- Systems of Measurement

Make Connections

In 1976, Canada adopted SI units to measure length. However, construction and manufacturing industries continue to use **imperial units**. Many Canadians use imperial units to measure their height.

What is your height?

Look around the classroom.
Which object has a length of about one foot?
Which object has a length of about one inch?
Which object has a length of about one yard?

Activate Prior Learning: SI Units

Common SI units of length are the metre, centimetre, and millimetre.

What are referents for these SI units?

Unit	Referent
millimetre	
centimetre	
metre	

1.2 Math Lab: Measuring Length and Distance

Systeme international d'unites (SI)

This is a measurement system commonly used in Canada. It is a decimal system based on multiples of 10. This means you can convert to other SI units simply by multiplying or dividing by a multiple of 10!

What are multiples of 10?

TABLE 1.5 Selected Prefixes Used in the Metric System

Prefix	Abbreviation	Meaning	Example
Giga	G	10^9	1 gigameter (Gm) $= 1 \times 10^9$ m
Mega	M	10^6	1 megameter (Mm) $= 1 \times 10^6$ m
Kilo	k	10^3	1 kilometer (km) $= 1 \times 10^3$ m
Deci	d	10^{-1}	1 decimeter (dm) $= 0.1$ m
Centi	c	10^{-2}	1 centimeter (cm) $= 0.01$ m
Milli	m	10^{-3}	1 millimeter (mm) $= 0.001$ m
Micro	μ^a	10^{-6}	1 micrometer (μm) $= 1 \times 10^{-6}$ m
Nano	n	10^{-9}	1 nanometer (nm) $= 1 \times 10^{-9}$ m
Pico	p	10^{-12}	1 picometer (pm) $= 1 \times 10^{-12}$ m
Femto	f	10^{-15}	1 femtometer (fm) $= 1 \times 10^{-15}$ m

[a]This is the Greek letter mu (pronounced "mew").

The imperial unit for measuring long distances is the mile. The length of one mile was first established as the distance a Roman soldier could walk in 1000 paces. One pace is 2 steps.

Imperial Unit	Abbreviation	Referent	Relationship between Units
Inch	in.	?	?
Foot	ft.		
Yard	yd.		
Mile	mi.		

Base Unit: a unit of measurement on which other units are based.
ex: length - meter (m); volume - litre (L); mass - gram (g)

Volume: the amount of space a solid occupies.

1.1 Imperial Measures of Length

Measurements using Imperial Units

What units would you use if you were to tell me your height and weight?

Imperial units are still used in many industries in Canada even though we have adopted SI units, also known as the metric system. The **imperial system** is ***not*** a decimal system as the measurements were all developed at different times to meet certain needs. Therefore, you must use a **conversion factor** to convert one imperial unit to another.

FIGURE 4.1
Some Common Imperial Units

Length	
Unit	*Abbreviation*
inch	in or "
foot	ft or '
yard	yd
mile	mi

5'6"

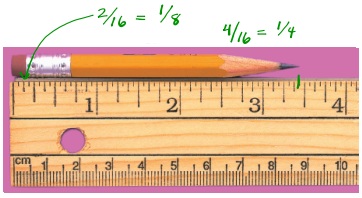
DISCUSSION...

Which imperial unit is the most appropriate unit to measure each item? Justify your choice.

a) the height of your desk
b) the thickness of a mattress
c) the width of a car
d) the length of a flat panel TV
e) the distance from the school to your home

1.1 Imperial Measures of Length

To measure the length of an object, first determine the smallest indicated unit by counting the number of divisions between two adjacent inch marks. The ruler below has ? divisions between two adjacent inch marks



The pencil point is closest to ?

?

A fraction of an imperial measure of length is usually written in fraction form, not decimal form.

1.1 Imperial Measures of Length

HOMEwork assignment...

Assignment - Measuring in an Imperial System.pdf

$2\frac{3}{4} - \frac{11}{4}$

$4\frac{5}{16} = \frac{69}{16}$

$3\frac{1}{3} = \frac{10}{3}$

$2\frac{5}{6} = \frac{17}{6}$

$41\frac{2}{3}''$ ooo 3×12=36

$3'5\frac{2}{3}''$

Improper Fractions ↔ Mixed Fractions

Improper Fractions	Mixed Fractions
$\frac{10}{3}$	$3\frac{1}{3}$
$\frac{27}{5}$	$5\frac{2}{5}$
$\frac{17}{4}$	$4\frac{1}{4}$
$\frac{231}{17}$	$13\frac{10}{17}$
$\frac{23}{3}$	$7\frac{2}{3}$
$\frac{37}{4}$	$9\frac{1}{4}$

Adding Mixed Numbers

ex $2\frac{1}{4} + 5\frac{2}{3}$

$7 \quad \frac{1}{4} + \frac{2}{3}$

$\frac{3}{12} + \frac{8}{12}$

$7\frac{11}{12}$

$\frac{9}{4} + \frac{17}{3}$ (×3, ×4)

$\frac{27}{12} + \frac{68}{12}$

$\frac{95}{12}$

$7\frac{11}{12}$

ex $6\frac{4}{5} - 2\frac{1}{3}$

$4 \quad \frac{4}{5} - \frac{1}{3}$

$4\frac{12}{15} - \frac{5}{15}$

$4\frac{7}{15}$

$\frac{34}{5} - \frac{9}{3}$

$\frac{102}{15} - \frac{45}{15}$

$\frac{57}{15}$

$3\frac{12}{15}$

Multiply / Dividing Fractions

ex $\frac{2}{3} \times \frac{4}{7} \rightarrow \frac{8}{21}$

ex $\frac{4}{8} \times \frac{1}{2} = \frac{4}{16} = \frac{1}{4}$

Dividing

$\frac{2}{3} \div \frac{4}{7}$

$\frac{2}{3} \times \frac{7}{4} \rightarrow \frac{14}{12} = \frac{7}{6}$

ex $4\frac{1}{7} \div 3$

$\frac{29}{7} \times \frac{1}{3}$

$\frac{29}{21} = 1\frac{8}{21}$

Imperial Conversions

We will be working with units for length. The smallest unit we will use is the inch, followed by a foot, followed by a yard, and finally a mile. ~~Read the top of page 143~~ and then copy and complete the table below.

IMPERIAL CONVERSION TABLE
1 foot = 12 inches
1 yard = 3 feet = 36 inches
1 mile = 1760 yards = 5280 feet

WARM-UP...Convert each of the following:

a) 78 in = 6 ft 6 in

b) 15 ft = 180 in

c) 2.5 mi = 58 400 inches

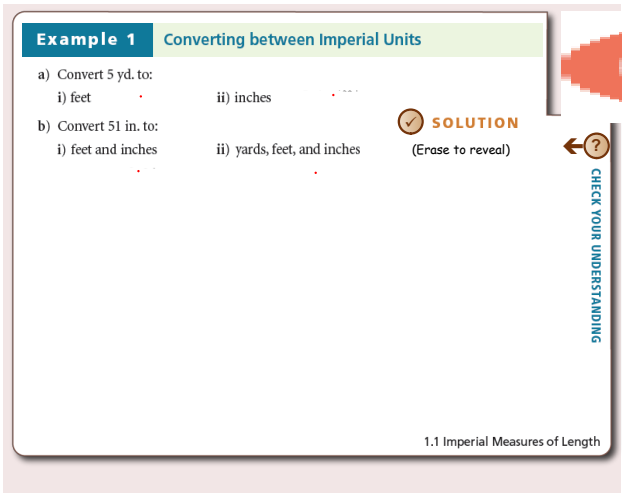
1 mile = 5280 feet
1 mile = 63 360 in

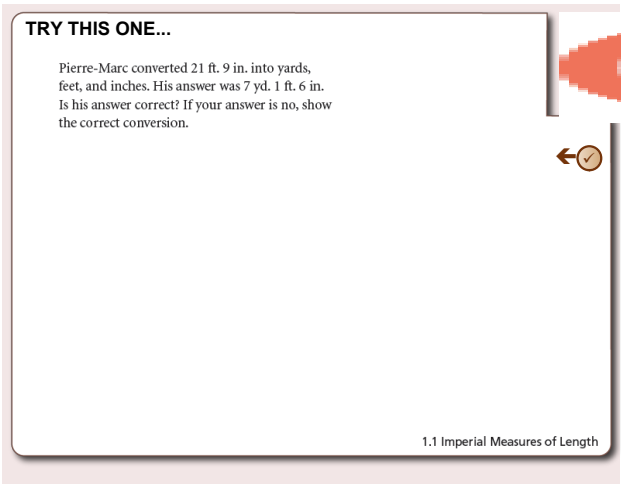
d) 250 " = 20.83 ft = 20 ft 10 inches

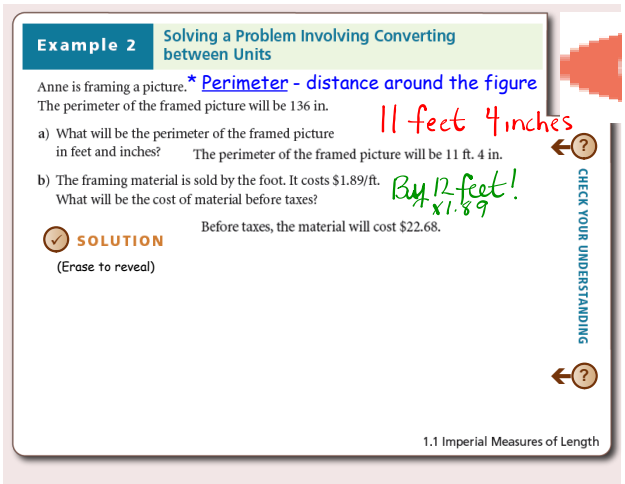
e) 500 yds = 1500 ft

f) 7' 2" = 2 yd 1 ft 2 in

g) 1 000 000 in = 15.8 mi







Example 3 Solving a Problem Involving Two Unit Conversions

The school council has 6 yd. of fabric that will be cut into strips 5 in. wide to make decorative banners for the school dance.

