

**'Must Know' GCSE Higher Revision Booklet!**

**Name** \_\_\_\_\_

**Class** \_\_\_\_\_

**Target Grade** \_\_\_\_\_

(1) Simplify the following:

(a)  $2p^5 \times 3p^{-1}$  \_\_\_\_\_ (b)  $(3p^3q^{0.5})^4$  \_\_\_\_\_ (c)  $6^{-2}$  \_\_\_\_\_ (d)  $\left(\frac{25}{36}\right)^{\frac{3}{2}}$  \_\_\_\_\_

(2) Multiply out (expand) and simplify the following:

(a)  $(2x-3)(x+5)$  \_\_\_\_\_ (b)  $(2-x)(2x-3)$  \_\_\_\_\_ (c)  $(3x-y)(x+y)$  \_\_\_\_\_

(3) Factorise the following:

(a)  $2x^2 + 4x$  \_\_\_\_\_ (b)  $x^2 - x - 6$  \_\_\_\_\_ (c)  $25x^2 - 9$  \_\_\_\_\_ (d)  $2x^2 + 7x - 4$  \_\_\_\_\_

(4) Solve the following equations. Leave your answers as exact fractions:

(a)  $\frac{1}{2}(x-1) = \frac{1}{3}(2x+3)$  \_\_\_\_\_ (b)  $\frac{2x-3}{6} = x-6$  \_\_\_\_\_ (c)  $0.2x-3 = 7-1.5x$  \_\_\_\_\_

(5) Make  $x$  the subject of each of the following:

(a)  $3x - z = y - x$  \_\_\_\_\_ (b)  $3xy - 4 = z + 2$  \_\_\_\_\_ (c)  $y = \frac{x+y}{2x-3}$  \_\_\_\_\_

(6) Solve the following simultaneous equations:

(a)  $\begin{cases} 2x + y = 4 \\ x - y = -1 \end{cases}$  \_\_\_\_\_ (b)  $\begin{cases} 5x - 3y = 3 \\ 2x + 2y = 14 \end{cases}$  \_\_\_\_\_ (c)  $\begin{cases} x - \frac{1}{2}y = 0 \\ \frac{1}{3}x + 2y = \frac{-13}{4} \end{cases}$  \_\_\_\_\_

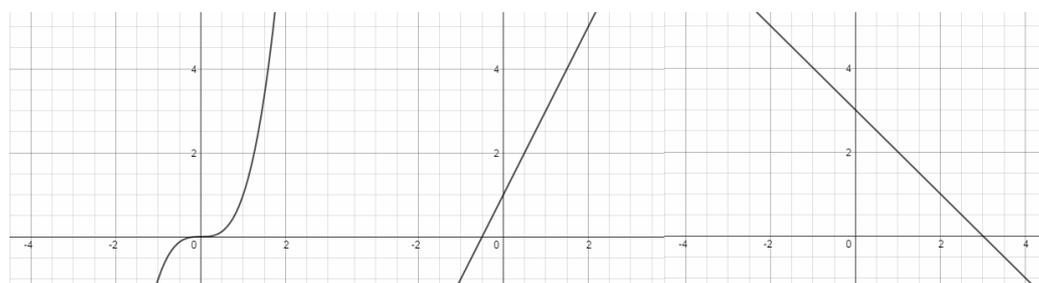
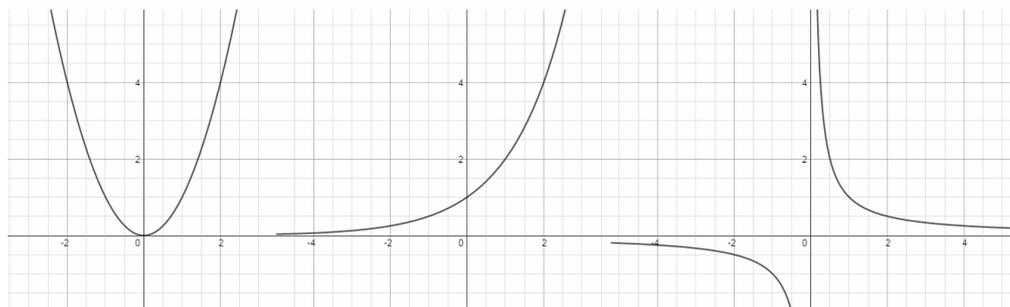
(7) Solve each of the following equations:

