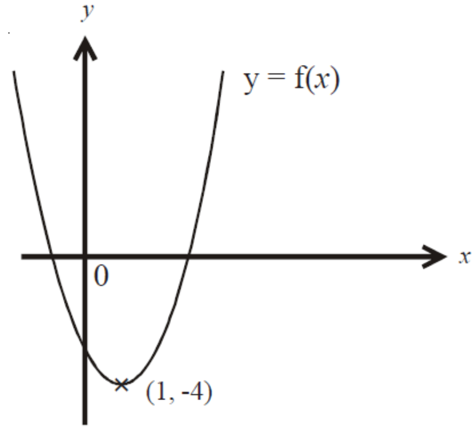
1) The diagram shows part of the curve with equation $y = f(x)$. The coordinates of the minimum point of this curve are (1, -4). Write down the coordinates of the minimum point of the curve with equation.



a) $y = f(2x)$ x coordinate multiplied by $\frac{1}{2}$ (0.5, -4)

b) $y = \frac{1}{2}f(x)$ y coordinate multiplied by $\frac{1}{2}$ $(1, -2)$

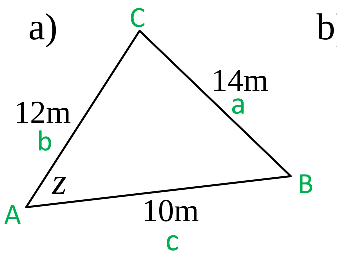
c) $y = f(x) + 4$ y coordinate moves by + 4 (1, 0)

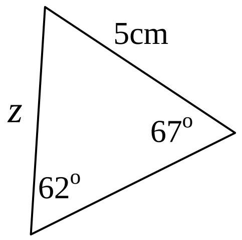
d) $y = 3f(x)$ y coordinate multiplied by 3 (1, -12)

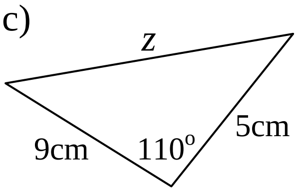
e) $y = f(x + 5)$ x coordinate moves by – 5 (-4, -4)

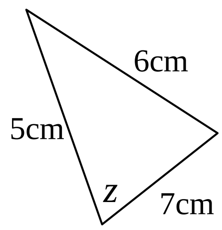
http://www.bbc.co.uk/schools/gcsebitesize/maths/algebra/transformationhirev2.shtml

2) For each triangle find the side or angle marked with the letter *z*. Give you answer correct to 1 decimal place. Sine and Cosine Rules

a) 

b) 

c) 

d) 

Cosine Rule $c^2 = b^2 + a^2 - 2ab\cos C$ Sine Rule $= \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

78.5^0 5.2cm 11.7cm 57.1^0

http://www.mathsisfun.com/algebra/trig-solving-triangles.html

3) Solve $3x^2 + 7x - 12 = 0$
Give your solution correct to 2 decimal places. x = 1.15 or x = -3.48

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

http://www.mathsisfun.com/algebra/quadratic-equation.html

4) q is inversely proportional to the square of t.
When $t = 4$, $q = 9.5$

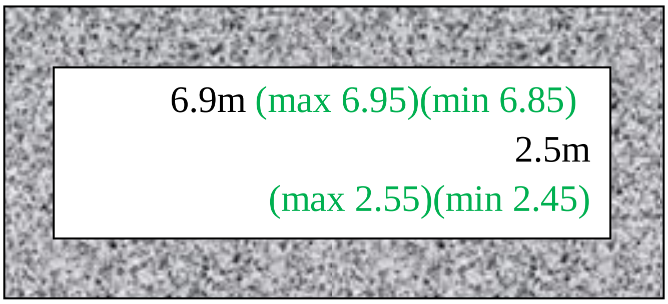
a) Find a formula for q in terms of t.

$q \propto \frac{1}{t^2}$ $so\ q = \frac{K}{t^2}$ substituting gives $9.5 = \frac{K}{4^2}$ then $9.5 \times 4^2 = K = 152$ $so\ q = \frac{152}{t^2}$

b) Calculate the value of q when $t = 8$ $q = \frac{152}{8^2} = 2.375$

c) When $q = 0.38$, calculate the value of t. $0.38 = \frac{152}{t^2}$ so $t = \sqrt{\frac{152}{0.38}} =$ 20

5) 10.4 m (max 10.45) (min 10.35)