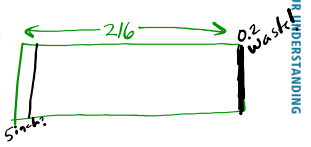
a) How many banners can be made?

SOLUTION

(Erase to reveal)

43 banners

6yd = 216 inches



CHECK YOUR UNDERSTANDING

1.1 Imperial Measures of Length

HOMEWORK...

Worksheet - Converting Imperial Lengths.docx

Do questions on p. 150 #1-6; 8

$A = \pi r^2$ $C = 2\pi r$

1 What is the length of the paper clip?

A 1 in.

B $1\frac{1}{8}$ in.

C $1\frac{1}{2}$ in.

WARM-UP...

A wallpaper border is to be pasted halfway up the wall around a child's bedroom.

a) What is the total length of border needed?

b) The border is purchased in 12-ft. rolls. How many rolls are required?

c) Each roll of border costs $12.49. How much will the border cost, before taxes?

12'9" + 8'1" + 8'1" + 12'6"

38' 14"

39' 2"

3 rolls → 36 feet

4 rolls → 48 feet

14. a) 39 ft. 2 in. b) 4 rolls c) $49.96

1.1 Imperial Measures of Length

4.2 - Converting Measurements

$60 \text{ miles} \times \frac{1.6093 \text{ km}}{1 \text{ mile}} = 96.6 \text{ km}$

Make Connections

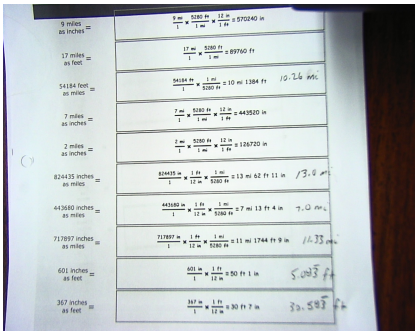
Two cars are driven in opposite directions from a Canada/United States border crossing.

In one hour, Hana drove 62 mi. south while Farrin drove 98 km north.

How could you determine which vehicle travelled farther from the border?

$\frac{62 \text{ miles}}{1} \times \frac{1.6093 \text{ km}}{1 \text{ miles}}$

99.7 km



Each measurement in the imperial system relates to a corresponding measurement in the SI system.

This table shows some approximate relationships between imperial units and SI units.

SI Units to Imperial Units	Imperial Units to SI Units
1 mm ≐ ?	1 in. ≐ ?
1 cm ≐ ?	1 ft. ≐ ?
	1 ft. ≐
1 m ≐ ?	1 yd. ≐ ?
1 m ≐	1 yd. ≐
1 km ≐ ?	1 mi. ≐ ?

We can use the data in the table above to convert between SI and imperial units of measure.

1.3 Relating SI and Imperial Units

THE CONVERSION FACTORS BETWEEN SI AND IMPERIAL UNITS

SI to Imperial	*Imperial to SI*
1 mm = 0.0394 in	1 in = 25.4 mm
1 cm = 0.3937 in	1 inch = 2.54 cm
1 m = 3.2808 ft	1 ft = 0.3048 m
1 m = 1.0936 yd	1 yd = 0.9144 m
1 km = 0.6214 mi	1 mi = 1.6093 km

MUST KNOW CONVERSIONS...

1 m = 1.0936 yd

1 m = 3.2808 ft

1 mi. = 1.6093 km

1 in. = 2.54 cm

PRACTICE: Concerting IMPERIAL to METRIC

Convert each measurement. Answer to the nearest tenth.

a) 16 in. to centimetres
b) 4 ft. to metres
c) 5 yd. to metres
d) 1650 yd. to kilometres
e) 6 mi. to kilometres
f) 2 in. to millimetres

2 ways

a) $\frac{16\text{ in}}{1} \times \frac{1\text{ cm}}{0.3937\text{ in}} = 40.6\text{ cm}$

$\frac{16\text{ in}}{1} \times \frac{2.54\text{ cm}}{1\text{ in}} = 40.6\text{ cm}$

b) $\frac{4\text{ ft}}{1} \times \frac{0.3048\text{ m}}{1\text{ ft}} = 1.2\text{ m}$

c) $\frac{5\text{ yd}}{1} \times \frac{0.9144\text{ m}}{1\text{ yd}} = 4.6\text{ m}$

d) $\frac{1650\text{ yd}}{1} \times \frac{1\text{ mi}}{1760\text{ yd}} \times \frac{1.6093\text{ km}}{1\text{ mi}} = 1.5\text{ km}$

$\frac{1650\text{ yd}}{1} \times \frac{1\text{ m}}{1.0936\text{ yd}} \times \frac{1\text{ km}}{1000\text{ m}} = 1.5\text{ km}$

e) $\frac{6\text{ miles}}{1} \times \frac{1.6093\text{ km}}{1\text{ mile}} = 9.7\text{ km}$

1.3 Relating SI and Imperial Units

PRACTICE: Converting METRIC to IMPERIAL

Convert each measurement.

a) 25 mm to the nearest inch
b) 2.5 m to the nearest foot
c) 10 m to the nearest yard
d) 150 km to the nearest mile

a) $\frac{25\text{ mm}}{1} \times \frac{0.0394\text{ in}}{1\text{ mm}} = 0.985\text{ inch}$

b) $\frac{2.5\text{ m}}{1} \times \frac{3.2808\text{ ft}}{1\text{ m}} = 8.202\text{ ft}$

c) $\frac{10\text{ m}}{1} \times \frac{1.0936\text{ yd}}{1\text{ m}} = 10.936\text{ yd}$

d) $\frac{150\text{ km}}{1} \times \frac{0.6214\text{ mi}}{1\text{ km}} = 93.21\text{ miles}$

1.3 Relating SI and Imperial Units

Example 1 Converting from Metres to Feet

A bowling lane is approximately 19 m long.

What is this measurement to the nearest foot?

SOLUTION

(Erase to reveal)

CHECK YOUR UNDERSTANDING

1.3 Relating SI and Imperial Units

HOMEWORK...

Worksheet - Converting Measurements.docx

WARM-UP...

The tallest structure in Canada is the CN Tower in Toronto. It is 553.3 m tall. The tallest structure in the United States is the Willis Tower, previously known as the Sears Tower, in Chicago. It is 1451 ft. tall.

a) Determine the height of the CN Tower in feet and the height of the Willis Tower in metres.

b) Which structure is taller? Explain how you know.

c) Determine the difference in the heights of the structures, in metres and to the nearest foot.

1.3 Relating SI and Imperial Units

HOMEWORK Solutions...

Name : _____ Score : _____

Teacher : _____ Date : _____

Converting English and Metric

1)	22	miles	=	35.41	kilometers
2)	12	yards	=	10.97	meters
3)	10	miles	=	16.09	kilometers
4)	12.12	miles	=	19.5	kilometers
5)	5.91	inches	=	15	centimeters
6)	9.84	yards	=	9	meters
7)	7	inches	=	17.78	centimeters
8)	3.83	yards	=	3.5	meters
9)	6.5	inches	=	16.5	centimeters
10)	5.28	miles	=	8.5	kilometers
11)	4.92	yards	=	4.5	meters
12)	4	miles	=	6.44	kilometers
13)	11	yards	=	10.06	meters
14)	2	yards	=	1.83	meters
15)	14.5	inches	=	36.83	centimeters
16)	17	inches	=	43.18	centimeters
17)	11.5	miles	=	18.51	kilometers
18)	20.23	yards	=	18.5	meters
19)	4.92	inches	=	12.5	centimeters
20)	13.05	miles	=	21	kilometers

Math-Aids.Com

Example 2 Converting between Miles and Kilometres

After meeting in Emerson, Manitoba, Hana drove 62 mi. south and Farrin drove 98 km north. Who drove farther?

SOLUTION

(Erase to reveal)

CHECK YOUR UNDERSTANDING

1.3 Relating SI and Imperial Units

Today: Warm up Pass in
Application Questions
Textbook questions for homework
P159 #1-4

Friday: Senteo quiz on conversions

TRY THIS ONE...

