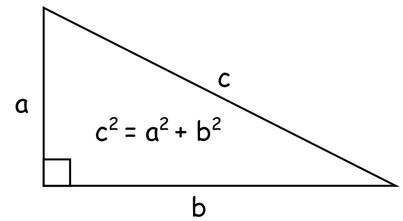
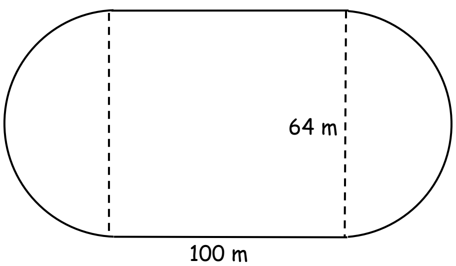
MFM1P Summary Notes and Examples - Unit 1 Measurement

1. Pythagorean Theorem



2. Perimeter & Area of Composite Figures

a) find area of given shape



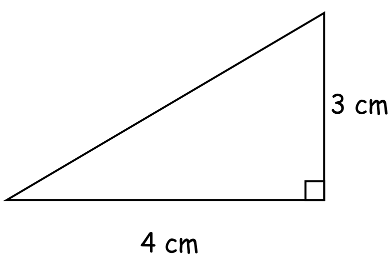
Radius = 64/2 = 32 m

Area of circle = Πr^2
= 3.14 x 32 x 32
= 3215.36 m^2

Area of rectangle = lw
= 100 x 64
= 6400 m^2

Area of track = Area of rect. + Area of circle
= 6400 + 3215.36
= 9615.36 m^2

b) find perimeter of triangle

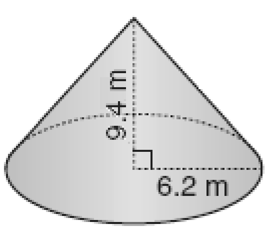


$a^2 + b^2 = c^2$
$3^2 + 4^2 = c^2$
$9 + 16 = c^2$
$25 = c^2$
$\sqrt{25} = c$
$5 = c$

P = a + b + c
P = 3 + 4 + 5
P = 12 cm

3. Volumes of Prisms, Pyramids, Cylinders, Cones, & Spheres

a) volume of a cone



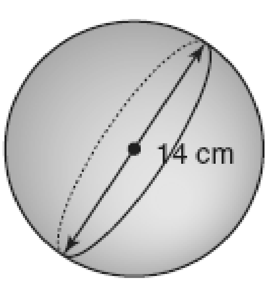
$V = \frac{\pi r^2 h}{3}$

$V = \frac{3.14 \times 6.2^2 \times 9.4}{3}$

$V = \frac{1134.6}{3}$

$V = 378.2\ m^3$

b) volume of a sphere



$V = \frac{4\pi r^3}{3}$

$V = \frac{4 \times 3.14 \times 7^3}{3}$

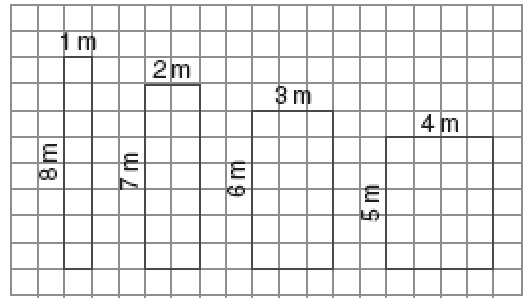
$V = \frac{4308.08}{3}$

$V = 1436.03\ cm^3$

MFM1P Summary Notes and Examples - Unit 2 Optimization

1. Maximizing the Area of a Rectangle

Rectangles with the same perimeter can have different areas.
For example, all these rectangles have a perimeter of 18 cm.



