

Candidate Name	Centre Number	Candidate Number
		0



**GCSE**

185/09

**MATHEMATICS (2 Tier)**

**HIGHER TIER**

**PAPER 1**

P.M. MONDAY, 18 May 2009

2 hours

**CALCULATORS ARE  
NOT TO BE USED  
FOR THIS PAPER**

### INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

Take  $\pi$  as 3.14.

### INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

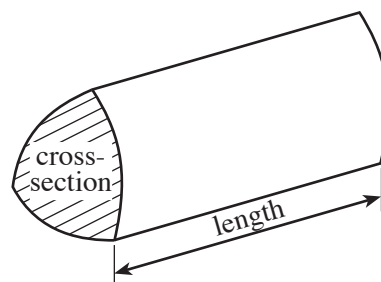
Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	6	
2	7	
3	7	
4	9	
5	7	
6	7	
7	8	
8	4	
9	8	
10	5	
11	6	
12	7	
13	9	
14	2	
15	3	
16	5	
TOTAL MARK		

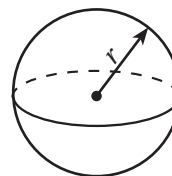
### Formula List

**Volume of prism** = area of cross-section  $\times$  length



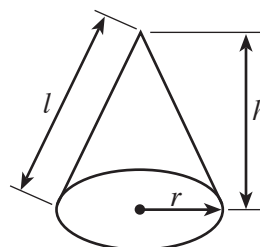
**Volume of sphere** =  $\frac{4}{3} \pi r^3$