The Fraser River is approximately 1375 km long.
The Tennessee River is approximately 886 mi. long.
Which river is longer? Justify your answer.

1.3 Relating SI and Imperial Units

Example 3 Solving a Problem that Involves Unit Conversions

Alex is 6 ft. 2 in. tall. To list his height on his driver's license application, Alex needs to convert this measurement to centimetres.

What is Alex's height to the nearest centimetre?

SOLUTION

(Erase to reveal)

6 ft 2 inches
72 inches + 2 inches
74 inches $\times \frac{1\text{ cm}}{0.3937\text{ inches}}$
187.96 cm

CHECK YOUR UNDERSTANDING

1.3 Relating SI and Imperial Units

Example 4 Estimating and Calculating Using Unit Conversions

A truck driver knows that her semitrailer is 3.5 m high. The support beams of a bridge are 11 ft. 9 in. high. Will the vehicle fit under the bridge? Justify the answer.

SOLUTION

(Erase to reveal)

132 inches + 9 in
141 in $\times \frac{1\text{ ft}}{12\text{ inches}} \times \frac{0.3048\text{ m}}{1\text{ ft}}$
3.5814
support beam

CHECK YOUR UNDERSTANDING

1.3 Relating SI and Imperial Units

$1.68\text{ m} \times \frac{1\text{ ft}}{0.3048\text{ m}}$

5.51 feet

TRY THIS ONE...

A retail fabric store advertises a storewide sale. It lists a certain material for $0.89/yd. A fabric warehouse is selling the same material for $0.93/m.

a) Which store has the better price?

b) Use mental math and estimation to justify that the answer is reasonable.

(A) 1 meter ≐ $0.93

1 yard = 0.9144m

(B) $0.85 per yard.

LAND AREAS...

18. The imperial unit to measure an area of land is the *acre*. During the initial agricultural expansion of the western provinces, the Canadian government offered 160 acres of land free to settlers who were willing to immigrate to Canada. Today, Canada uses the *hectare* to measure land area:
1 hectare ≐ 2.471 acres

a) How many hectares did each settler receive?

b) One hundred sixty acres is a square with a side length of one-half a mile. How many hectares are in one square mile?

18. a) Approximately 65 hectares
b) Approximately 259 hectares

CHECK YOUR UNDERSTANDING

1. A Canadian football field is approximately 59 m wide.

What is this measurement to the nearest foot?

59 m × 3.2808 ft / 1 m

193.6 feet

CHECK YOUR UNDERSTANDING

2. After meeting in Osoyoos, B. C., Takoda drove 114 km north and Winona drove 68 mi. south. Who drove farther?

68 miles × 1 km / 0.6214 miles

109.4 km

CHECK YOUR UNDERSTANDING

3. Nora knows that she is 5 ft. 7 in. tall.

a) What height in centimetres will she list on her driver's license application?

b) Use mental math and estimation to justify that the answer is reasonable.

CHECK YOUR UNDERSTANDING

4. A truck driver knows that his load is 15 ft. wide. Regulations along his route state that any load over 4.3 m wide must have wide-load markers and an escort with flashing lights. Does this vehicle need wide-load markers? Justify your answer.

4.3 m × 3.2808 ft / 1 m = 14.1 ft

HOMEWORK...

Page 159: #1 – 4, 6, 8

Complete the table below...

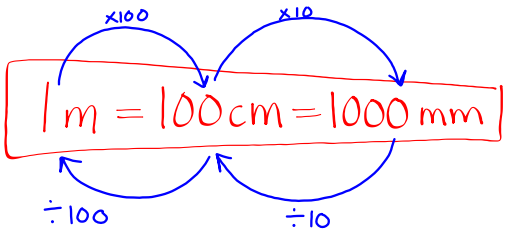
Object	mm	ft	yd	cm	in	m
Thickness of hardwood floor	19	0.062	0.0208	1.9	0.748	0.019
Height of a room	2743.2	9	3	274.32	108	2.7432
Width of a football field	50292	165	55	5029.2	1980	50.292
Length of a pencil	180	0.5905	0.197	18	7.08	0.18
Height of a table	736.6	2.4 2'5"	0.8055	73.66	29	0.7366
A home run in baseball	135 000	442.908	147.6	13500	5314.9	135

$0.019\ m \times \frac{3.2808\ ft}{1\ m}$ $165\ ft \times \frac{0.3048\ m}{1\ ft}$

SOLUTIONS...

Complete the table.

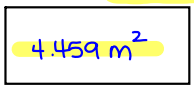
Object	mm	ft	yd	cm	in	m
Thickness of hardwood floor	19	0.0625	0.021	1.9cm	0.75	0.019
Height of a room	2743.2	9	3	274.32	108	2.74
Width of a football field	50 292	165	55	5029.2	1980	50.29
Length of a pencil	180	0.59	0.2	18	7.09	0.18
Height of a table	736.6	2.42	0.81	73.66	29	0.74
A home run in baseball	135000	442.91	147.64	13500	5314.8	135



Converting Squared Units...

Option #1 - Convert BEFORE area calculation.

EX #1: How many squared metres?



$4\ ft \times \frac{1\ m}{3.2808\ ft}$ 1.2192 1.2192 6

$12\ ft \times \frac{1\ m}{3.2808\ ft}$ 3.657644477...

1 m = 1.0936 yd
1 m = 3.2808 ft
1 mi. = 1.6093 km
1 in. = 2.54 cm

Option #2 - Convert AFTER area calculation.

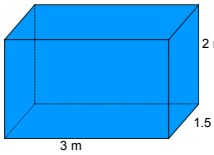
$A = lw = (12)(4) = 48$ square feet $\quad \frac{48\ ft^2}{1} \times \frac{1\ m}{3.2808\ ft} \times \frac{1\ m}{3.2808\ ft}$

$4.459 = m^2$

RULE: When converting squared units...
SQUARE THE CONVERTER!!!

What about cubed units???

EX #2: How many cubic yards?



$V = lwh = (3m)(1.5m)(2m) = 9m^3$

RULE: When converting cubed units...
CUBE THE CONVERTER!!!

$9m^3 =$ _____ cubic yards

$1m = 1.0936$ yards

$9m^3 \times \frac{(1.0936\ yards)^3}{(1m)^3}$

11.77 cubic yards

MORE EXAMPLES...

1) $22\ m^2 =$ _____ ft^2

2) $1.75\ mi^2 =$ _____ km^2

3) $2400\ cm^2 =$ _____ in^2

4) $750\ yd^2 =$ _____ m^2

5) $315\ yd^3 =$ _____ m^3

6) $15\ m^3 =$ _____ ft^3

7) $0.5\ mi^3 =$ _____ km^3

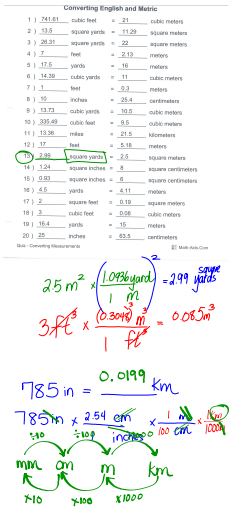
8) $2450\ mm^3 =$ _____ in^3

HOMEWORK...

Worksheet - Converting Squared and Cubed Units.docx

page 159: #5, 7, 9

HOMEWORK SOLUTIONS...



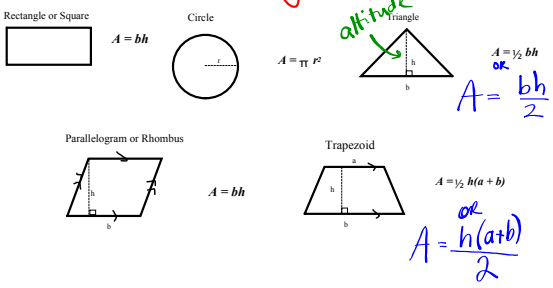
4.3 - Surface Area

Make Connections

The ancient pyramids at Giza, Egypt, were built about 4500 years ago.

This pyramid has a square base with a side length of 755 feet. The original height of the pyramid was 481 feet. Archeologists believe that the pyramid was once covered with a white limestone casing. How could you calculate the area that was once covered with limestone?

AREA Formulas... copy on pink sheet

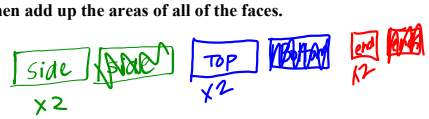


Surface Area

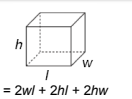
Surface area is the total area of all of the faces of the object.

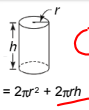
Steps need to find Surface area are:

1. **Draw all of the faces with dimensions displayed on them.**
2. **Find the area of each face.**
3. **Then add up the areas of all of the faces.**



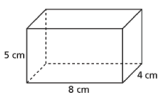
Activate Prior Learning: Surface Areas of Right Prisms and Cylinders

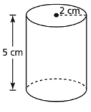




O + O + □ (2πr) h

Which object below has the greater surface area?