(a)  $x^2 - 2x = 8$  \_\_\_\_\_ (b)  $2x^2 - x - 8 = 0$  \_\_\_\_\_ (c)  $2x + 9 - x^2 = 0$  \_\_\_\_\_

(8) Find the  $n$ th term for each linear sequence:

(a) 2, -1, -4, -7... \_\_\_\_\_ (b) 0.5, 1, 1.5, 2, 2.5..... \_\_\_\_\_

(9) Match each graph with its equation below.



$y = x^2$

$y = x^3$

$y = \frac{1}{x}$

$y = 3 - x$

$y = 2x + 1$

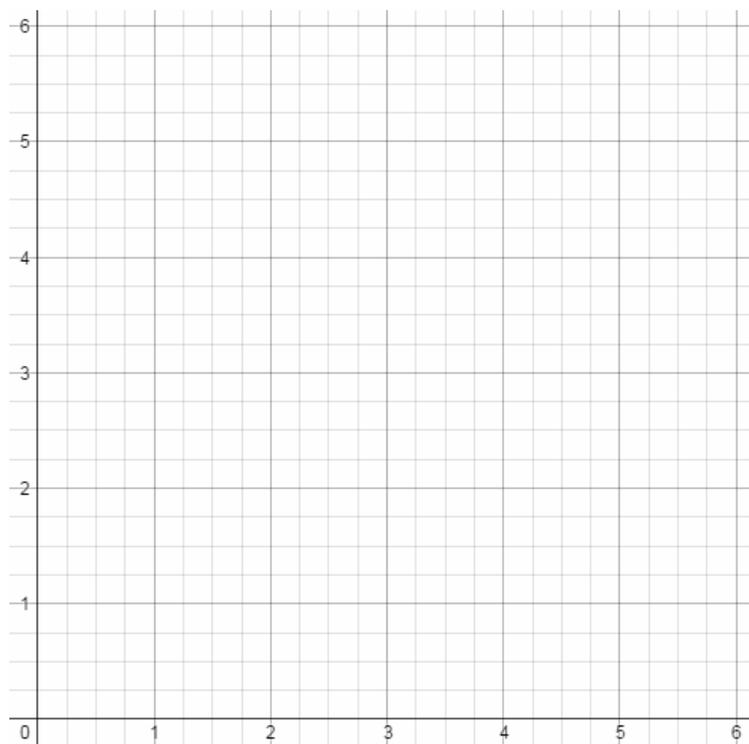
$y = 2^x$

(10) Show the region (R) on the grid below that satisfies:

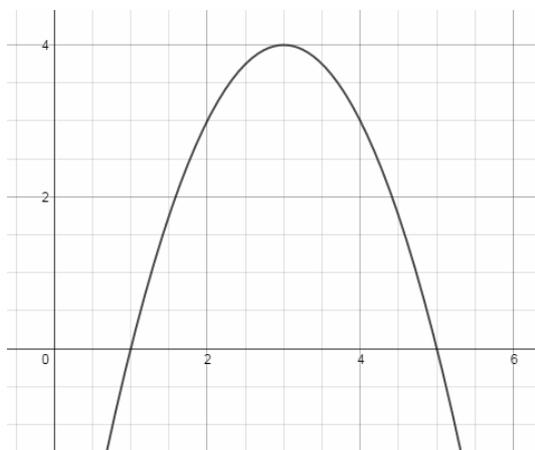
$$x > 2$$

$$3 \leq y$$

$$x + y < 5$$



(11) The graph of  $y = f(x)$  is shown below. The maximum point  $P$  on the graph has coordinates  $(3, 4)$ .