**Surface area of sphere** =  $4\pi r^2$



**Volume of cone** =  $\frac{1}{3} \pi r^2 h$

**Curved surface area of cone** =  $\pi r l$

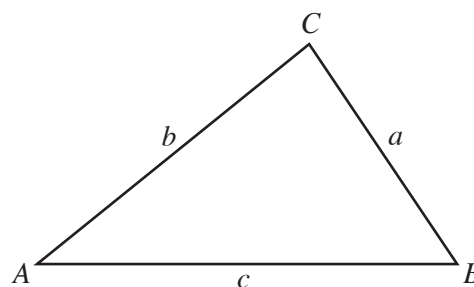


**In any triangle ABC**

**Sine rule**  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

**Cosine rule**  $a^2 = b^2 + c^2 - 2bc \cos A$

**Area of triangle** =  $\frac{1}{2} ab \sin C$



### The Quadratic Equation

The solutions of  $ax^2 + bx + c = 0$

where  $a \neq 0$  are given by

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

### Standard Deviation

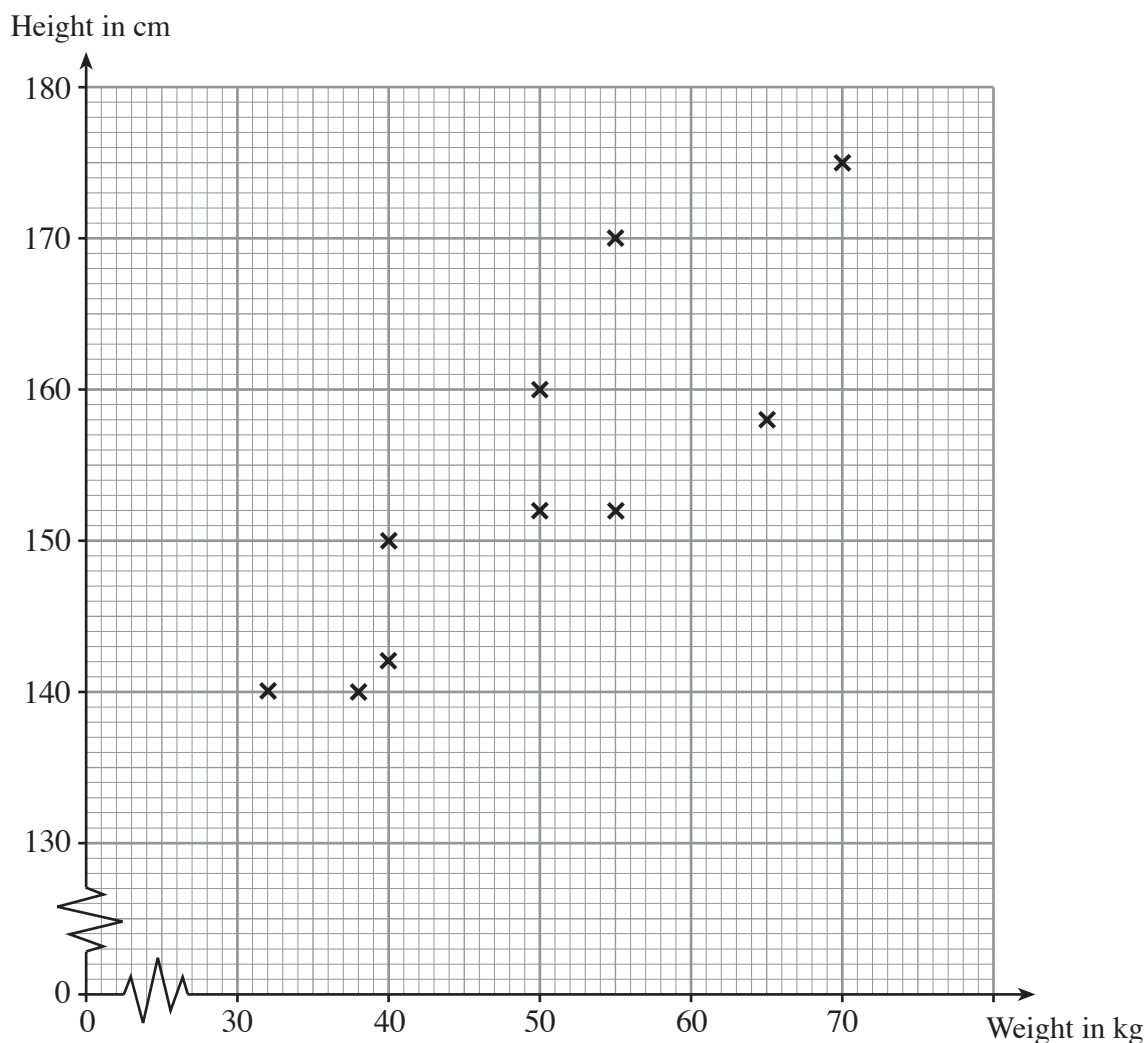
Standard deviation for a set of numbers

$x_1, x_2, \dots, x_n$ , having a mean of  $\bar{x}$  is given by

$$s = \sqrt{\frac{\sum (x - \bar{x})^2}{n}} \quad \text{or} \quad s = \sqrt{\frac{\sum x^2}{n} - \left\{ \frac{\sum x}{n} \right\}^2}$$

**BLANK PAGE**

1. The scatter diagram shows the height, in cm, and the weight, in kg, for each of 10 persons.



- (a) Write down the weight and height of the **tallest** of the 10 persons.

Weight ..... kg

Height ..... cm

[2]

- (b) Write down the type of correlation shown by the scatter diagram.

.....  
[1]

- (c) Draw, by eye, a line of best fit on the scatter diagram.

[1]

- (d) Estimate the weight of a person of height 165 cm.

.....  
[1]

- (e) Is it possible to tell from the scatter diagram which was the first of the 10 people to be weighed and have their height measured? You must give a reason for your answer.

.....

.....

.....

.....

[1]

2.

### Mixed Berry Yogurt Shake

Serves **8** people

Ingredients:      4 cups semi-skimmed milk  
                          4 cups low fat natural yogurt  
                          16 ounces mixed summer fruits  
                          4 tablespoons of honey

The recipe for Mixed Berry Yogurt Shake appears in an old cookery book. Inside the cover of the book the reader is told that 1 cup = 250 ml, 4 ounces is approximately 115 g and 1 tablespoon is 15 ml.

(a) Complete the recipe below for serving 8 people using ml and g.

### Mixed Berry Yogurt Shake

Serves **8** people

Ingredients:      ..... ml semi-skimmed milk  
                          ..... ml low fat natural yogurt  
                          ..... g mixed summer fruits  
                          ..... ml of honey

[4]

(b) Jamie has large quantities of natural yogurt, mixed summer fruits and honey but only has 5.5 litres of semi-skimmed milk. Find the largest number of people for whom Jamie can make Mixed Berry Yogurt Shakes.

.....

.....

.....

.....

[3]

3. (a) Estimate the value of  $\frac{49 \times 396}{199}$  .

.....

.....

.....

.....

.....

[2]

- (b) Given that  $36 \times 428 = 15\,408$ , write down the value of  $\frac{15\,408}{3 \cdot 6}$  .

.....

.....

[1]

- (c) William scores 45 out of 50 in an English test. Express this as a percentage.

.....

.....

[1]

- (d) Which of the following fractions is closest to  $\frac{1}{4}$  ?

$$\frac{13}{20}$$

$$\frac{2}{5}$$

$$\frac{3}{10}$$

Show how you made your decision.

.....

.....

.....

.....

.....