SA = O + O + □

$= 2\pi(2cm)^2 + 2\pi(2cm)(5cm)$

$= 25.13cm^2 + 62.8cm^2$

$= 87.96cm^2$

$SA = 2(8cm \times 4cm) + 2(8cm \times 5cm) + 2(4cm \times 5cm)$

$= 2(32cm^2) + 2(40cm^2) + 2(20cm^2)$

$= 64cm^2 + 80cm^2 + 40cm^2$

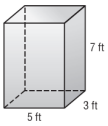
$= 184cm^2$

The surface area of a prism is equal to the sum of the areas of its faces. For a rectangular prism with length ℓ, width w, and height h, the surface area is $S = 2\ell w + 2\ell h + 2wh$.

EXAMPLE 1 **Find the surface area of the rectangular prism.**

$S = 2\ell w + 2\ell h + 2wh$

Surface area of a prism
$\ell = 3$, $w = 5$, $h = 7$
Simplify.



erase for answer

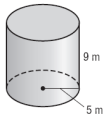
SOLUTION
(Erase to reveal)

The surface area S of a cylinder with height h and radius r is the area of the two bases plus the area of the curved surface, or $S = 2\pi r^2 + 2\pi rh$.

EXAMPLE 2 **Find the surface area of the cylinder. Round to the nearest tenth.**

$S = 2\pi r^2 + 2\pi rh$

Surface area of a cylinder
$r = 5$, $h = 9$
Simplify.

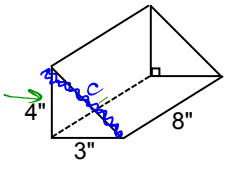


erase

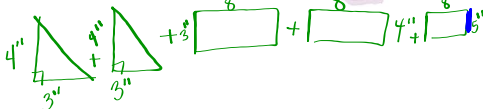
SOLUTION
(Erase to reveal)

EXAMPLE #3:

ANOTHER FORMULA...



$c^2 = 4^2 + 3^2$
$c^2 = 16 + 9$
$c^2 = 25$
$c = 5$



$A = \frac{bh}{2}$

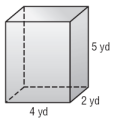
$= (3")(4") + (3")(8") + (8")(4") + (8")(5")$

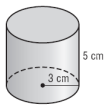
$12 + 24 + 32 + 40$

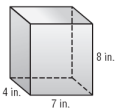
108 square inches

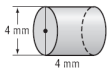
EXERCISES

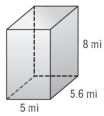
Find the surface area of each solid. Round to the nearest tenth if necessary.

1. 

2. 

3. 

4. 

5. 

6. 

7. rectangular prism: length, 2.3 in.; width, 7 in.; height, 8 in.

8. cylinder: radius, 4 cm; height, 8.2 cm

Solutions...

1) 76 yd² 2) 150.8 cm² 3) 232 in² 4) 75.4 mm²
5) 225.6 mi² 6) 505.2 km² 7) 181 in² 8) 306.6 cm²

Homework...

Worksheet - Surface Area of Prisms and Cylinders.docx

Solutions...

1) 88 ft² 2) 169.6 in² 3) 96 mm² 4) 276.5 yd²
5) 361.4 cm² 6) 304 m² 7) 210 mi² 8) 325.8 km²
9) 464.0 ft² 10) 558 m² 11) 378 cm² 12) 1164.9 in²
13) 726 m² 14) 1043.6 cm² 15) 1441.1 mm² 16) 2339.9 in²

9. diameter = 10.4 ft r = 5.2
height = 9 ft

$SA = 0 + 0 +$ ☐

$\pi r^2 + \pi r^2 + 2\pi rh$

$2\pi(5.2)^2 + 2\pi(5.2)(9)$

463.950

464.0 ft²

$2\pi r^2 + 2\pi rh$

$2\pi r(r + h)$

$2\pi(5.2)(5.2 + 9)$

The triangular sides of a pyramid are called **lateral faces**. The altitude or height of each lateral face is called the **slant height**. The surface area of a pyramid is the sum of the areas of the lateral faces, or **lateral area**, plus the area of the base.

EXAMPLE 1 **Find the surface area of the square pyramid.**

Find the lateral area and the base area.

Area of each lateral face

$A = \frac{1}{2}bh$ Area of a triangle
$A = \frac{1}{2}(4)(5)$ $b = 4$, $h = 5$
$A = 10$ Simplify.

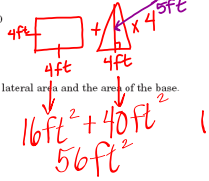
There are 4 faces, so the lateral area is $4(10)$ or 40

Area of base

$A = s^2$ Area of a square
$A = 4^2$ or 16 $s = 4$

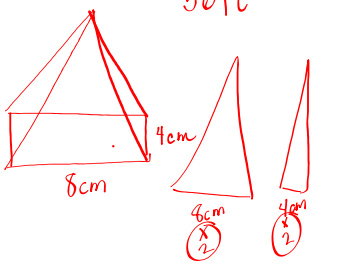
The surface area of the pyramid is the sum of the lateral area and the area of the base.

SOLUTION
(Erase to reveal)



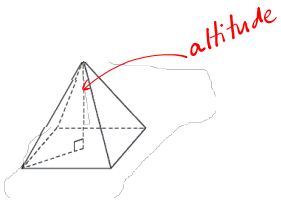
$16\text{ft}^2 + 40\text{ft}^2$

56ft^2

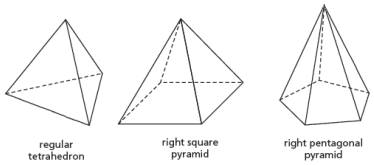


A **right pyramid** is a 3-dimensional object that has triangular faces and a base that is a polygon. ?
The shape of the base determines the name of the pyramid. ?
The triangular faces meet at a point called the apex. ?
The *height* of the pyramid is the perpendicular distance from the apex to the centre of the base. ?

90° = right angle

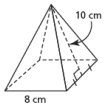


When the base of a right pyramid is a regular polygon, the triangular faces are congruent. Then the **slant height** of the right pyramid is the height of a triangular face.
?



The surface area of a right pyramid is the sum of the areas of the triangular faces and the base.

This right square pyramid has a slant height of 10 cm and a base side length of 8 cm.
?



The area, *A*, of each triangular face is:

$A = \frac{1}{2}(8)(10)$

$A = 40$

The area, *B*, of the base is:

$B = (8)(8)$

$B = 64$

So, the surface area, *SA*, of the pyramid is:

$SA = 4A + B$

$SA = 4(40) + 64$

$SA = 224$

The surface area of the pyramid is 224 cm^2.

Example 1 Determining the Surface Area of a Regular Tetrahedron Given Its Slant Height

Jeanne-Marie measured then recorded the lengths of the edges and slant height of this regular tetrahedron. What is its surface area to the nearest square centimetre?

$A = \frac{bh}{2} = \frac{(9\text{cm})(7.8\text{cm})}{2} = 35.1\text{ cm}^2$

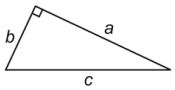
SOLUTION
(Erase to reveal)

$SA = 4(35.1\text{cm}^2)$
$= 140.4\text{ cm}^2$

CHECK YOUR UNDERSTANDING

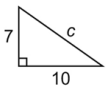
Activate Prior Learning:
The Pythagorean Theorem

In any right triangle, the sum of the squares of the two shorter sides is equal to the square of the longer side.



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

What is the unknown length in this right triangle?



Example 2 Determining the Surface Area of a Right Rectangular Pyramid

A right rectangular pyramid has base dimensions 8 ft. by 10 ft., and a height of 16 ft. Calculate the surface area of the pyramid to the nearest square foot.

SOLUTION
(Erase to reveal)

CHECK YOUR UNDERSTANDING

rcular base and a

the apex to the base. ?
curved surface
base. ?

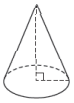
Surface Area of a Right Cone

Surface area = lateral area + base area

For a right cone with slant height s and base radius r:

$SA = \pi rs + \pi r^2$

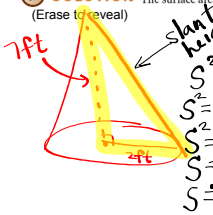
A right circular cone is usually called a **right cone**.



Example 3 Determining the Surface Area of a Right Cone

A right cone has a base radius of 2 ft. and a height of 7 ft.
Calculate the surface area of this cone to the nearest square foot.

SOLUTION The surface area of the cone is approximately 58 square feet.
(Erase to reveal)



$S^2 = 7^2 + 2^2$
$S^2 = 49 + 4$
$S^2 = 53$
$S = \sqrt{53}$
$S \doteq 7.28$

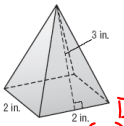
$SA = \pi rs + \pi r^2$
$= \pi(2ft)(\sqrt{53}ft) + \pi(2ft)^2$
$= 58.3$ feet

CHECK YOUR UNDERSTANDING

EXERCISES

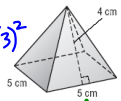
Find the surface area of each solid. Round to the nearest tenth if necessary.

