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Wednesday 5 November 2014 – Morning

GCSE MATHEMATICS B

J567/03   Paper 3 (Higher Tier)

Duration: 1 hour 45 minutes

Candidate forename		Candidate surname	

Centre number						Candidate number					

INSTRUCTIONS TO CANDIDATES

* Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
* Use black ink. HB pencil may be used for graphs and diagrams only.
* Answer **all** the questions.
* Read each question carefully. Make sure you know what you have to do before starting your answer.
* Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
* Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
* Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

* The number of marks is given in brackets **[ ]** at the end of each question or part question.
* Your quality of written communication is assessed in questions marked with an asterisk (*).
* The total number of marks for this paper is **100**.
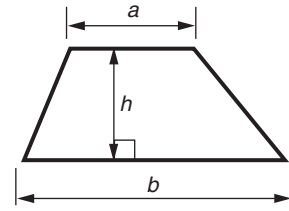* This document consists of **24** pages. Any blank pages are indicated.
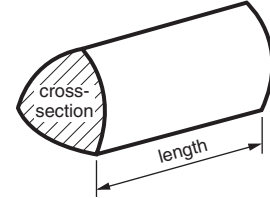
WARNING

☒ **No calculator can be used for this paper**

Turn over

Formulae Sheet: Higher Tier

Area of trapezium $= \frac{1}{2}(a + b)h$

Volume of prism = (area of cross-section) × length

In any triangle ABC

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

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

Area of triangle $= \frac{1}{2} ab \sin C$
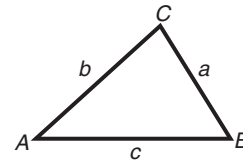
Volume of sphere $= \frac{4}{3} \pi r^3$

Surface area of sphere $= 4\pi r^2$
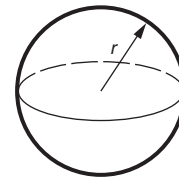
Volume of cone $= \frac{1}{3} \pi r^2 h$

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

The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

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

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Answer **all** the questions.

1 (a) Here are the first four terms of a sequence.
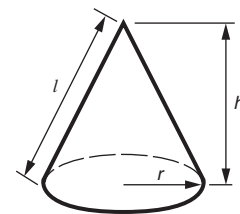
$$2 \quad 5 \quad 8 \quad 11$$

Write down an expression for the nth term.

(a) .... [2]

(b) The expression for the nth term of another sequence is $5(2n + 1)$.

Write down the first three terms of this sequence.

(b) .... [2]

2 Bus tickets cost £3.56 each.
Mr Green buys 24 tickets.

Work out the exact cost of 24 tickets.

£ .... [3]

Turn over

3 Andrew and Lucy want to find the most common vowel in their books.
They record how often each letter appears in the first sentence.

The results from the first sentence in Andrew's book are shown in the bar chart.

Letters in Andrew's first sentence
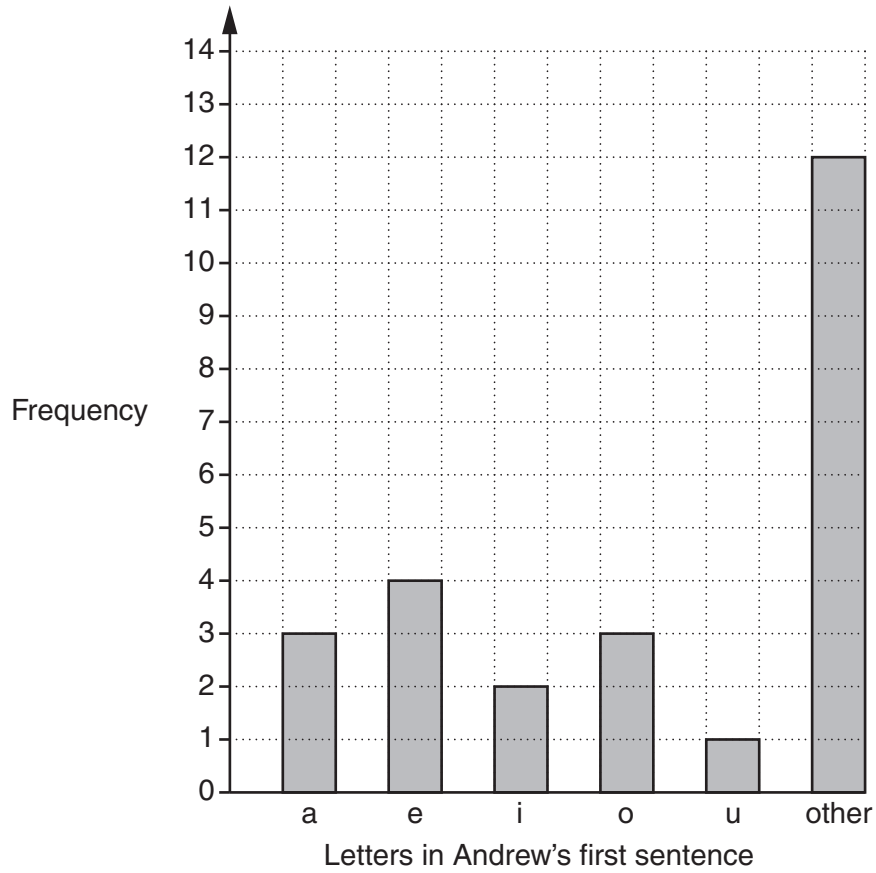
The results from the first sentence in Lucy's book are shown in the pie chart.
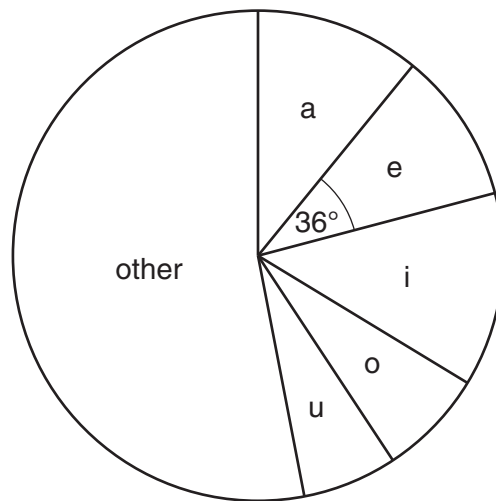
Letters in Lucy's first sentence