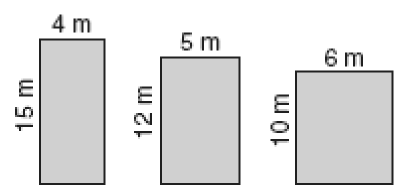
If all 4 sides of the rectangle are enclosed, then the maximum area occurs when the length and width are closest in value. If 3 sides of the rectangle are enclosed, then the maximum occurs when the length is twice the width.

A rectangle has a perimeter of 100 cm. Complete the given table by determining the length and area of each given width.

Width (cm)	Length (cm)	Area (cm^2)
5	$\frac{100-2(5)}{2}$ = 45	5 x 45 = 225
10	$\frac{100-2(10)}{2}$ = 40	400
15	35	525
20	30	600
25	25	625

2. Minimizing the Perimeter of a Rectangle

Rectangles with the same area can have different perimeters.
For example, all these rectangles have an area 60 m^2.

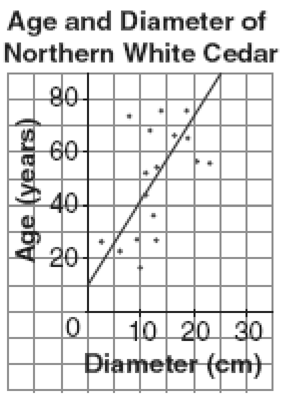


If all 4 sides of the rectangle are enclosed, then the minimum perimeter occurs when the length and width are closest in value.

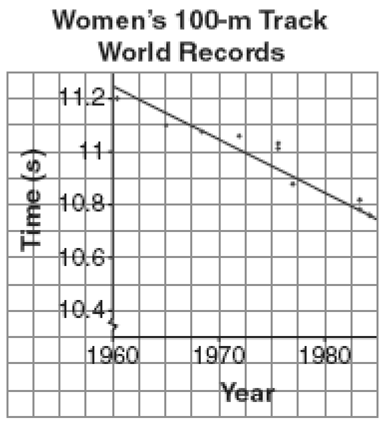
MFM1P Summary Notes and Examples - Unit 3 Relationships