1.



2.

3.



$\pi rs + \pi r^2$ $\pi(3)(2) + \pi(3)^2$

$\square + \triangle$ $(2in)(2in) + \frac{1}{2}(3in \times 2in)$

$\square + \triangle$ $(5cm)^2 + \frac{1}{2}(5 \times 4)$

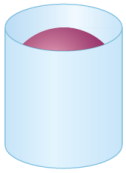
Solutions...

1) 16 in^2 2) 47.1 mm^2 3) 65 cm^2

What about a sphere???

The surface area of a sphere is related to the curved surface area of a cylinder that encloses it. ?

?



If the curved surface of the cylinder is made from paper, it can be cut and pasted on the surface of the sphere to cover it.

First.....
Rearranging Equations

$A = bh$ $\frac{A}{b} = \frac{bh}{b}$ $\frac{A}{b} = h$

$30m^2$ | x? height
10 m
base

ex 2: $C = 2\pi r$ $\frac{C}{2\pi} = \frac{2\pi r}{2\pi}$ $\frac{C}{2\pi} = r$

ex. $A = \pi r^2$ $\frac{A}{\pi} = \frac{\pi r^2}{\pi}$ $\frac{A}{\pi} = r^2$ $\sqrt{\frac{A}{\pi}} = r$

ex $A = \frac{1}{2}bh$ or $2A = bh$ $\frac{2A}{h} = \frac{bh}{h}$ $\frac{2A}{h} = b$

ex. $A = \pi r s$ $\frac{A}{\pi r} = \frac{\pi r s}{\pi r}$ $\frac{A}{(\pi r)} = s$

$A \div \pi \div r$
$A \div (\pi r)$

The curved surface area,
$SA_C = 2\pi rh$

?

???

So, this is also the formula for the surface area of a sphere with radius r.

Surface Area of a Sphere

The surface area, SA, of a sphere with radius r is:
$SA = 4\pi r^2$

ere

Example 1 Determining the Surface Area of a Sphere

The diameter of a baseball is approximately 3 in.
Determine the surface area of a baseball to the nearest square inch.

$S = 4\pi r^2$

SOLUTION

(Erase to reveal)

$d = 3$ inches
$r = 1.5$ inches

$SA_{sphere} = 4\pi(1.5")^2$
$= 28.27\ in^2$
$= 28\ in^2$

1.6 Surface Area and Volume of a Sphere

CHECK YOUR UNDERSTANDING

1. The diameter of a softball is approximately 4 in.
Determine the surface area of a softball to the nearest square inch.

1.6 Surface Area and Volume of a Sphere

Homework...

Worksheet - Surface Area of Pyramids and Cones.pdf

Solutions...

give you the base!

1) 113.1 in² 2) 40 m² 3) 188.5 mm² 4) 63.3 yd²
5) 84 ft² 6) 263.9 cm² 7) 208 m² 8) 301.6 in²
9) 123.7 ft² 10) 263.2 mm² 11) 95.7 cm² 12) 210 yd²
13) 74.4 cm² 14) 152 yd² 15) 857.7 in²

Example 2 Determining the Diameter of a Sphere

The surface area of a lacrosse ball is approximately 20 square inches.
What is the diameter of the lacrosse ball to the nearest tenth of an inch?

SOLUTION

(Erase to reveal)

$SA = 20\ in^2$

$SA = 4\pi r^2$
$\frac{SA}{4\pi} = r^2$
$\sqrt{\frac{SA}{4\pi}} = r$
$\sqrt{\frac{20}{4\pi}} = r$
$1.26 = r$

$20 \div (4\times\pi)$
$20 \div 4 \div \pi$

$d = 2.5$

1.6 Surface Area and Volume of a Sphere

CHECK YOUR UNDERSTANDING

2. The surface area of a soccer ball is approximately 250 square inches.
What is the diameter of a soccer ball to the nearest tenth of an inch?

$SA = 4\pi r^2$
$\sqrt{\frac{SA}{4\pi}} = r$
$\sqrt{\frac{250}{4\pi}} = r = 4.460$
$d = 8.9$

1.6 Surface Area and Volume of a Sphere

Example 4 Determining an Unknown Measurement

The lateral area of a cone is 220 cm². The diameter of the cone is 10 cm. Determine the height of the cone to the nearest tenth of a centimetre.

SOLUTION (Erase to reveal)

The height of the cone is approximately

CHECK YOUR UNDERSTANDING

1.4 Surface Areas of Right Pyramids and Right Cones

Surface Area Application

The roof of Juan's house is a triangular prism. The two long rectangular sides and the triangular front and back of the roof need to be reshingled. The roof measures 65 ft long and the slant height is 27 ft. The front and back triangles have a base of 50 ft and a height of 8 ft. The contractor charges $500.00 for labour and the shingles are sold in bundles that cover 40 ft² which each cost $15.99. What is the total cost to shingle the roof?

HOMEWORK...

Worksheet - Surface Area of 3D Objects.doc

5.

WARM-UP...

The centre of a doughnut is removed and formed to make a sphere of dough with diameter 2.5 cm. A batch of these spheres is to be covered in a sugar glaze. There is enough glaze to cover an area of 4710 cm². How many spheres can be glazed?

1.6 Surface Area and Volume of a Sphere

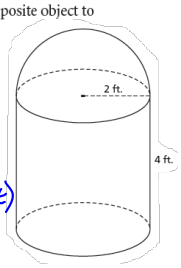
Determining the Surface Area of a Composite Object

To calculate the surface area of a composite object, the first step is to determine the faces that comprise the surface area. Then calculate the sum of the areas of these faces.

EXAMPLE #1: Determine the surface area of this composite object to the nearest square foot.

SOLUTION

(Erase to reveal)



sphere top + bottom + rectangle

$2\pi r^2 + \pi r^2 + 2\pi rh$

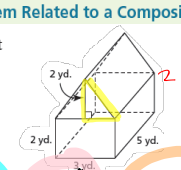
$2\pi(2\text{ft})^2 + \pi(2\text{ft})^2 + 2\pi(2\text{ft})(4\text{ft})$

87.96ft^2

The surface area of the composite object is approximately 88 square feet.

EXAMPLE #2: Solving a Problem Related to a Composite Object

A cabane à sucre is a composite object formed by a rectangular prism with a right triangular prism as its roof. Determine the surface area of the cabane à sucre in square yards.



SOLUTION

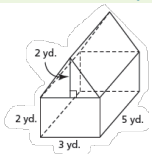
(Erase to reveal)

$(3)(2)(2) + (5\times2)(2) + \left(\frac{3\times2}{2}\right)(2) + (2.5\times5)(2)$

$= 63$ square yards

EXAMPLE #2: Solving a Problem Related to a Composite Object

A cabane à sucre is a composite object formed by a rectangular prism with a right triangular prism as its roof. Determine the surface area of the cabane à sucre in square yards.

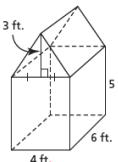


SOLUTION

(Erase to reveal)

TRY THIS ONE...

A tool shed is formed by a rectangular prism with a triangular prism as its roof. Determine the surface area of the tool shed to the nearest square foot.



$2\times(4\times5) + 2\times(6\times5) + 2\left(\frac{3\times4}{2}\right) + 2(6\sqrt{13})$

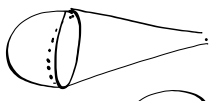
155.3 square feet

HOMEWORK...

Worksheet - Finding Surface Area of a Composite Object.docx

Practice - Converting Measurements.pdf

1 d)

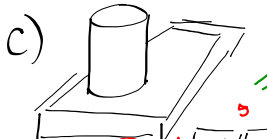


$\frac{4\pi r^2}{2} + \pi rs$

$2\pi(4\text{in})^2 + \pi(4\text{in})(17\text{in})$

314.159

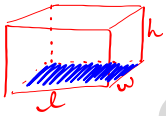
c)



$2\pi(1)(4) + (4\times1) + 2(5\times5)$

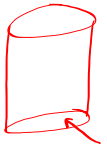
95.1 in^2

V_{prism} = Area of base × h



$V = \ell w h$

$V_{pyramid} = \frac{1}{3}$ Area of base × h

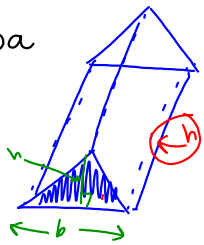


$V_{cylinder}$ = Area of base × h = $\pi r^2 h$

$V_{cone} = \frac{\text{Area of base} \times h}{3}$

$V_{sphere} = \frac{4}{3}\pi r^2$

3a

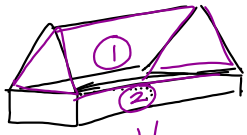


$A_{base} \times h$

$\frac{bh}{2} \times h$

3c) $V_{pyramid} = \frac{1}{3} A_{base} \times h$

$\frac{1}{3}\left(\frac{bh}{2}\right) \times h$



3e) $V_{①} + V_{②}$

$A_{base} \times h + A_{base} \times h$

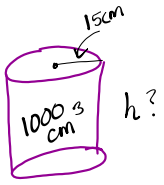
$\left(\frac{bh}{2}\right) \times h + (\ell w) \times h$

$V = \pi r^2 h$

$\frac{V}{\pi r^2} = h$

$\frac{1000 cm^3}{\pi (15cm)^2} = h$

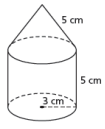
$cm = h$



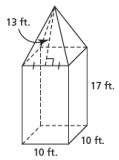
HOMEWORK...