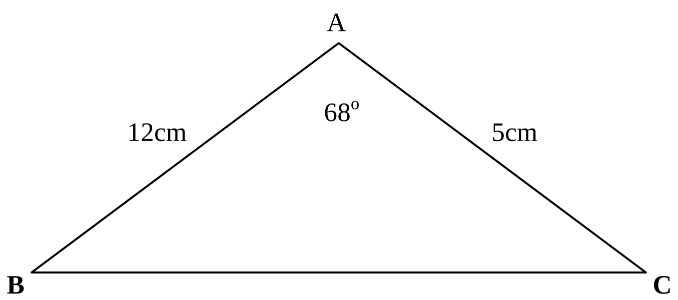
4.3m (max 4.35) (min 4.25)

All the measurements are rounded correct to 1 decimal place.

a) Find the largest possible value of shaded area. 45.4575 – 16.7825 = 28.675m^2

b) Find the least possible value of shaded area. 43.9875 -17.7225 = 26.265

6) Calculator the area of triangle ABC.
Give your answer correct to 1 decimal place. Area = 1/2(b)(c) x sinA.
http://www.wikihow.com/Calculate-the-Area-of-a-Triangle



Area = $\frac{1}{2} \times 5 \times 12 \times \sin 68$

Area = 30×0.9272

Area = 28.82cm^2

7) Simplify fully

a) $\frac{x^2+3x-10}{x^2-8x+12}$ $\qquad$ $\frac{(x-2)(x+5)}{(x-2)(x-6)} = \frac{x+5}{x-6}$

b) $\frac{8}{x+5} + \frac{6}{x-2}$ $\qquad$ $\frac{8(x-2)+6(x+5)}{(x+5)(x-2)} = \frac{8x-16+6x+30}{(x+5)(x-2)} = \frac{14x+14}{(x+5)(x-2)} = \frac{14(x+1)}{(x+5)(x-2)}$

c) Show that the equation $\frac{5}{y+3} = \frac{2-3y}{y-2}$ can be rearranged to give

$$3y^2 + 12y - 16 = 0$$

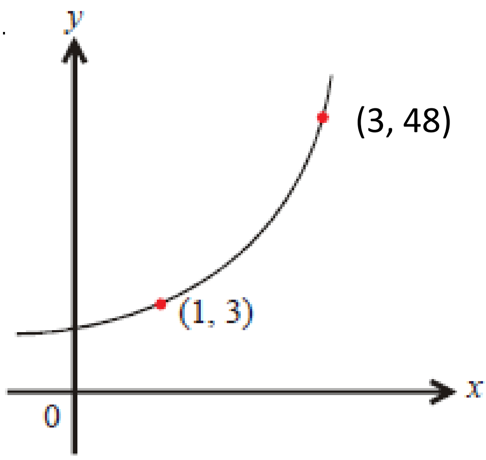
$5(y-2) = (2-3y)(y+3)$

$5y - 10 = 2y + 6 - 3y^2 - 9y$

$5y - 10 - 2y - 6 + 3y^2 + 9y = 0$

$\mathbf{3y^2 + 12y - 16 = 0}$

8) The sketch shows a curve with function $y = \mathbf{k}\mathbf{a}^x$ where **k** and **a** are constants and **a** > 0.
The curve passes through points (1,3) and (3,48).
Calculate the value of k and the value of **a**.