[3]

4. (a) When  $f = 5$  and  $g = -2$  find the value of

(i)  $\frac{2f - 3g}{2}$  ,

.....

.....

.....

.....

(ii)  $3fg^2$ .

.....

.....

.....

.....

[4]

- (b) The diagram below shows a number machine.



Write down the OUTPUT when the INPUT is  $n$ .

.....

.....

[1]

- (c) (i) Find the  $n$ th term of a sequence 5, 12, 19, 26, 33, . . .

.....

.....

.....

- (ii) The  $n$ th term of a sequence is  $n^2 - 2$ . Find the value of the twentieth term of the sequence.

.....

.....

.....

[4]



5. (a) Complete the following table by placing a tick (✓) in any box where the given statement is true.

Statement	Square	Parallelogram	Trapezium
The diagonals are equal in length			
Opposite angles are equal			
Only one pair of opposite sides are parallel			
The diagonals are lines of symmetry			

[3]

- (b) Explain why three lines of lengths 3 cm, 5 cm and 10 cm cannot be used to form a triangle.

.....

.....

.....

.....

[1]

- (c) Two exterior angles of a triangle are  $150^\circ$  and  $110^\circ$ . Calculate the size of the third exterior angle of the triangle.

.....

.....

.....

.....

[3]

6. (a) A solid metal ingot weighs 1.5 kg and has a volume of  $300 \text{ cm}^3$ . Find the density of the metal in  $\text{g/cm}^3$ .

.....

.....

.....

.....

[3]

- (b) It takes 50 seconds to fill a 4 litre bucket with water from a hose pipe. It takes 10 minutes to fill a tank with water using the same hose pipe with the same rate of flow. Find the volume of the tank.

.....

.....

.....

.....

.....

[3]

- (c) Two boxes have heights of 134 mm and 23 mm, each measured to the nearest mm. Find the maximum height when the boxes are placed one on top of the other.

.....

.....

[1]

7. (a) Expand  $c(c^3 - 5)$ .

[1]

- (b) Simplify  $4(2d - 3) + 3(5 - 7d)$ .

[2]

- (c) Solve **each** of the following equations.

(i)  $7e + 12 = 3(e + 6)$

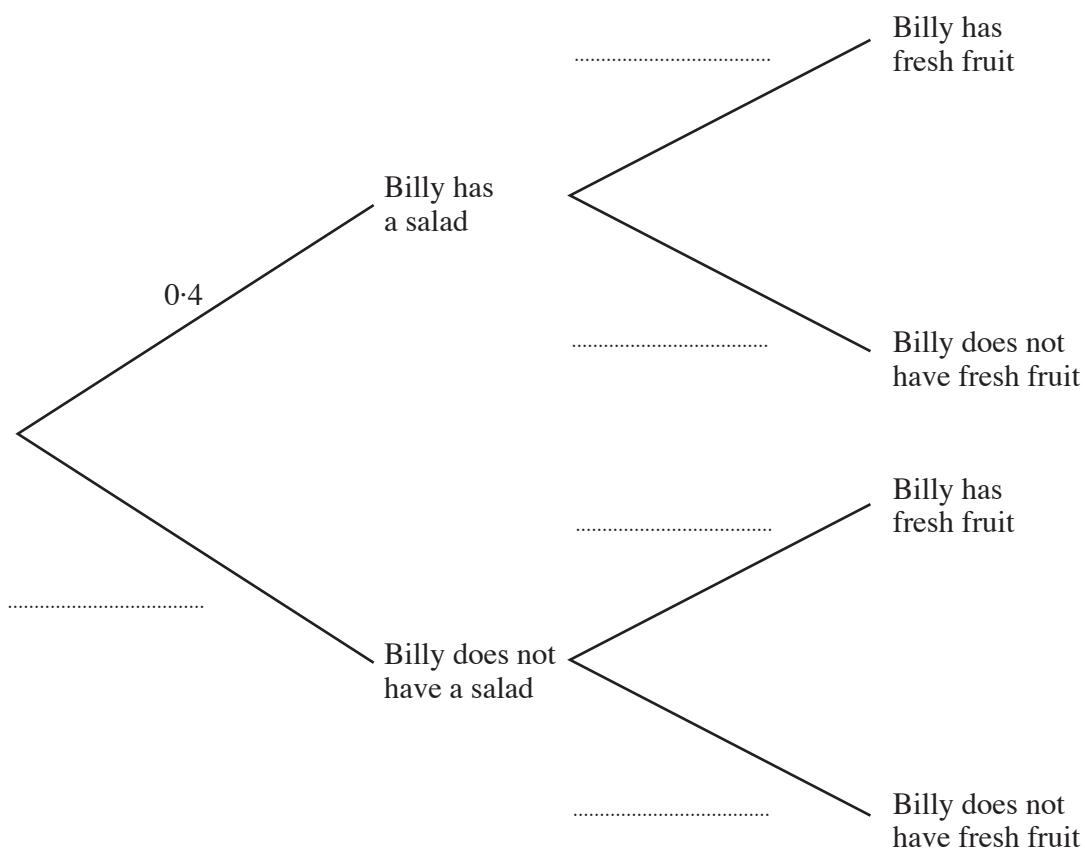
[3]