#1. Determine the surface area of each composite object to the nearest square unit.

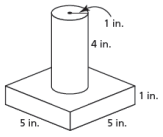
a) right cylinder and right cone



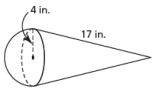
b) right square prism and right square pyramid



c) right square prism and right cylinder



d) right cone and hemisphere

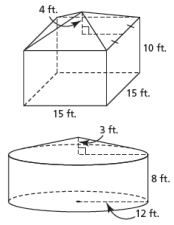


Solutions...

#1. a) 170 cm² b) 1040 ft.² c) 95 in.² d) 314 in.²

#2. Here are two different grain storage bins.

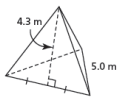
Each storage bin has a cement base.
The materials for the walls and roof of the square-based bin cost $10.49 per square foot.
The materials for the walls and roof of the circular-based bin cost $9.25 per square foot.
Which bin is cheaper to build? Justify your answer.



1.7 Solving Problems Involving Objects

CHECK YOUR UNDERSTANDING

1. Calculate the surface area of this regular tetrahedron to the nearest square metre.



CHECK YOUR UNDERSTANDING

2. A right rectangular pyramid has base dimensions 4 m by 6 m, and a height of 8 m. Calculate the surface area of the pyramid to the nearest square metre.

CHECK YOUR UNDERSTANDING

3. A right cone has a base radius of 4 m and a height of 10 m. Calculate the surface area of this cone to the nearest square metre.

CHECK YOUR UNDERSTANDING

4. A model of the Great Pyramid of Giza is constructed for a museum display. The surface area of the triangular faces is 3000 square inches. The side length of the base is 50 in. Determine the height of the model to a tenth of an inch.

4.4 - Volume

PROBLEMS... Different systems:

Volume is the amount of space an object occupies. It is measured in cubic units.

Capacity is the amount of material a container holds. It is measured in cubic units or capacity units.

US and British units of volume are different. A US pint contains 16 US fl oz, while a British pint contains 20 British fl oz. US gallons and British gallons are also different: a US gallon equals 3.785 L, while a British gallon equals 4.54609 L.

Students can discuss the fact that an imperial cup is 284.13 mL; a metric cup is 250 mL in Canada, Australia, and New Zealand; a US legal cup is 240 mL; and a Japanese cup is 200 mL. Students can then create an international table of conversions to see what the recipe would look like in a different country.

ACTIVITY 4.9
CONVERTING A RECIPE

Lu'sknikn is a traditional Mi'kmaq bread that is served at community feasts and celebrations. You have found the following *lu'sknikn* recipe that you would like to make, but the measurements are all in imperial units and you only have SI measuring equipment.

1. Examine your teaspoon and measuring cup. What SI and imperial markings are on them? Use the two items and work with a partner to convert the following recipe.

***LU'SKNIKN* RECIPE**

Imperial	*Ingredients*	*SI*
4 cups	flour	____mL
1 teaspoon	baking powder	____mL
$\frac{3}{4}$ teaspoon	salt	____mL
$\frac{1}{2}$ cup	shortening	____mL
3 cups	water	____mL
$\frac{3}{4}$ cup	molasses	____mL

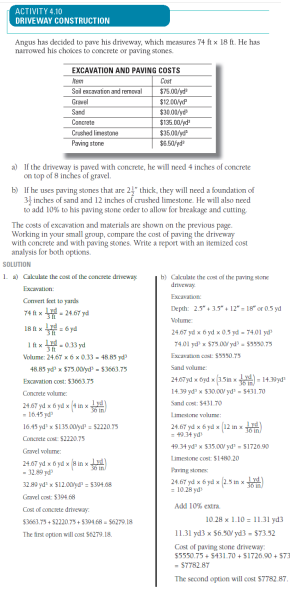
Solution...

2. Copy the table below in your notebook and fill in the missing information to create a conversion chart.

CONVERTING COMMON COOKING UNITS

Imperial	*SI*
$\frac{1}{4}$ teaspoon	____mL
$\frac{1}{2}$ teaspoon	____mL
1 teaspoon	____mL
1 tablespoon (3 teaspoons)	____mL
1 cup	____mL
1 pint	568.2614 mL
1 quart (2 pt)	1.1365 L
1 gallon (4 qt)	4.5461 L

Solution...



ACTIVITY 4.10
DRIVEWAY CONSTRUCTION

Angus has decided to pave his driveway, which measures 74 ft x 18 ft. He has narrowed his choices to concrete or paving stones.

EXCAVATION AND PAVING COSTS

Item	Cost
Soil excavation and removal	$75.00/yd³
Gravel	$12.00/yd³
Sand	$30.00/yd³
Concrete	$135.00/yd³
Crushed limestone	$35.00/yd³
Paving stone	$9.50/yd²

a) If the driveway is paved with concrete, he will need 4 inches of concrete on top of 8 inches of gravel.

b) If he uses paving stones that are 2½" thick, they will need a foundation of 3½ inches of sand and 12 inches of crushed limestone. He will also need to add 10% to his paving stone order to allow for breakage and cutting.

The costs of excavation and materials are shown on the previous page. Working in your small group, compare the cost of paving the driveway with concrete and with paving stones. Write a report with an itemized cost analysis for both options.

SOLUTION

1. a) Calculate the cost of the concrete driveway.

Excavation:

Convert feet to yards

$74 \text{ ft} \times \frac{1 \text{ yd}}{3 \text{ ft}} = 24.67 \text{ yd}$

$18 \text{ ft} \times \frac{1 \text{ yd}}{3 \text{ ft}} = 6 \text{ yd}$

$1 \text{ ft} \times \frac{1 \text{ yd}}{3 \text{ ft}} = 0.33 \text{ yd}$

Volume: $24.67 \times 6 \times 0.33 = 48.85 \text{ yd}^3$

$48.85 \text{ yd}^3 \times \$75.00/\text{yd}^3 = \$3663.75$

Excavation cost: $3663.75

Concrete volume:

$24.67 \text{ yd} \times 6 \text{ yd} \times \left(4 \text{ in} \times \frac{1 \text{ yd}}{36 \text{ in}}\right) = 16.45 \text{ yd}^3$

$16.45 \text{ yd}^3 \times \$135.00/\text{yd}^3 = \$2220.75$

Concrete cost: $2220.75

Gravel volume:

$24.67 \text{ yd} \times 6 \text{ yd} \times \left(8 \text{ in} \times \frac{1 \text{ yd}}{36 \text{ in}}\right) = 32.89 \text{ yd}^3$

$32.89 \text{ yd}^3 \times \$12.00/\text{yd}^3 = \$394.68$

Gravel cost: $394.68

Cost of concrete driveway:

$\$3663.75 + \$2220.75 + \$394.68 = \$6279.18$

The first option will cost $6279.18.

b) Calculate the cost of the paving stone driveway.

Excavation:

Depth: $2.5" + 3.5" + 12" = 18"$ or 0.5 yd

Volume:

$24.67 \text{ yd} \times 6 \text{ yd} \times 0.5 \text{ yd} = 74.01 \text{ yd}^3$

$74.01 \text{ yd}^3 \times \$75.00/\text{yd}^3 = \$5550.75$

Excavation cost: $5550.75

Sand volume:

$24.67 \text{ yd} \times 6 \text{ yd} \times \left(3.5 \text{ in} \times \frac{1 \text{ yd}}{36 \text{ in}}\right) = 14.39 \text{ yd}^3$

$14.39 \text{ yd}^3 \times \$30.00/\text{yd}^3 = \$431.70$

Sand cost: $431.70

Limestone volume:

$24.67 \text{ yd} \times 6 \text{ yd} \times \left(12 \text{ in} \times \frac{1 \text{ yd}}{36 \text{ in}}\right) = 49.34 \text{ yd}^3$

$49.34 \text{ yd}^3 \times \$35.00/\text{yd}^3 = \$1726.90$

Limestone cost: $1480.20

Paving stones:

$24.67 \text{ yd} \times 6 \text{ yd} \times \left(2.5 \text{ in} \times \frac{1 \text{ yd}}{36 \text{ in}}\right) = 10.28 \text{ yd}^3$

Add 10% extra.