1. Types of Relationships

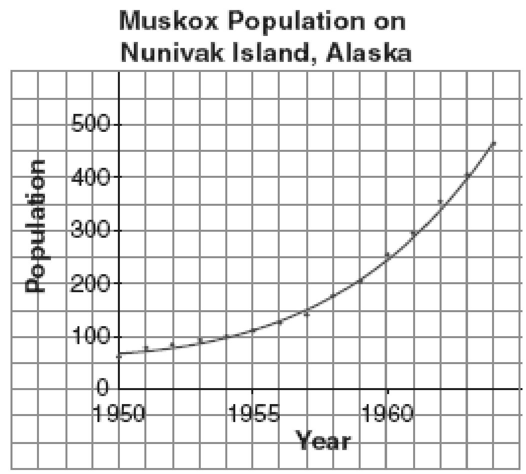
a) weak,
positive,
linear



b) moderate strength
negative
linear

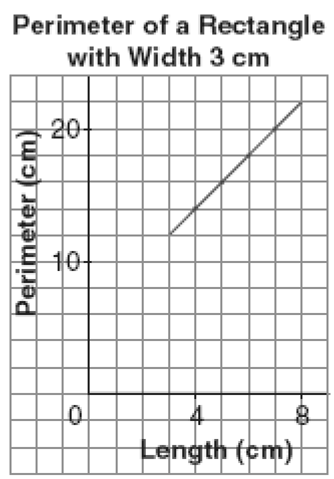


c) strong
positive
non-linear



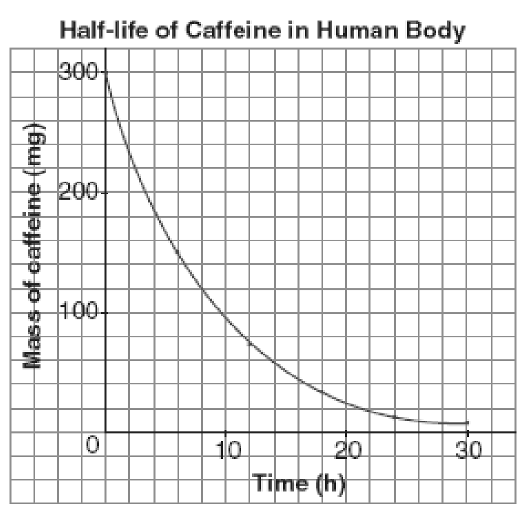
2. First Differences

linear relation
←→ graph is a straight line
←→ first differences are constant



Length(cm)	Perimeter(cm)	First Differences
4	14	------------
5	16	16 – 14 = 2
6	18	18 – 16 = 2
7	20	20 - 18 = 2

Non-linear relation
←→ graph is NOT a straight line
←→ first differences are NOT constant

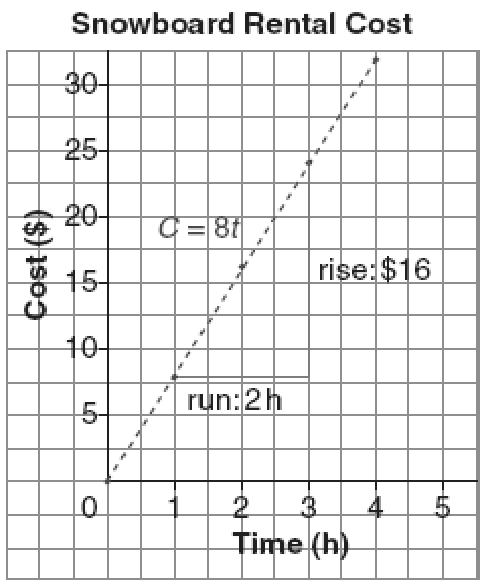


Time (h)	Mass of caffeine (mg)	First Differences
0	300	------------
6	150	150 – 300 = -150
12	75	75 – 150 = -75
18	37.5	37.5 – 75 = -37.5
24	18.75	18.75 – 37.5 = -18.75
30	9.375	0.375 – 18.75 = - 18.375

MFM1P Summary Notes and Examples - Units 4 Linear Models

1. Direct Variations

A graph that represents direct variation is a straight line that passes through the origin.



Time t (h)	Cost C (\$)	First Differences
0	0	
1	8	$8 - 0 = 8$
2	16	$16 - 8 = 8$
3	24	$24 - 16 = 8$
4	32	$32 - 24 = 8$

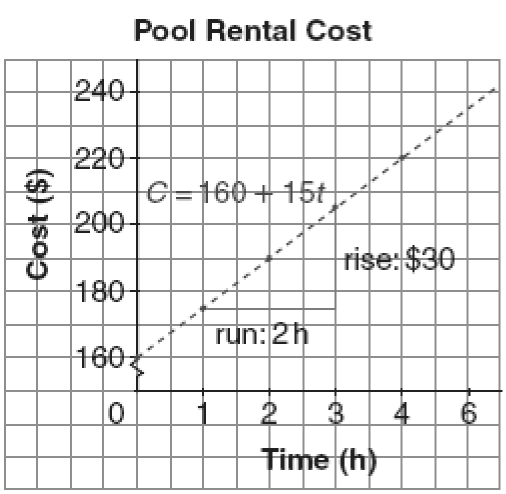
Rate of change $= \frac{\text{rise}}{\text{run}} = \frac{\$16}{2h} = \$8/h$

The equation is: $C = 8t$

rate of change is \$8/h

2. Partial Variations

A graph that represents partial variation is a straight line that does not pass through the origin.