$x = 1$ $y = 3$ gives $3 = \mathrm{k}a^1$ so $\frac{3}{a} = k$

$x = 3$ $y = 48$ gives $48 = \mathrm{k}a^3$ so $48 = \frac{3a^3}{a}$

therefore $48 = 3a^2$ and $\sqrt{\frac{48}{3}} = a$

a = 4

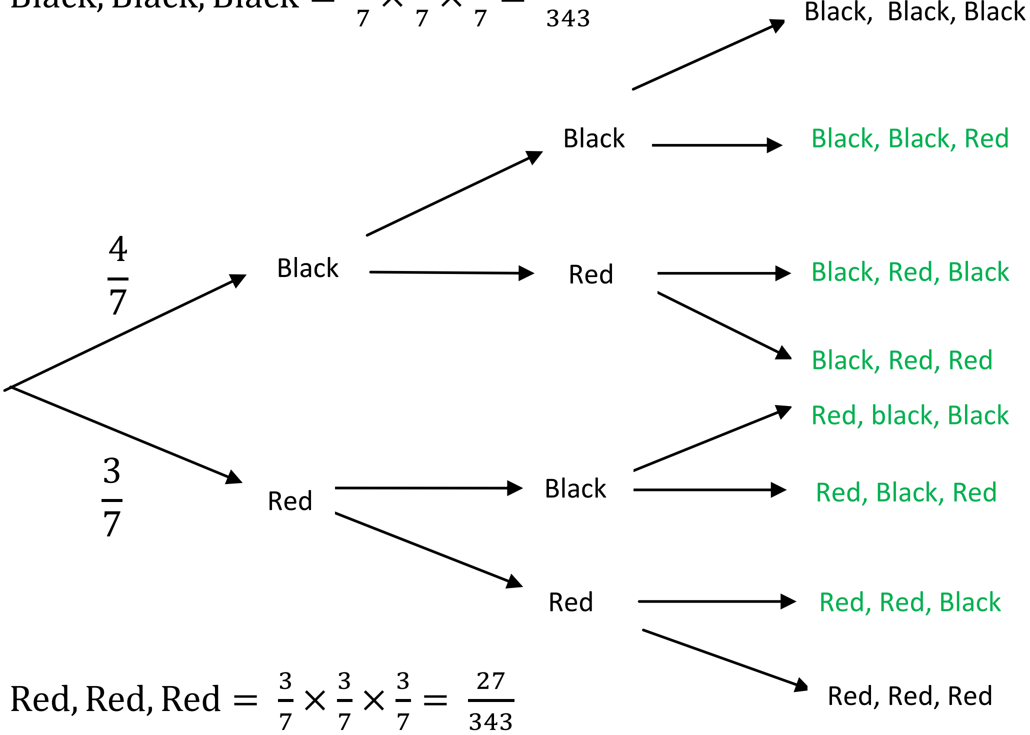
Substitute to find k gives $3 = \mathrm{k} \times 4^1$ so $\frac{3}{4} = \mathrm{k}$

k = 0.75

9) Sophie has 4 blue pens and 3 red pens in a pencil case. She picks a pen at random, notes its colour and then replaces it. She does this two more times.

Work out the probability that when Sophie takes three pens, exactly two are the same colour. $\textit{exactly two the same clour} = 1 - \frac{64}{343} - \frac{27}{343} = \frac{252}{343}$

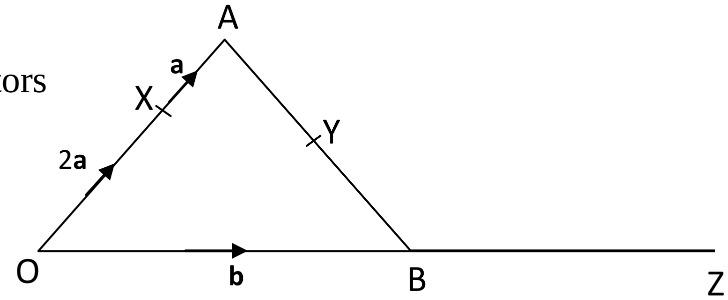
$\text{Black, Black, Black} = \frac{4}{7} \times \frac{4}{7} \times \frac{4}{7} = \frac{64}{343}$



$\text{Red, Red, Red} = \frac{3}{7} \times \frac{3}{7} \times \frac{3}{7} = \frac{27}{343}$

10) OAB is a triangle. B is the midpoint of OZ. Y is the midpoint of AB.

$\overrightarrow{OX} = 2a \qquad \overrightarrow{XA} = a \qquad \overrightarrow{OB} = b$



a) Find in terms of **a** and **b**, the vectors

i) $\overrightarrow{AB}$ -3**a** + **b**

ii) $\overrightarrow{XZ}$ -2**a** + 2**b** = $2(-\mathbf{a} + \mathbf{b})$

ii) $\overrightarrow{XY}$ $\mathbf{a} + \frac{1}{2}(-3\mathbf{a} + \mathbf{b}) = \mathbf{a} - \frac{3}{2}\mathbf{a} + \frac{1}{2}\mathbf{b} = -\frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b} = \frac{1}{2}(-\mathbf{a} + \mathbf{b})$

b) Explain why XYZ is a straight line. $\overrightarrow{XZ} = 4\overrightarrow{XY}$ so XY is parallel to XZ from the same point. So XYZ is a straight line.

c) The length of XY is 3cm.

Find the length of XZ. 12cm

11) A college has 470 students.

Each student studies French, German, Italian or Spanish.

This table shows how many students study each of these languages.

Language	Frequency	Stratified sample	
French	148	31	$\frac{148}{470} \times 100$
German	43	9	$\frac{43}{470} \times 100$
Italian	198	42	$\frac{198}{470} \times 100$
Spanish	81	17	$\frac{81}{470} \times 100$

The inspector wants to look at the work of a stratified sample of 100 of these students. Find the number of students studying each language that should be sampled.

12) Make y the subject of $4(y + 6) = x(4 + 3y)$

$4y + 24 = 4x + 3xy$ so $4y - 3xy = 4x - 24$ then $y(4 - 3x) = 4x - 24$ and $y = \frac{4x-24}{4-3x}$