$10.28 \times 1.10 = 11.31 \text{ yd}3$

$11.31 \text{ yd}3 \times \$6.50/\text{yd}3 = \$73.52$

Cost of paving stone driveway:

$\$5550.75 + \$431.70 + \$1726.90 + \$73.52 = \$7782.87$

The second option will cost $7782.87.

FIGURE 4.2
Imperial Units of Volume and Capacity

Unit	*Abbreviation*
ounce	oz
fluid ounce	fl oz
pint	pt
quart	qt
gallon	gal

SI Units of Volume and Capacity	
Unit	*Abbreviation*
liter	L
cubic meter	m^3

TABLE 1.5 Selected Prefixes Used in the Metric System

Prefix	Abbreviation	Meaning	Example
Giga	G	10^9	1 gigameter (Gm) $= 1 \times 10^9$ m
Mega	M	10^6	1 megameter (Mm) $= 1 \times 10^6$ m
Kilo	k	10^3	1 kilometer (km) $= 1 \times 10^3$ m
Deci	d	10^{-1}	1 decimeter (dm) $= 0.1$ m
Centi	c	10^{-2}	1 centimeter (cm) $= 0.01$ m
Milli	m	10^{-3}	1 millimeter (mm) $= 0.001$ m
Micro	μ^a	10^{-6}	1 micrometer (μm) $= 1 \times 10^{-6}$ m
Nano	n	10^{-9}	1 nanometer (nm) $= 1 \times 10^{-9}$ m
Pico	p	10^{-12}	1 picometer (pm) $= 1 \times 10^{-12}$ m
Femto	f	10^{-15}	1 femtometer (fm) $= 1 \times 10^{-15}$ m

1000
0.1
0.01
0.001

[a]This is the Greek letter mu (pronounced "mew").

Conversions in Capacity: SI vs Metric

CONVERTING COMMON COOKING UNITS

Imperial	*SI*
¼ teaspoon	1.25 mL
½ teaspoon	2.5 mL
1 teaspoon	5 mL
1 tablespoon (3 teaspoons)	15 mL
1 cup	250 mL
1 pint	568.2614 mL
1 quart (2 pt)	1.1365 L
1 gallon (4 qt)	4.5461 L

CONVERTING US IMPERIAL TO SI UNITS

US Imperial	*SI*
1 fl oz	29.5735 mL
1 pt = 16 fl oz	473.176 mL or 0.473 L
1 qt = 2 pt	946.352 mL or 0.946 L
1 gal = 4 qt	3785.4 mL or 3.785 L

NOTE: 1 L = 1000 mL
1 kL = 1000 L
1 cm^3 = 1 mL

British

US

FORMULA/TABLE Sheet???

GMF 10 – Conversions & Formulas for Chapter 4

IMPORTANT CONVERSIONS...

SI Length

1 cm = 10 mm
1 m. = 100 cm
1 km = 1000 m

Imperial Length

1 m = 1.0936 yd
1 mi. = 1.6093 km
1 in. = 2.54 cm

1 ft. = 12 in.
1 yd = 3 ft.
1 mi. = 1760 yd

SI Capacity: 1 L = 1000 mL, 1 kL = 1000 L
SI Volume: 1 cm^3 = 1 mL

CONVERTING COMMON COOKING UNITS

Imperial	*SI*
¼ teaspoon	1.25 mL
½ teaspoon	2.5 mL
1 teaspoon	5 mL
1 tablespoon (3 teaspoons)	15 mL
1 cup	250 mL
1 pint	568.2614 mL
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CONVERTING US IMPERIAL TO SI UNITS

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1 fl oz	29.5735 mL
1 pt = 16 fl oz	473.176 mL or 0.473 L
1 qt = 2 pt	946.352 mL or 0.946 L
1 gal = 4 qt	3785.4 mL or 3.785 L

IMPORTANT SURFACE AREA FORMULAS...

$SA_{prism} = Add\ area\ of\ all\ the\ faces$

$SA_{cylinder} = 2\pi r^2 + 2\pi rh$

$SA_{cone} = \pi r^2 + \pi rs$

$SA_{pyramid} = A_{base} + (area\ of\ the\ triangular\ faces)$

IMPORTANT VOLUME FORMULAS...

$V_{prism} = lwh$

$V_{cylinder} = \pi r^2 h$

EXAMPLES: Fill in the blanks...

a) 16 cups = 4 liters $\quad 4\text{L} \times \frac{1000\text{mL}}{1\text{L}} \times \frac{1\text{cup}}{250\text{mL}}$

b) 8 tablespoons = 120 milliliters $\quad 8\text{tbsp} \times \frac{15\text{mL}}{1\text{tbsp}} =$

c) 6 US quarts = 5.676 liters $\quad 6\text{qt} \times \frac{0.946\text{L}}{1\text{qt}}$

d) 16 tsp = 5.3 tbsp $\quad 16\text{tsp} \times \frac{1\text{tbsp}}{3\text{tsp}}$

e) 22.7 cups = 12 US pints $\quad 12\text{USpints} \times \frac{473.176\text{mL}}{1\text{pint}} \times \frac{1\text{cup}}{250\text{mL}}$

f) 10 fl oz = 1.18294 cup $\quad 10\text{fl oz} \times \frac{29.5735\text{mL}}{1\text{fl oz}} \times \frac{1\text{cup}}{250\text{mL}}$

MORE EXAMPLES: Fill in the blanks...

a) _____ in^3 = 250 mL

b) 4 L = _____ US gal

c) 2.5 m^3 = _____ L

d) 20 US pints = _____ US quarts

e) _____ L = 12 Brit gal

f) 20 fl oz = _____ mL

HOMEWORK...

NOTE: Use US Imperial for pt, qt & gal

Worksheet - Converting Volumes Imp_Metric.docx

Worksheet - Converting Capacity in Imp.docx

GMF_10_-_Chp._4_Tables_and_Formulas.docx

HW SOLUTIONS...

Worksheet - Converting Volumes Imp_Metric.docx

Converting English and Metric

1)	1.22	teaspoons	=	6	milliliters
2)	1	gallons	=	3.79	liters
3)	494.41	cubic feet	=	14	cubic meters
4)	11.62	quarts	=	11	liters
5)	27.47	cubic yards	=	21	cubic meters
6)	5	quarts	=	4.73	liters
7)	15.5	cups	=	3.67	liters
8)	0.49	cubic inches	=	8	milliliters
9)	1.96	cubic yards	=	1.5	cubic meters
10)	12.5	cubic feet	=	0.35	cubic meters
11)	723.95	cubic feet	=	20.5	cubic meters
12)	63.4	cups	=	15	liters
13)	0.7	cubic inches	=	11.5	milliliters
14)	3	teaspoons	=	14.79	milliliters
15)	4.23	quarts	=	4	liters
16)	7.5	cups	=	1.77	liters
17)	19.5	cubic inches	=	319.55	milliliters
18)	3.5	cubic yards	=	2.68	cubic meters
19)	17	tablespoons	=	251.38	milliliters
20)	25	gallons	=	94.64	liters

Geometry, Measurement & Finance 10 Math-Aids.Com

$1.5\,m^3 \times \left(\frac{1\,yd}{0.9144\,m}\right)^3$

$19.5\,in^3 \times \left(\frac{2.54\,cm}{1\,in}\right)^3$

18) $35\ cubic\ yards \times \left(\frac{0.9144\,m}{1\,yards}\right)^3 = 2.68\,m^3$

SOLUTIONS...

Worksheet - Converting Capacity in Imp.docx

Liquid Measure Quiz

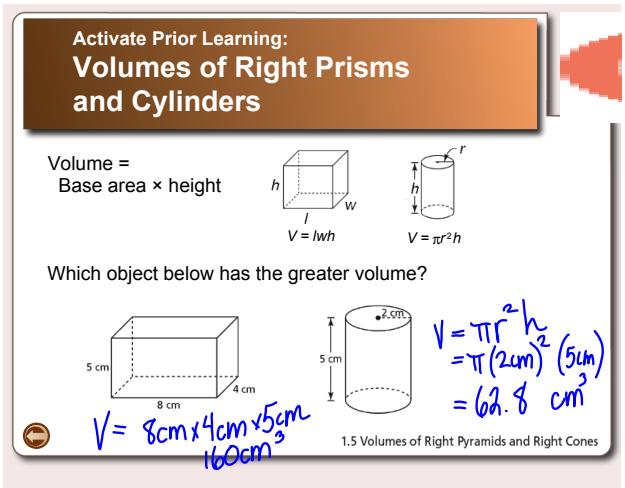
1)	12	tsp	=	4	tbsp
2)	8	cups	=	64	fl oz
3)	4	pints	=	1/2	gallon
4)	1	quart	=	1/4	gallon
5)	4	cups	=	1	quart
6)	8	tbsp	=	1/2	cup
7)	1	gallon	=	128	fl oz
8)	16	cups	=	1	gallon
9)	3	tsp	=	1	tbsp
10)	16	cups	=	8	pints
11)	2	cups	=	1	pint
12)	2	pints	=	1	quarts
13)	1/2	pint	=	8	fl oz
14)	2	cups	=	16	fl oz
15)	4	cups	=	2	pints
16)	1/2	quart	=	16	fl oz
17)	3	tsp	=	1/2	fl oz
18)	1	cup	=	8	fl oz
19)	1/4	cup	=	2	fl oz
20)	8	pints	=	4	gallon