(ii)  $\frac{f}{5} + 7 = 17$

[2]

8. At lunchtime, the probability that Billy has a salad is 0.4. Whether or not Billy has a salad, the probability that Billy has fresh fruit afterwards is 0.3.

(a) Complete the following tree diagram.



[2]

- (b) Calculate the probability that Billy has a salad for lunch but does not have fresh fruit afterwards.

.....

.....

.....

.....

[2]

9. (a) Write **each** of the following numbers in standard form.

(i) 0.0047

.....

(ii) 32 000

.....

[2]

(b) Find, in standard form, the value of

$$(2.1 \times 10^{-5}) \times (3 \times 10^8).$$

.....

.....

[2]

(c) Evaluate  $3\frac{1}{3} \times 1\frac{1}{5}$ .

.....

.....

.....

[2]

(d) Simplify  $(\sqrt{19})^2$ .

.....

[1]

(e) Evaluate  $3^{-4}$ .

.....

[1]

- [illegible]

(a) Complete the table by finding the values of  $y$  for  $x = -2$ .

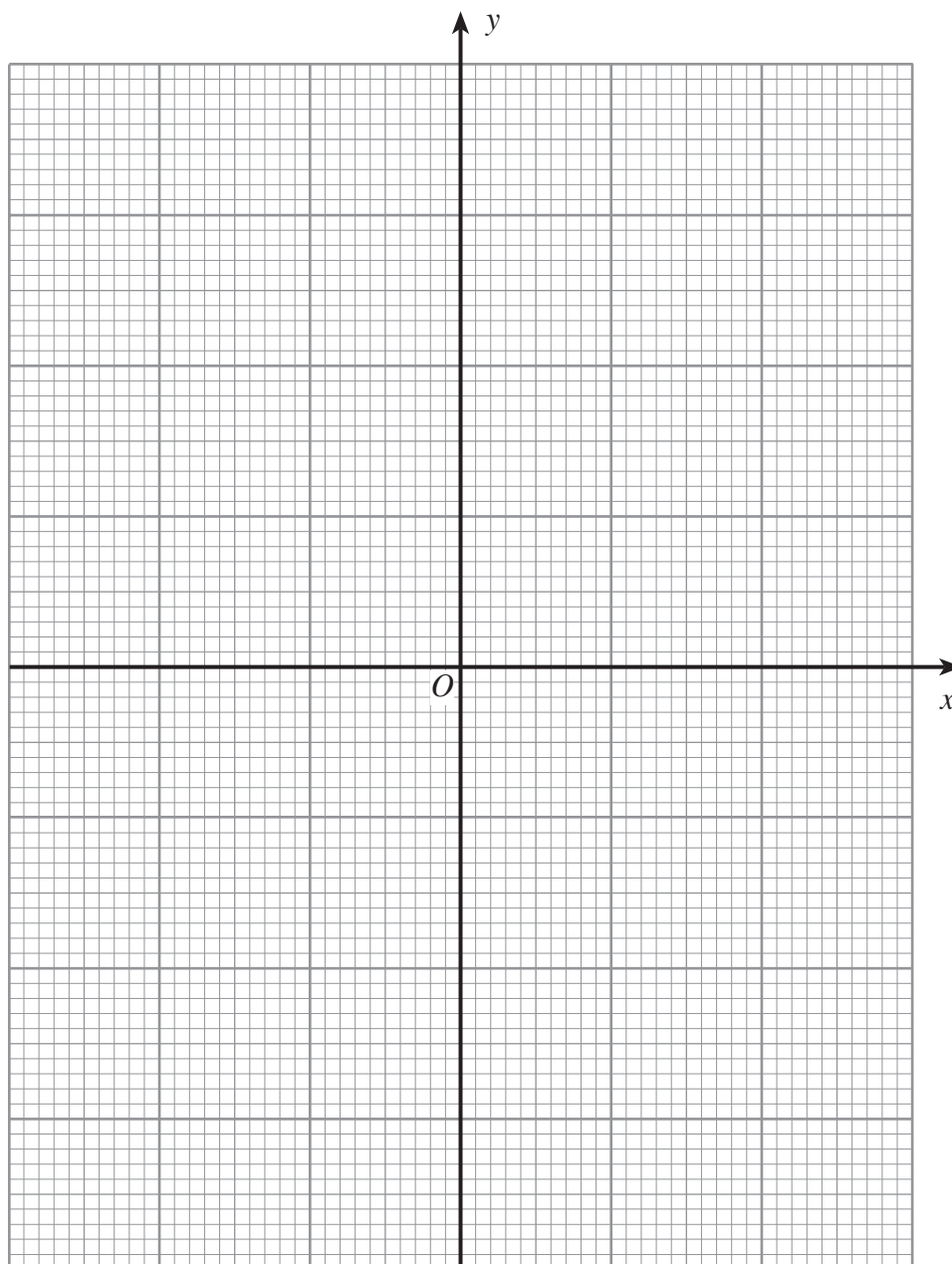
.....