Time t (h)	Cost C (\$)	First Differences
0	160	
1	175	$175 - 160 = 15$
2	190	$190 - 175 = 15$
3	205	$205 - 190 = 15$
4	220	$220 - 205 = 15$

Rate of change $= \frac{\text{rise}}{\text{run}} = \frac{\$30}{2h} = \$15/h$

fixed cost   variable cost

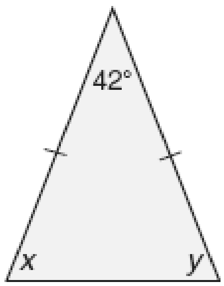
The equation is: $C = 160 + 15t$

initial value is \$160   rate of change is \$15/h

MFM1P Summary Notes and Examples - Unit 5 Geometry

1. Determine the angle measure indicated by each letter. Justify your answer.

a)

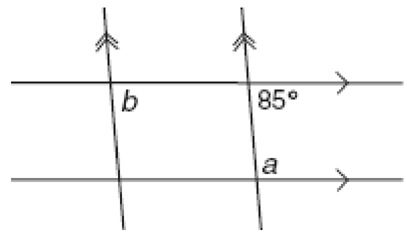


x = y because the triangle is isosceles

$x = \frac{180 - 42}{2} = 69°$

y = 69°

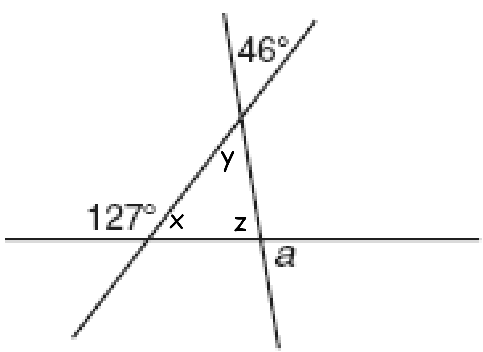
b)



b = 85° by the Parallel Line Theorem (corresponding angles, F - Pattern)

a = 180 – 85 = 95° by the Parallel Line Theorem (co-interior angles, C-Pattern)

c)

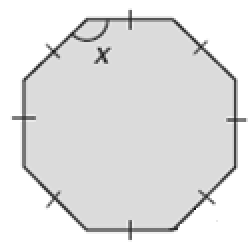


x = 180 – 127 = 53° because supplementary angles add up to 180°

y = 46° because opposite angles are equal

z = 180 – 53 – 46 = 81° because the sum of the interior angles of a triangle add to 180°

d)



The octagon has 8 sides therefore the sum of the interior angles is 180 x 6 = 1080°.

All the sides are equal so it's a regular octagon which means all the interior angles are equal to each other.

$x = \frac{1080}{8} = 135°$

MFM1P Summary Notes and Examples - Unit 6 Proportional Reasoning

1. Ratios
   A ratio is a comparison of two quantities with the same units.
   Two ratios are equivalent when they can be reduced to the same ratio.
   For example, both 12 : 16 and 9 : 12 reduce to 3 : 4.

2. Proportions
   A proportion is a statement with two ratios that are equal. For example, 2 : 3 = 10 : 15.
   To solve a proportion means to determine the value of an unknown term in a proportion.

   a) Solve 2 : 10 = 5 : x

   $$\frac{2}{10} = \frac{5}{x}$$

   cross multiply → 2x = 50
   divide both sides by 2 → x = 25

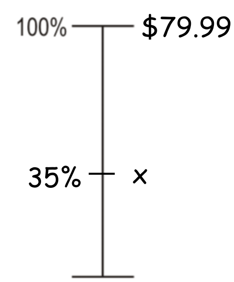
3. Rates
   A rate is a ratio of two terms with different units. A unit rate is a rate where the second term is 1 unit.

   a) Express as 100 kilometres in 2 hours as a unit rate. $\frac{100}{2}$ = 50 km/h

4. Percents
   A percent is a ratio with second term 100. A ratio can be written as a fraction, decimal, or percent.

Ratio	Fraction	Decimal	Percent
25 : 100	$\frac{25}{100}$	0.25	25%

   a) A winter jacket is regularly priced at $79.99. It is on sale for 35% off.
   Determine the discount and the sale price.



   $$\frac{100}{35} = \frac{79.99}{x}$$

   100x = 2799.65
   x = 27.9965 Therefore, the discount is $28.