State the coordinates of  $P$  after each of the following transformations has been performed:

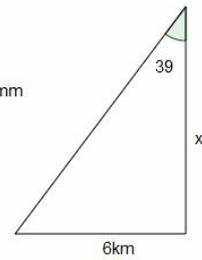
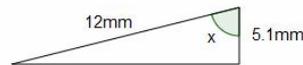
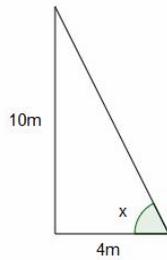
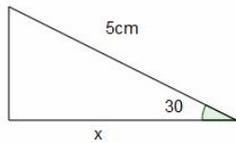
$y = f(x - 2)$	$y = f(x) + 3$	$y = -f(x)$	$y = 5f(x)$	$y = f(3x)$
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(12) Simplify the fraction (a)  $\frac{x^2 - x - 6}{x^2 + 2x}$  \_\_\_\_\_ (b)  $\frac{x^2 - 25}{x^2 - 2x - 15}$  \_\_\_\_\_

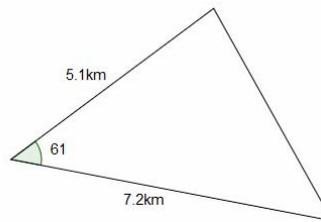
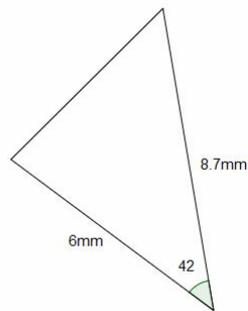
(13) Find an equation of the straight line passing through the point  $(2, 1)$  that is (i) parallel to and (ii) perpendicular to the line with equation  $y = 3x - 5$ .

(14) State 4 points the graph of  $x^2 + y^2 = 25$  passes through and draw a sketch of the graph below.

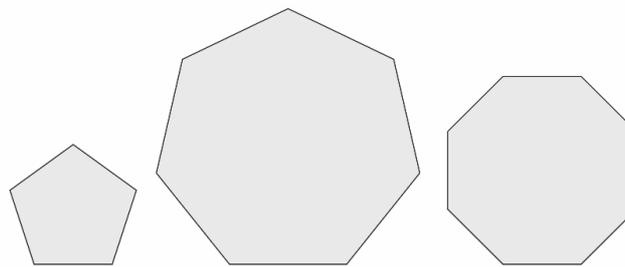
(1) Find the value of  $x$  in each of the right angled triangles below:



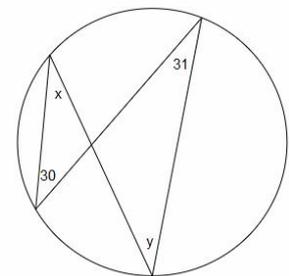
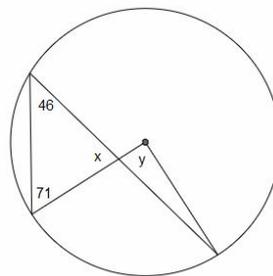
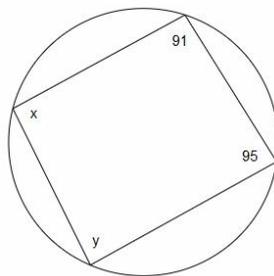
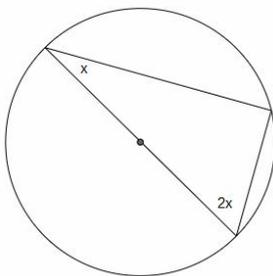
(2) (a) Find the area of each of the triangles below. (b) Find the missing length in each triangle.