.....

.....

(185-09)

- (b) On the graph paper below, draw the graph of  $y = 2x^3 - 3$  for values of  $x$  between  $-2$  and  $2$ . [3]



- (c) Write down the coordinates of the point of intersection of  $y = 2x^3 - 3$  with the line  $y = x + 4$ .

.....

.....

.....

[2]

12. (a) (i) Factorise  $25x^2 - 49y^2$ .

.....

.....

.....

- (ii) **Hence** simplify  $\frac{25x^2 - 49y^2}{10x^2 - 14xy}$  .

.....

.....

.....

.....

.....

.....

.....

.....

[4]

- (b) Factorise the expression  $15x^2 + 19x + 6$ , and **hence** solve the equation  $15x^2 + 19x + 6 = 0$ .

.....

.....

.....

.....

.....

.....

.....

.....

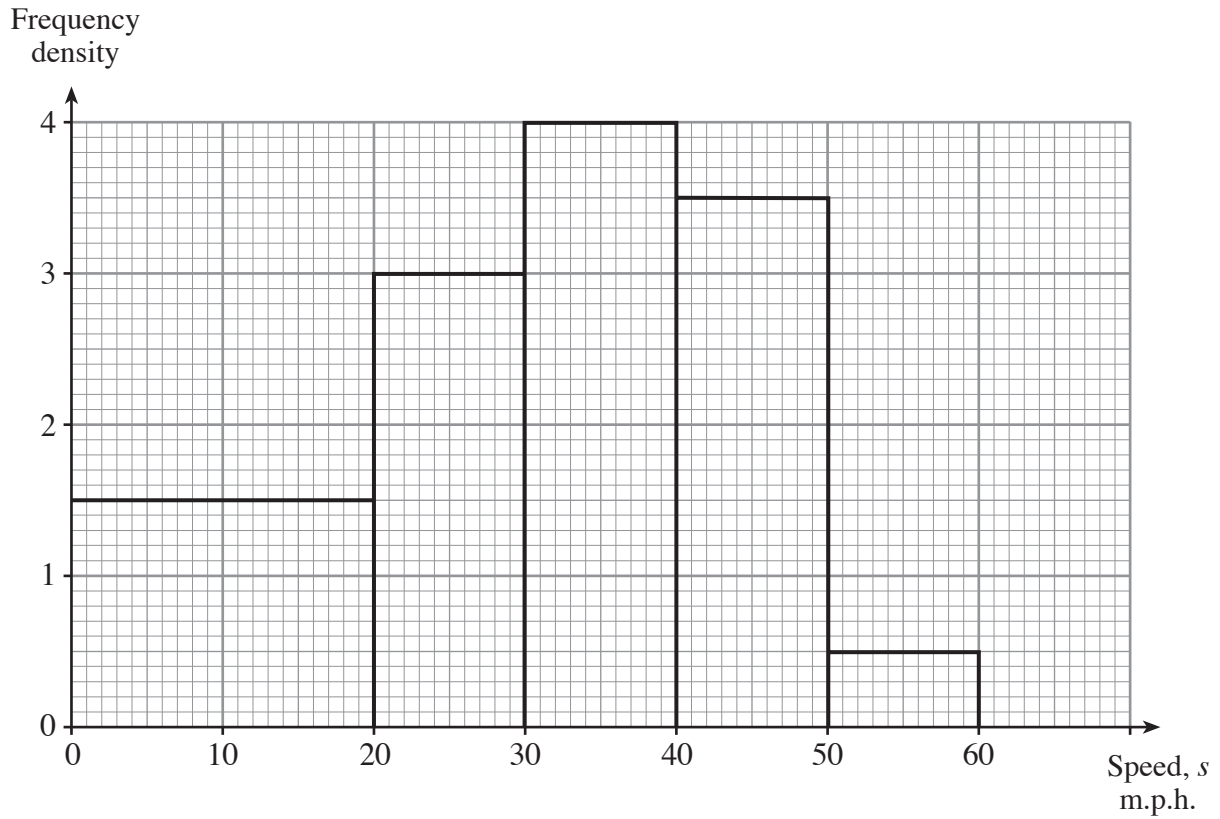
.....