   79.99 – 28 = 51.99 Therefore, the sale price is $51.99.

5. Scale Diagrams

   A scale is the ratio of the diagram measurement to the actual measurement.
   scale = diagram measurement : actual measurement

   a) Determine the scale used if the actual width of the design is 35 cm.

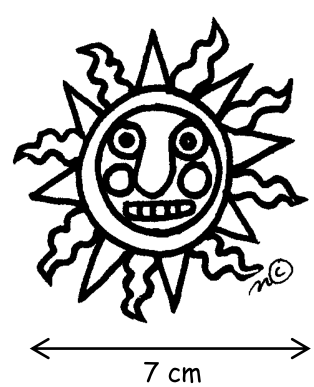
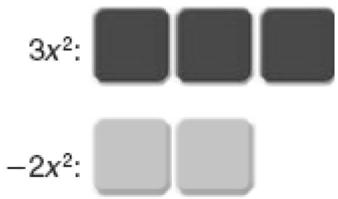


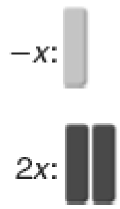
   diagram : actual
   7 cm : 35 cm
   = 1 : 5 (lowest term) Therefore, the scale is 1 : 5

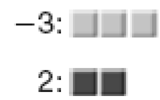
MFM1P Summary Notes and Examples - Unit 7 Algebra

1. <u>Polynomials</u>

Like terms are represented by the same type of algebra tile (i.e. same variable raised to the same exponents)
$3x^2$ and $-2x^2$ are like terms. $-x$ and $2x$ are like terms. -3 and 2 are like terms.







The Distributive Property - Each term in the brackets is multiplied by the term outside the brackets.

a) $(3x^2 - 5x - 1) - (2x^2 - 7x + 4)$
$= 3x^2 - 5x - 1 - 2x^2 + 7x - 4$
$= x^2 + 2x - 5$

b) $-5x(3x - 4) + 2(x^2 - 7x)$
$= -15x^2 + 20x + 2x^2 - 14x$
$= -13x^2 + 6x$

2. <u>Solving Equations</u>

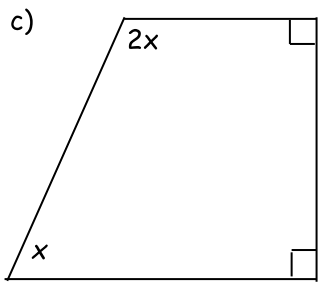
To solve an equation means to determine the value of the variable that makes the equation true.

Solve for each unknown.

a)
$2x + 10 = 4$
$2x + 10 - 10 = 4 - 10$
$2x = -6$
$\frac{2x}{2} = \frac{-6}{2}$
$x = -3$

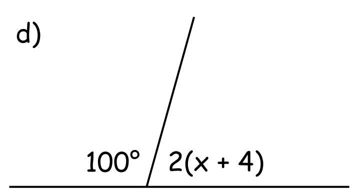
b)
$3x + 3 = x + 7$
$3x + 3 - x = x + 7 - x$
$2x + 3 = 7$
$2x + 3 - 3 = 7 - 3$
$2x = 4$
$\frac{2x}{2} = \frac{4}{2}$
$x = 2$

c)



$x + 2x + 90 + 90 = 360$
$3x + 180 = 360$
$3x + 180 - 180 = 360 - 180$
$3x = 180$
$\frac{3x}{3} = \frac{180}{3}$
$x = 60°$

d)



$2(x + 4) + 100 = 180$
$2x + 8 + 100 = 180$
$2x + 108 = 180$
$2x + 108 - 108 = 180 - 108$
$2x = 72$
$x = 36°$