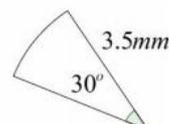
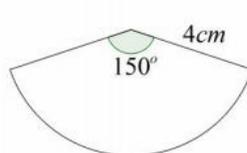
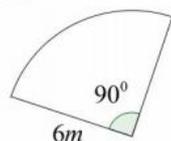
(3) Name each regular polygon below and find the size of each interior and exterior angle for each.



(4) Find the missing values in each of the circles below:



(5) Find the area, arc length and perimeter of each of the sectors below.



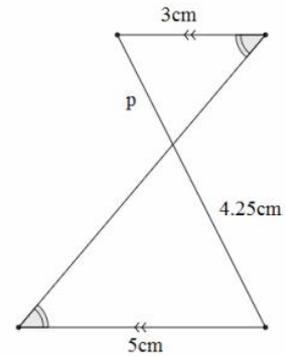
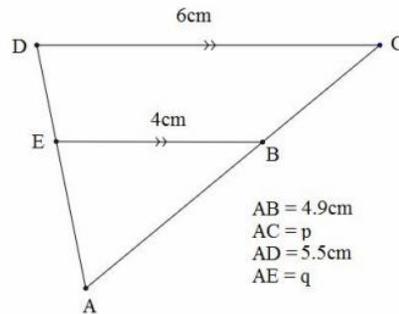
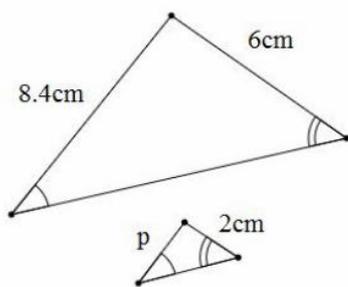
(6) Find the surface area **and** the volume of a sphere with radius 9mm. (You may use the formula  $V = \frac{4}{3}\pi r^3$ )

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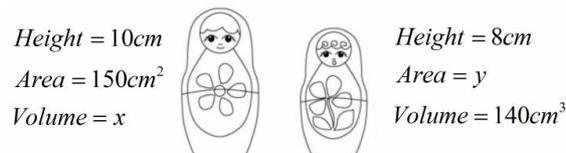
(7) Find each of the following:

- (a) The volume of a block with density  $400\text{ gm/cm}^3$  and mass  $60\text{ g}$  . \_\_\_\_\_  
 (b) The mass of a block with volume  $320\text{ cm}^3$  and density  $20\text{ gm/cm}^3$  \_\_\_\_\_  
 (c) The density of a block with mass  $1\text{ kg}$  and volume  $126\text{ cm}^3$  \_\_\_\_\_

(8) Find the missing value(s) in each diagram below:

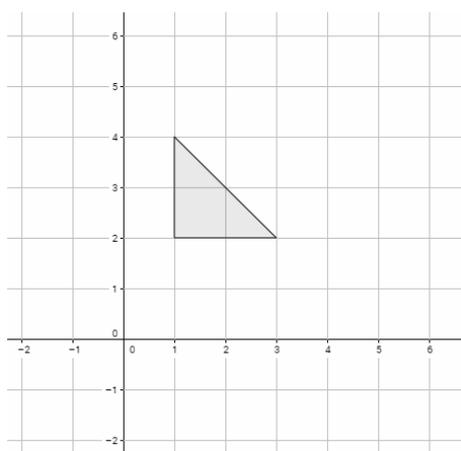


(9) The two solids below are mathematically similar. Find the values of  $x$  and  $y$  .

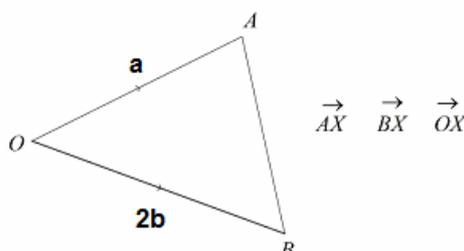


(10) Convert the following: (a)  $40\text{ cm}^2$  into  $\text{m}^2$  \_\_\_\_\_ (b)  $50\text{ m}^3$  into  $\text{cm}^3$  \_\_\_\_\_

(11) The diagram below shows a triangle. Enlarge the triangle by a scale factor of  $-\frac{1}{2}$  about the point (3,4) .



