface space that something has.

7. a. 38 cm b. 56 m c. 44 mm

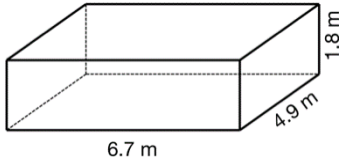
8. a. Baseboard: 17 m, Carpet:  $17.86\text{ m}^2$  b. Baseboard: 10.8 m, Carpet:  $7.2\text{ m}^2$ c. Baseboard: 47.4 m, Carpet:  $48.91\text{ m}^2$  d. 16 pieces e. Yes, one roll is enough.9. a.  $38.26\text{ m}^2$  b. 20.2 m c. 3 spools

10.

		
<ul style="list-style-type: none"> <li>- 1D</li> <li>- Line</li> <li>- Measured in units</li> <li>- ft.</li> <li>- km</li> </ul>	<ul style="list-style-type: none"> <li>- Area</li> <li>- Measured in <math>\text{units}^2</math></li> <li>- Flat surface</li> <li>- Centimetres squared</li> <li>- 2D</li> <li>- <math>A = l \times w</math></li> </ul>	<ul style="list-style-type: none"> <li>- <math>V = l \times w \times h</math></li> <li>- Volume</li> <li>- 3D</li> <li>- Measured in <math>\text{units}^3</math></li> <li>- <math>\text{cm}^3</math></li> </ul>

11. a.  $2760\text{ cm}^3$  b.  $70.8\text{ m}^3$  c.  $336\,895\text{ in.}^3$

12. a.  $27.6 m^3$  b.  $2106 ft.^3$  c.  $3986.6 in.^3$  d.  $73\,883.69 cm^3$

13. a.  b.  $59.09 m^3$  c.  $74.59 m^2$  d.  $23.20 m$  e.  $32.83 m^2$

f.  $104.49 m^3$  g.  $54.17 m^3$

## SECTION 2.2

1.

Abbreviation	Mnemonic	Prefix	Example: Metres	Example: Litres	Example: Grams
<b>K</b>	Kats	Kilo-	Kilometres (km)	Kilolitre (kL)	Kilogram (kg)
<b>H</b>	Hate	Hecto-	Hectometres (hm)	Hectolitre (hL)	Hectogram (hg)
<b>D</b>	Dogs	Deca-	Decametre (dam)	Decalitre (daL)	Decagram (dag)
<b>Base Unit</b>	—	none	Metres (m)	Litres (L)	Gram (g)
<b>D</b>	Dogs	Deci-	Decimetre (dm)	Decilitres (dL)	Decigram (dg)
<b>C</b>	Chase	Centi-	Centimetres (cm)	Centilitres (cL)	Centigram (cg)
<b>M</b>	Mice	Milli-	Millimetres (mm)	Millilitre (mL)	Milligram (mg)

2. a. Right b. Left c. 3, Left d. 3, Right

3. a. 0.54 b. 7.8 c. 4.22 d. 1.575 e. 1.8 f. 0.06755

4. a. 40 000 g b. 610 mL c. 15 250 mm d. 7000 dL e. 3500 m f. 538 mg

5. f, b, e, c, a, d

6. a. 81 mL, 0.081 L b. 58 mL, 0.058 L c. 150 mL, 0.15 L d. 980 mL, 0.98 L

## SECTION 2.3

1. a. 55.76 ft. b. 2.76 lbs. c. 18.95 L

2. a. 7.09 in. b. 20.93 km c. 53.64 kg d. 16.91 oz. e. 60.96 cm f. 0.45 kg  
g. 62.11 mi.

3. a. Correct b. Correct c. Incorrect (all work shown for each)

4. a. The conversion factor  $\frac{7d}{1w}$  should have been written the other way:  $\frac{1w}{7d}$ , so that the d (days) would cancel each other. b. 2 weeks

5. a. 165 mL b. 910 g

#### SECTION 2.4

1. a. 59 ft. by 102 ft. b. 322 ft. c. \$966.00
2.  $1172\text{cm} = 11.72\text{m}$ , \$37.67
3.  $13.5\text{ ft.}^2$ ,  $0.0625\text{ ft.}^2$ , 216 tiles, 7.2 boxes (or listed as 8)
4.  $58.71\text{ m}^2 = 631.73\text{ ft.}^2$ , 1.6 cans per coat, 3.2 cans total, 4 cans
5.  $2.88\text{m}^3 = 2.880\text{L}$ , 1008 g
6. 192 min. *or* 3 hours & 12 min.