Geometry, Measurement & Finance 10 Math-Aids.Com

12 tsp x 1 tbsp / 4 tsp

1 cup = 8 fl oz

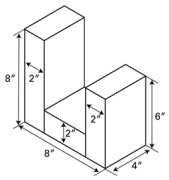
1 cup = ½ pint

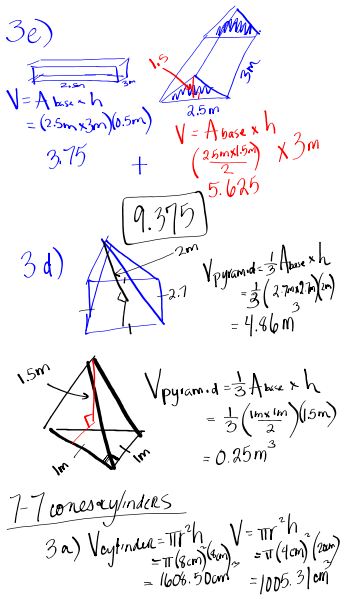


Volume/Capacity Applications

EXAMPLE #1...

Matthew was hired to produce 25 pairs of plastic bookends using the dimensions shown in the diagram below. The bookends will be constructed using an injection mould. Determine the cost of 25 pairs of bookends if the cost of plastic is $15.25 a cubic foot.



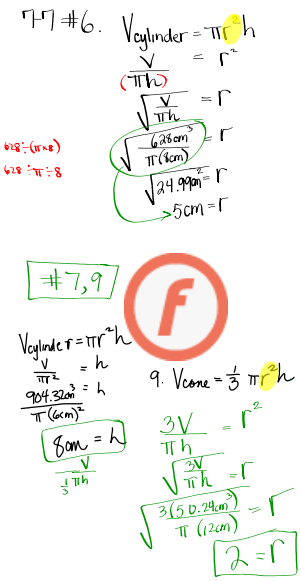


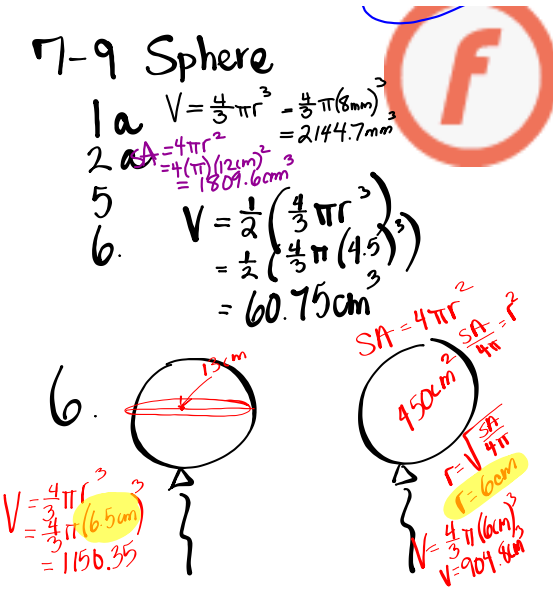
EXAMPLE #2...

The gas tank of Rory's car can hold 60 litres of gas.

a) Rory is travelling in Colorado, USA, and needs to fill up his tank. The cost of gas is $3.49/gallon. How much will it cost him to fill up, assuming the tank is completely empty?

b) If Rory took the same car to England, where gas costs $8.01/gal, how much would it cost him to fill up the tank?





EXAMPLE #3...

Gwen is following a recipe for pancakes that calls for 10 cups of flour, $1\frac{1}{4}$ cups of sugar, and 2.5 tsp of baking soda. What will the total volume of the dry goods be in mL if she makes a double batch?

Volume, Capacity and Mass

Volume - the amount of space an object occupies (i.e. cubic metres)

Capacity - the amount a hollow object will hold (i.e Litres or ml)

Mass - the amount of matter in an object (i.e. grams or Kg)

**The mass of $1cm^3$ of water at 4°C is 1 gram

$1\ cm^3 = 1mL$ $1000cm^3 = 1L$

Example

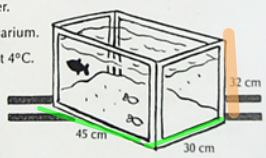
The aquarium with interior dimensions as shown is filled with water.

a. Find the volume of the water.

b. Find the capacity of the aquarium.

c. Find the mass of the water at 4°C.

a. $V = Ah$
$= (45)(30)(32)$
$= 43\ 200$
The volume of the water is 43 200 cm^3.



b. 1000 cm^3 = 1 L
43 200 cm^3 = 43.2 L
The capacity of the aquarium is 43.2 L.

c. 1 cm^3 → 1 g
43 200 cm^3 → 43 200 g
or 43.2 kg
The mass of the water is 43.2 kg.

7-8 #1 a) cylinder

#2

#4

#5–#8 for HW! ☺

1a) $V = \pi r^2 h$
$= \pi (6cm)^2 (22cm)$
$= 2488.14 cm^3$

$1cm^3 = 1mL$

2488.14 mL
2.488 L
2.5 L

2a) 2488 g
2.5 kg

1b) $V = \frac{1}{3} \pi r^2 h$
$= \frac{1}{3} \pi (3cm)^2 (8cm)$
$V = 75.4 cm^3$
Capacity = 75.4 mL
Mass = 75.4 g

1. 6cm, 5, 8, 8

$V = \frac{1}{3} A_{base} \times h$
$= \frac{1}{3} (8cm \times 8cm) \times (6cm)$
$V = 128 cm^3$

$1cm^3 = 2.7g$

$Mass = 128 cm^3 \times \frac{2.7g}{1cm^3}$
$= 346g$

EXAMPLE #4...

A new Nissan car is advertising a fuel consumption rating of 8.2 L / 100 km.
The imperial system uses a rating of miles/gallon. Determine the fuel consumption of the car in mi/gal.

2a) $1440cm^2$

$L \rightarrow m^2$

HOMEWORK...

NOTE: Use US Imperial for pt, qt & gal

1) page 182 #1 - 5

2) Review Worksheet - Converting Imp_Metric.docx

SOLUTIONS...

Review Worksheet - Converting Imp_Metric.docx

Converting English and Metric

1)	8.27	inches	=	21	centimeters
2)	10	mph	=	6.21	kmph
3)	9.01	miles	=	14.5	kilometers
4)	13	gallons	=	49.21	liters
5)	3.17	quarts	=	3	liters
6)	9	cups	=	2.13	liters
7)	9.5	teaspoons	=	46.82	milliliters
8)	19.5	square inches	=	125.81	square centimeters
9)	8	cups	=	1.89	liters
10)	0.21	cubic inches	=	3.5	milliliters
11)	0.46	cubic inches	=	7.5	milliliters
12)	10.5	gallons	=	39.75	liters
13)	16.4	feet	=	5	meters
14)	70.63	cubic feet	=	2	cubic meters
15)	1.22	teaspoons	=	6	milliliters
16)	15.7	cubic yards	=	12	cubic meters
17)	0.16	square inches	=	1	square centimeters
18)	19	yards	=	17.37	meters
19)	20	fluid ounces	=	591.47	milliliters
20)	15	cubic feet	=	0.42	cubic meters

Geometry, Measurement & Finance 10 - MIXED Conversions Math-Aids.Com

HOMEWORK...Unit Test is Wednesday!!!

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Sample Chapter Test Review - Chapter 4 Sample Test.pdf

Geometry, Measurement & Finance 10
Bulletin Board

Date	Upcoming Test / Quiz / Assignment
Sept. 23	**Unit Test** - Systems of Measurement and Conversions
Sept. 16	**Quiz** - Converting Measurements
Sept. 5	**Assignment** - Reading Imperial Measurements (due FIRST of class Sept. 6)

CHECK/CORRECT

Attachments

Worksheet - Intro. to Imperial Measurement.docx

Worksheet - Converting Measurements.docx

Worksheet - Converting Squared and Cubed Units.docx

Worksheet - Surface Area of Prisms and Cylinders.pdf

Worksheet - Surface Area of Pyramids and Cones.pdf

Worksheet - Surface Area of 3D Objects.doc

Practice - Converting Measurements.pdf

Worksheet - Finding Surface Area of a Composite Object.docx

GMF_10_-_Chp._4_Tables_and_Formulas.docx

Worksheet - Converting Capacity in Imp.docx

Worksheet - Converting Volumes Imp_Metric.docx

Review Worksheet - Converting Imp_Metric.docx

Review - Chapter 4 Sample Test.pdf

Assignment - Measuring in an Imperial System.pdf

Worksheet - Converting Imperial Lengths.docx

Worksheet - Surface Area of Prisms and Cylinders.docx