(12) Given that  $X$  is the midpoint of  $OA$  , find the 3 vectors below.



(1) Without a calculator, find the value of each of the following:

(a)  $1\frac{3}{4} + 2\frac{1}{3}$  \_\_\_\_\_ (b)  $5\frac{2}{5} - 3\frac{2}{7}$  \_\_\_\_\_ (c)  $3\frac{2}{3} \times 4\frac{1}{9}$  \_\_\_\_\_ (d)  $7\frac{1}{5} \div 2\frac{3}{4}$  \_\_\_\_\_

(2) A t shirt is in a sale. The t shirt has been reduced by 8%. Given that the new price of the t shirt is £51.52, find the original price before the sale. \_\_\_\_\_

(3) Fred has an increase in his salary of 12%. After the increase he earns £506.24 a week. What did he earn each week before the increase? \_\_\_\_\_

(4) A rectangle has one side length increased by 10% and one side length decreased by 10% to create a new rectangle. By what percentage has the area of the rectangle changed?  
\_\_\_\_\_  
\_\_\_\_\_

(5) A boat was initially valued at £400. It was valued a year later at £500. Find the percentage increase in the value of the boat.  
\_\_\_\_\_  
\_\_\_\_\_

(6) A rock is eroding at a rate of 7.5% a day. Given that the original mass of the rock was 48g, find the mass of the rock after one week. \_\_\_\_\_

(7) A bank offers a compound interest rate of 5% and a simple interest rate of 6%. Mike invests £4000 for 7 years. Which of the two rates should Mike take if he wants to have the largest possible balance after 7 years?  
\_\_\_\_\_

(8) Write the following numbers in standard form:

(a) 240000 \_\_\_\_\_ (b) 127000000 \_\_\_\_\_ (c) 0.00037 \_\_\_\_\_ (d) 0.00908 \_\_\_\_\_

(9) Without using a calculator, find the value of the following:

(a)  $(4 \times 10^5) \times (1.2 \times 10^6)$  \_\_\_\_\_ (b)  $(3 \times 10^3) \times (3.6 \times 10^{-1})$  \_\_\_\_\_

(c)  $(4.8 \times 10^8) \div (3 \times 10^5)$  \_\_\_\_\_ (d)  $(1.2 \times 10^{-3}) \div (4 \times 10^{-6})$  \_\_\_\_\_

(10) The population of an island is  $1.8 \times 10^5$ . The area of the island  $3 \times 10^7$  square kilometres. Find out how much land each person would have if it was shared equally. Give your answer in **square meters**.  
\_\_\_\_\_  
\_\_\_\_\_

(11)  $x = 1.2$  correct to 2 significant figures.

$y = 43$  correct to the nearest integer.

$z = 2.375$  correct to 3 d.p

(a) Find the maximum value of  $xyz$ . \_\_\_\_\_

(b) Find the minimum value  $\frac{yz}{x}$  \_\_\_\_\_

(12) Without using a calculator write the following recurring decimals as fractions in their simplest form:

(a)  $0.\dot{4}$  \_\_\_\_\_

(b)  $0.\dot{3}\dot{5}$  \_\_\_\_\_

(c)  $0.1\dot{2}\dot{6}$  \_\_\_\_\_

(13) A recipe for 4 cakes requires 500g of flour, 240g of sugar, 8 eggs and 300g of butter. Fred has  $\frac{1}{4}$  of a kilogram of flour, half a kilogram of sugar, 12 eggs and 700g of butter. What is the maximum number of cakes he can make?

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(14)  $y$  is directly proportional to the square of  $x$ . When  $x = 5$ ,  $y = 100$ .