[3]



**BLANK PAGE**

13. A survey was carried out to record the speeds of cars entering a village. The histogram illustrates the results of the survey.



- (a) Use the histogram to complete the grouped frequency table below.

Speed, $s$ m.p.h.	$0 < s \leq 20$	$20 < s \leq 30$	$30 < s \leq 40$	$40 < s \leq 50$	$50 < s \leq 60$
Frequency					

[2]

- (b) Calculate an estimate of the number of cars with speeds exceeding 32 m.p.h.

.....

.....

.....

.....

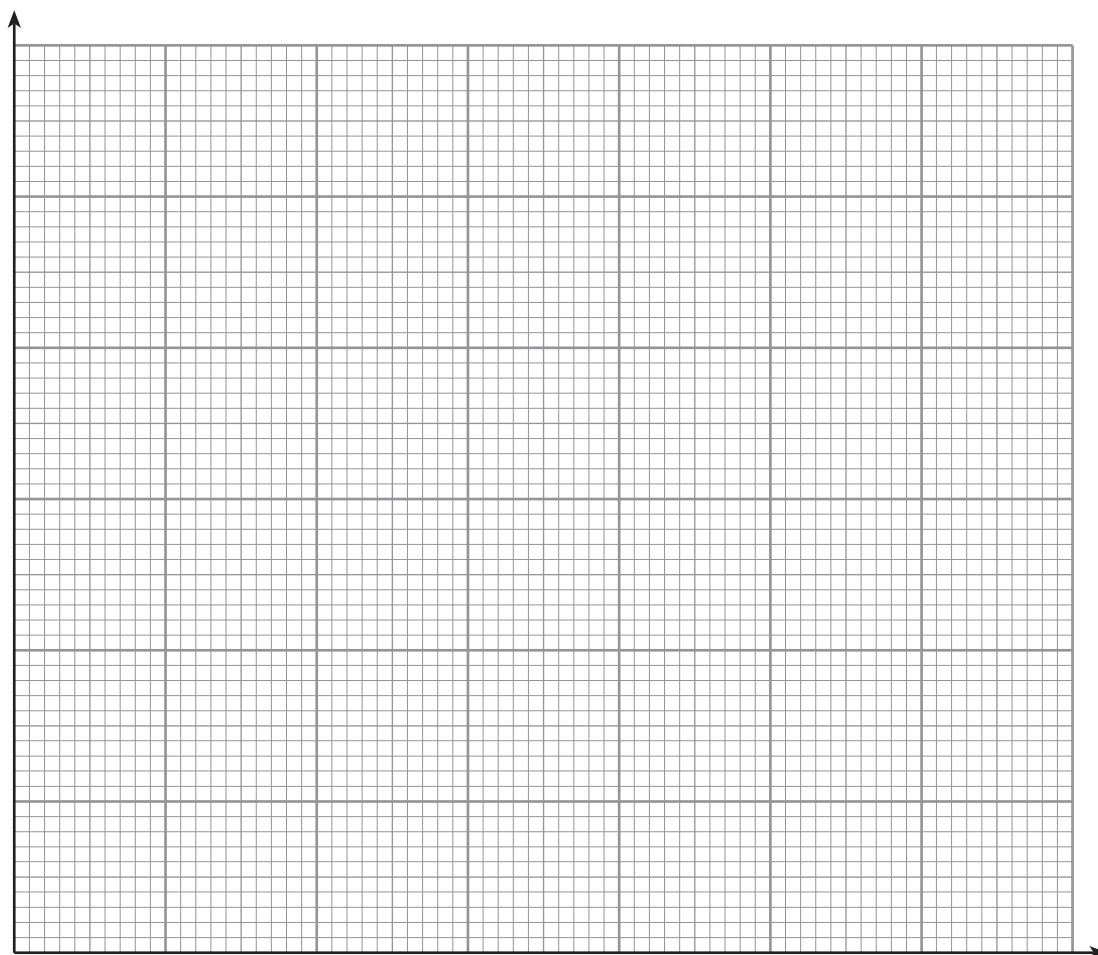
[3]

- (c) A further survey was carried out after the placement of a speed camera warning sign. The results are summarised in the grouped frequency distribution below.

