MAP4CI UNIT 1: FORMULAS

Key Measurements For Conversions: Imperial and Metric

LENGTH

Imperial	**Metric**	**Conversion**
1 mile = 1760 yards 1 yard = 3 feet 1 foot = 12 inches	1 km = 1000 m 1 m = 100 cm 1 m = 1000mm 1 cm = 10 mm	1 inch = 2.54 cm 1 foot = 304.8 mm = 0.3048 m 1 yard = 914.4 mm 1 mile = 1.609 km

MASS/WEIGHT

Imperial	**Metric**	**Conversion**
16 ounces (oz) = 1 pound (lb) 2000 pounds = 1 ton (US)	1000 g = 1 kg 1000 kg = 1 t (tonne)	1 oz = 28.35 g 1 pound = 453.6 g 1 ton = 907 200 g

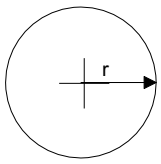
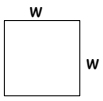
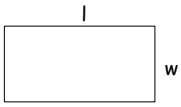
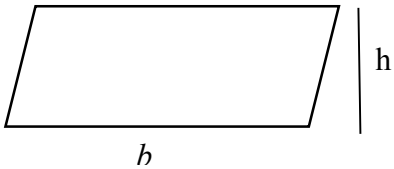
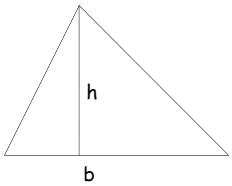
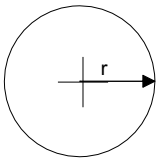
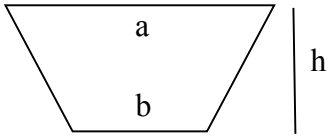
VOLUME

Note: In Canada, if we say gallons, we mean UK gallons rather than US gallons

Imperial (UK)	**Metric**	**Conversion**
8 fluid oz = 1 cup 2.5 cups = 1 pint 5 cups = 1 quart 20 cups = 1 UK gallon	1 L = 1000mL 1 mL = 1 cm^3	1 fluid oz = 28.413 mL 1 L = 0.88 quarts 1 UK gallon = 4.54 L 1 US gallon = 0.83267 UK gallons

$$Value\ in\ new\ units = value\ in\ old\ units \times \frac{conversion\ number\ in\ new\ units}{conversion\ number\ in\ old\ units}$$

Perimeter/Area Formulas

Perimeter Units: cm m km	Square, Rectangle, Triangle, Trapezoid – add up length of all sides Circle (circumference) $C = 2\pi r\ \ or\ \ C = \pi d$ 
Area Units : cm^2 m^2 km^2	Square $area = w \times w$  Rectangle $area = l \times w$  Parallelogram $area = b \times h$  Triangle $area = b \times h \div 2$  Circle $area = \pi r^2$  Trapezoid: $area = \frac{(a+b)}{2}(h)$ 

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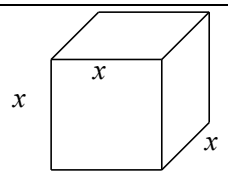
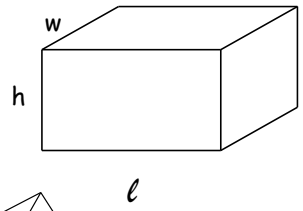
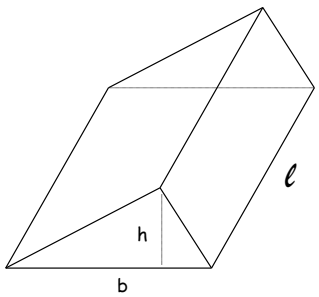
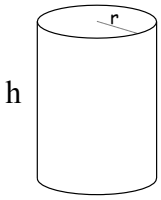
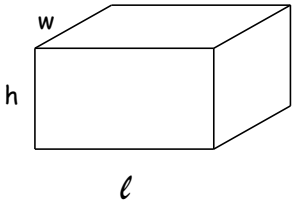
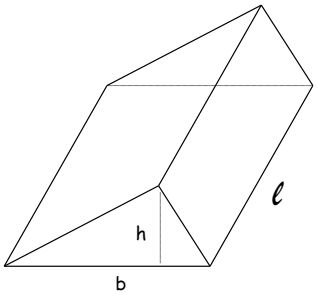
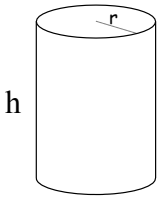
Volume Units: cm^3 m^3 km^3	Cube Volume = x^3  Rectangular Prism $volume = l \times w \times h$  Triangular Prism $volume = b \times h \div 2 \times l$ h is height of triangle ℓ is height of prism (or length when on its side)   Cylinder $volume = \pi r^2 h$ **Volume of any prism = Area of the base × the height of the prism**.

Surface Area Units: cm^2 m^2 km^2	Cube Surface Area = $6x^2$ Rectangular Prism SA = 2lw + 2lh + 2wh  Triangular Prism For surface area, calculate the Area of each side and add them together. $SA = A_{2\ triangles} + A_{3\ rectangles}$  Cylinder $SA = 2\pi r^2 + 2\pi rh$ 

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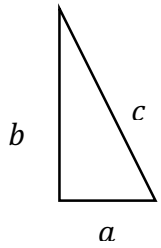
Pythagorean Theorem:



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

U1D6: Additional Questions

1. Determine the surface area of each of the following figures. Round answers to two decimal places, where necessary.
   a. Rectangular prism: length = 75 cm, width = 28 cm, height = 25 cm
   b. Cube: length = 4.4 mm
   c. Cylinder: radius = 21 cm, height = 65 cm

Answers: a) 9350 cm^2 or 0.94 m^2 b) 116.16 mm^2 c) 11 347.43 cm^2 or 1.13 m^2

OPTIMIZING MEASURES:

Maximizing Area & Minimizing Perimeter Summary

	Given Perimeter, Maximizing Area	Given Area, Minimizing Perimeter
Enclosing all 4 sides (optimal is a square)	*Width = Perimeter* ÷ 4 Area = Width^2	Width = $\sqrt{Area}$ Perimeter = 4×Width
Enclosing only 3 sides (rectangle with length twice the width)	*Width = Perimeter* ÷ 4 Length = 2×Width Area = Length × Width	Width = $\sqrt{(Area \div 2)}$ Perimeter = 4×Width

Maximizing Volume & Minimizing Surface Area Summary
All of these – provided all sides are enclosed

	Given Surface Area, Maximizing Volume	Given Volume, Minimizing Surface Area
Square Based Prism Enclosing all sides. (optimal is a cube with side length x)	Surface Area = $6x^2$ *Solve for x.* Volume = x^3	Volume = x^3 *Solve for x.* Surface Area = $6x^2$
Cylinder Enclosing all sides. (optimal has height = diameter or h = 2r)	Surface Area = $6\pi r^2$ *Solve for r.* Volume = $2\pi r^3$	Volume = $2\pi r^3$ *Solve for r.* Surface Area = $6\pi r^2$