(a) Find the value of  $y$  when  $x = 10$  \_\_\_\_\_

(b) Find the positive value of  $x$  when  $y = 36$  \_\_\_\_\_

(15)  $y$  is inversely proportional to the square root of  $x$ . When  $x = 64$ ,  $y = 2$ .

(a) Find the value of  $y$  when  $x = 49$  \_\_\_\_\_

(b) Find the value of  $x$  when  $y = 12$  \_\_\_\_\_

(16) The ratio of cats to dogs at a vets is 7:9. The ratio of dogs to chickens at the vets is 7:5. Find the ratio of cats to chickens at the vets.

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(17) Without using a calculator, fully simplify each of the following:

(a)  $\sqrt{3} + 4\sqrt{3}$  \_\_\_\_\_

(b)  $\sqrt{8} - \sqrt{2}$  \_\_\_\_\_

(c)  $\sqrt{7} \times 2\sqrt{7}$  \_\_\_\_\_

(d)  $\sqrt{5}(\sqrt{10} - \sqrt{20})$  \_\_\_\_\_

(e)  $(1 + \sqrt{2})(3 - \sqrt{8})$  \_\_\_\_\_

(18) Without using a calculator, rationalise the denominator or the following:

(a)  $\frac{1}{\sqrt{2}}$  \_\_\_\_\_

(b)  $\frac{5}{\sqrt{3}}$  \_\_\_\_\_

(c)  $\frac{4}{7\sqrt{2}}$  \_\_\_\_\_

(19) Without using a calculator, put the following values in ascending order:

$$\frac{\sqrt{6}}{2}$$

$$\sqrt[4]{81}$$

$$0.\dot{9}$$

$$16^{0.25}$$

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(20) As a product of its prime factors  $X = 2^2 \times 3^4 \times 5$  and  $Y = 2^3 \times 3^2 \times 7$ .

(a) Find the highest common factor (HCF) of  $X$  and  $Y$ .

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(b) Find the lowest common multiple (LCM) of  $X$  and  $Y$ .

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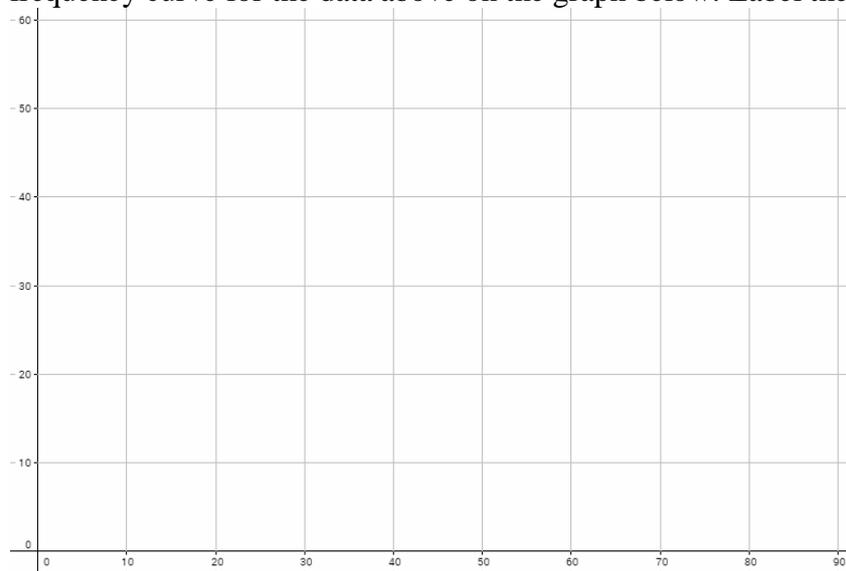
(1) Find an estimated mean from the grouped data below and explain why your answer is an estimate.

Age	Frequency		
$0 \leq a < 10$	6		
$10 \leq a < 30$	14		
$30 \leq a < 40$	22		
$40 \leq a < 70$	15		

(2) (a) Complete the table below

Height (in cm)	Frequency	Cumulative Frequency	Frequency Density
$0 \leq h < 20$	9		
$20 \leq h < 30$	14		
$\_ \leq h < \_$	22		
$50 \leq h < 80$	15		

(b) Draw a cumulative frequency curve for the data above on the graph below. Label the axis clearly.