Speed, $s$ m.p.h.	$0 < s \leq 20$	$20 < s \leq 30$	$30 < s \leq 40$	$40 < s \leq 50$	$50 < s \leq 60$
Frequency	60	40	20	15	5
Frequency density					

Draw a histogram to illustrate the results of this survey.

[3]



- (d) Compare the two histograms. Do you consider the speed camera warning sign to have been effective? Give a reason for your answer.

.....

.....

.....

.....

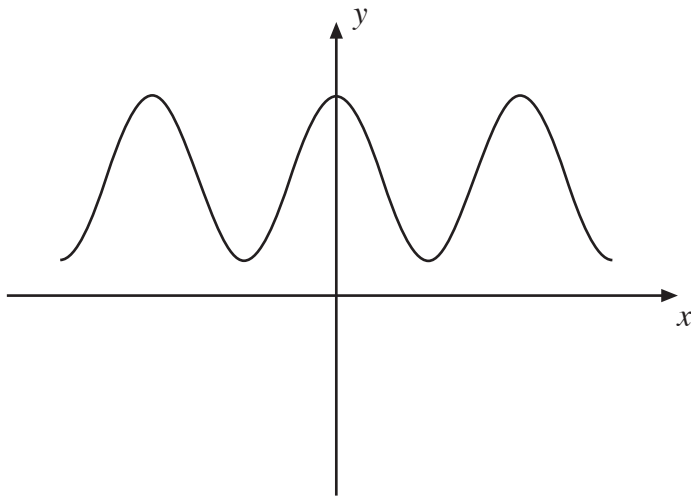
[1]

14. Match each of the following equations to the appropriate sketch by writing the equations in the spaces below.

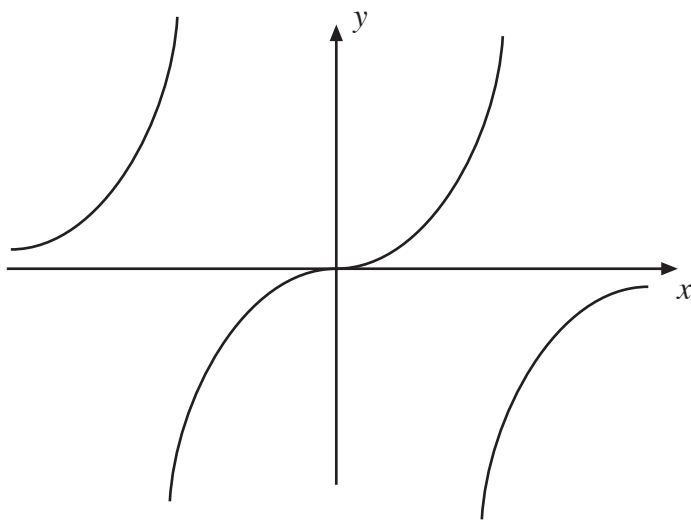
$y = \sin x$

$y = \tan x$

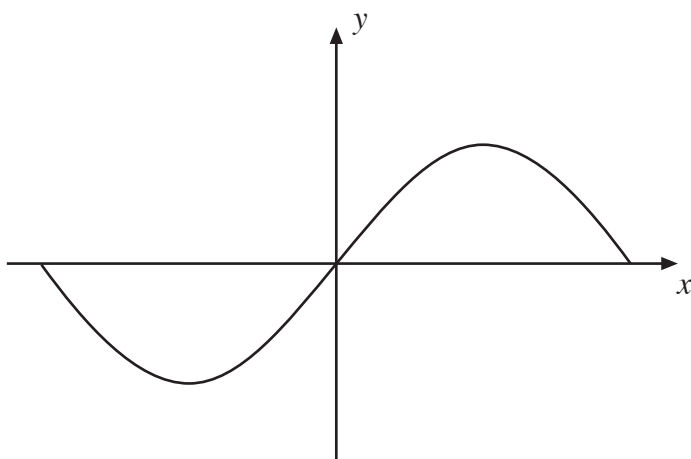
$y = 2 + \cos x$



Equation .....

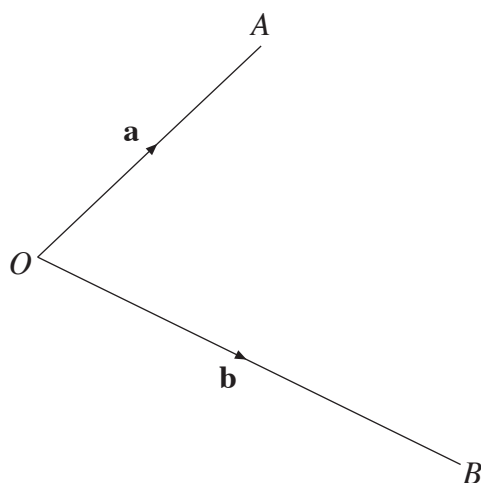


Equation .....