(c) Find an estimate for the lower quartile, median, upper quartile and the interquartile range from the data.

(d) State which graph would be drawn using the frequency density. \_\_\_\_\_

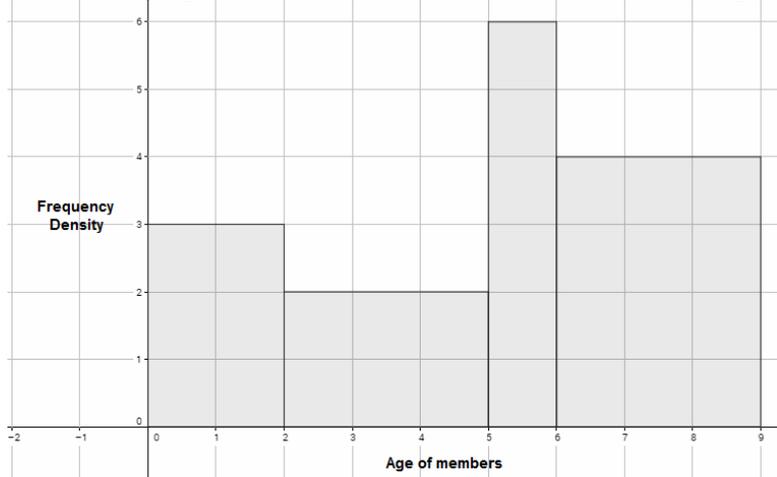
(3) The box plots below shows information about how boys and girls performed on the same maths tests.



(a) Find the lower quartile, median, upper quartile and the interquartile range for both the boys and the girls.

(b) Make 3 comparisons, in context, about the performances of the boys and the girls.

(4) The Histogram below shows information about the ages of members of a kids club.



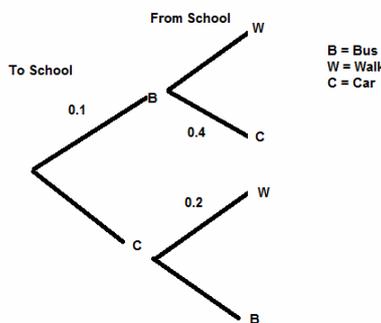
(a) Given that there were 6 members between the ages of 5 and 6, find the total number of kids at the club.

(b) Sketch a cumulative frequency curve to the right of the graph to represent the data.

(5) A sample of stratified by age is to be taken from a school. Using the information below decide how many of each year group should be in the sample.

Year	Number of Pupils	Number in Sample
7	120	
8	140	
9	130	
10	110	
11	100	

(6) Ahmed travels to and from school either by getting a lift in a car, by bus or by walking. Travelling to and from school are independent events. Some information is shown in the tree diagram below.



(a) Complete the tree diagram.

(b) Find the probability Ahmed:

(i) Walks home \_\_\_\_\_ (ii) Doesn't catch the bus home \_\_\_\_\_

(7) There are 12 counters in a bag. 4 are red, 5 are yellow and the rest are blue. Mike takes 3 counters from the bag and doesn't replace them. Find the probability:

(a) All 3 counters are red \_\_\_\_\_ (b) All 3 counters are the same colour \_\_\_\_\_

(c) All 3 counters are different colours \_\_\_\_\_ (d) None of the counters are red \_\_\_\_\_

(8) There are  $k$  counters in a bag. 8 of the counters in the bag are red and the rest of the counters are blue. Two counters are chosen at random and not replaced. Explain what the following probabilities represent:

(a)  $\frac{8}{k} \times \frac{7}{k-1}$  \_\_\_\_\_

(b)  $\frac{k-8}{k} \times \frac{8}{k-1}$  \_\_\_\_\_