Equation .....

15.

*Diagram not drawn to scale.*

The point  $C$  is the point on  $AB$  such that  $AC:CB$  is  $2:3$ .

Given that  $\mathbf{OA} = \mathbf{a}$  and  $\mathbf{OB} = \mathbf{b}$ , find  $\mathbf{OC}$ . Simplify your answer.

.....

.....

.....

.....

.....

.....

.....

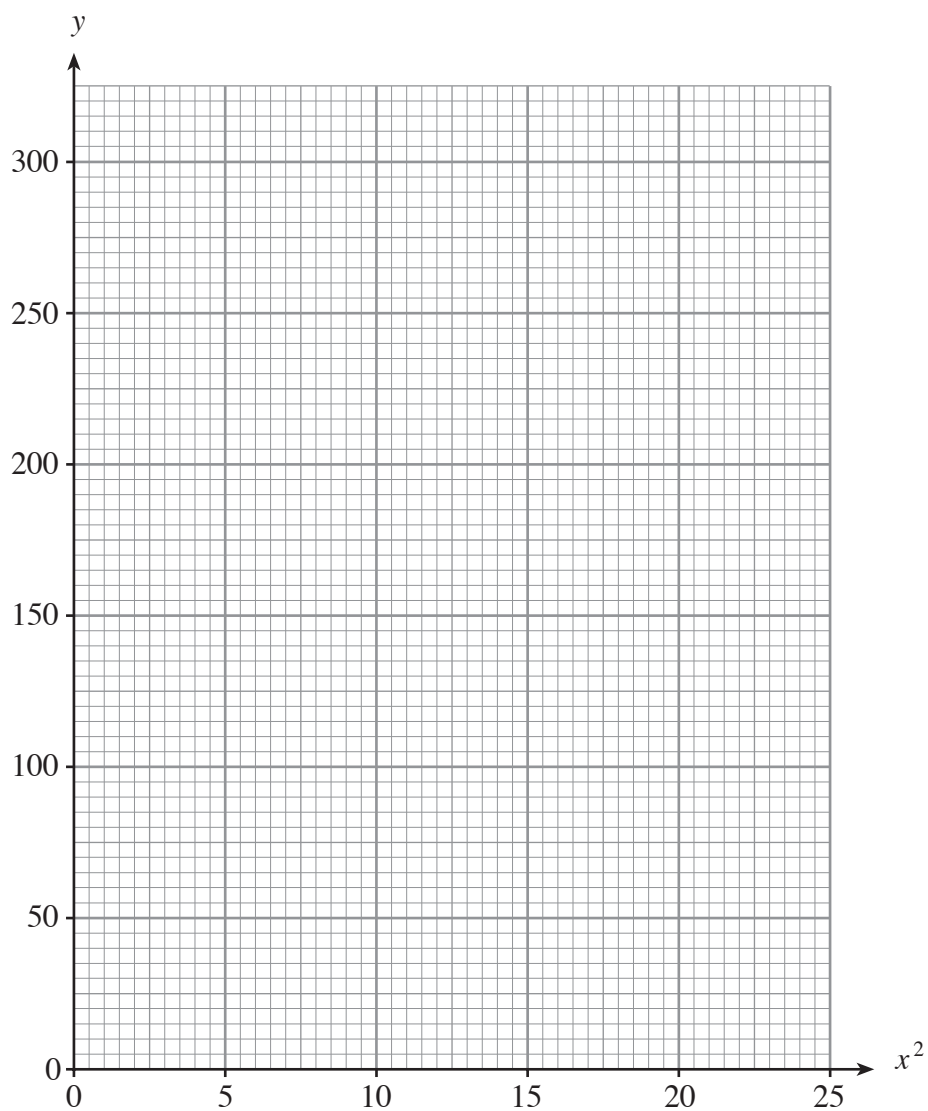
[3]

16. The data in the table was recorded during an experiment. Results were recorded for the two variables  $x$  and  $y$ .

$x$	1	2	3	4	5
$y$	110	132	170	230	302

- (a) On the graph paper plot the values of  $y$  against the values of  $x^2$ .

[2]



- (b) It is known that  $y$  is approximately equal to  $ax^2 + b$ .  
Use your graph to estimate the values of  $a$  and  $b$ .

.....

.....

.....

.....

.....

.....

.....

[3]