(a) Use these results to decide whose sentence contains the higher proportion of the letter e.
Show how you decide. **[4]**

(b) Andrew says

"e is the most common vowel in my book".

Explain why he might be wrong.

....

.... **[1]**

4 Jagdeep sells desktop and laptop computers.
The table summarises his sales of each type of computer one month.
He also records the gender of each customer.

	Desktops	**Laptops**	**Total**
Male			17
Female	4		
Total		20	35

(a) Complete the table. **[2]**

(b) The names of these customers are entered into a prize draw and one name is picked at random.
Each customer bought only one computer.

Find the probability that the winner bought a laptop.
Write your answer in its simplest form.

(b) .... **[2]**

5* Westbourne Castle is open one weekend each year.
Visitors must book in advance to visit the castle.
This year the number of visitors will be 108 on Saturday and 156 on Sunday.

Visitors are shown round the castle in groups.

- All groups must be the same size on **both** days.
- The number of groups must be as small as possible.

Work out what the group size should be.

.... **[3]**

6 **(a)** Work out the value of $6a - 5b$ when $a = {}^-2$ and $b = 4$.

(a) .... **[2]**

(b) Multiply out these brackets.

(i) $4(x - 3)$

(b)(i) .... **[1]**

(ii) $x(x + 5)$

(ii) .... **[1]**

(c) Factorise fully.

$6x^2 + 4x$

(c) .... **[2]**

(d) Solve.

$5x + 2 = 3x - 9$

(d) $x =$ .... **[3]**

7 **(a)** The graph shows two triangles, **A** and **B**.
Triangle **B** is an enlargement of triangle **A**.
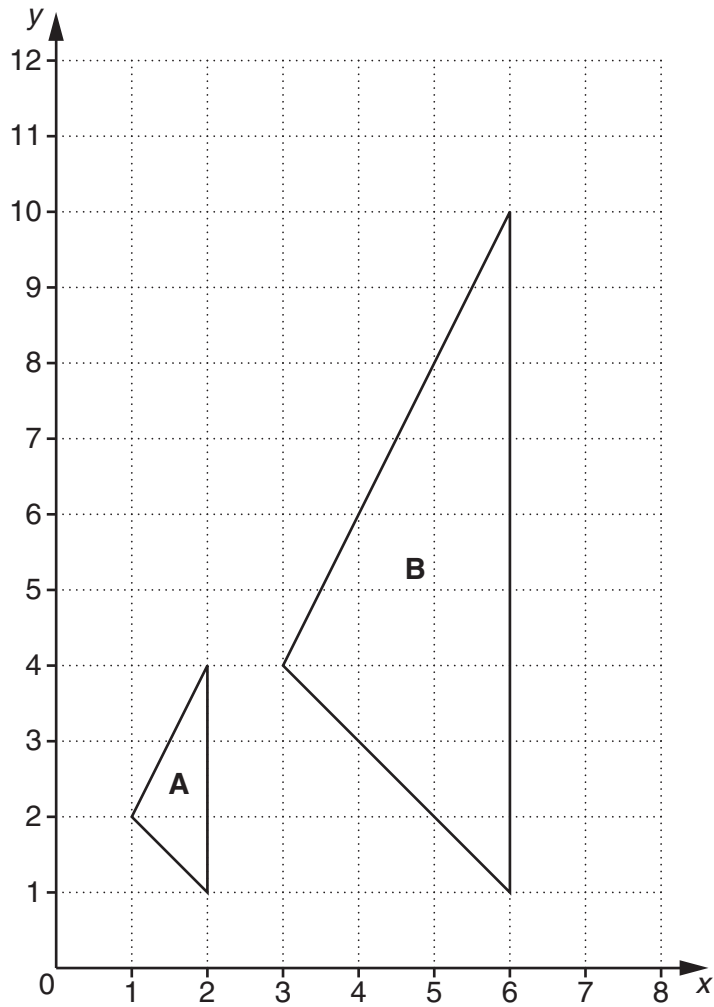
(i) Mark the centre of enlargement on the diagram and write down its coordinates.

(a)(i) (........................ , ...) **[2]**

(ii) Write down the scale factor of the enlargement.

(ii) .... **[1]**
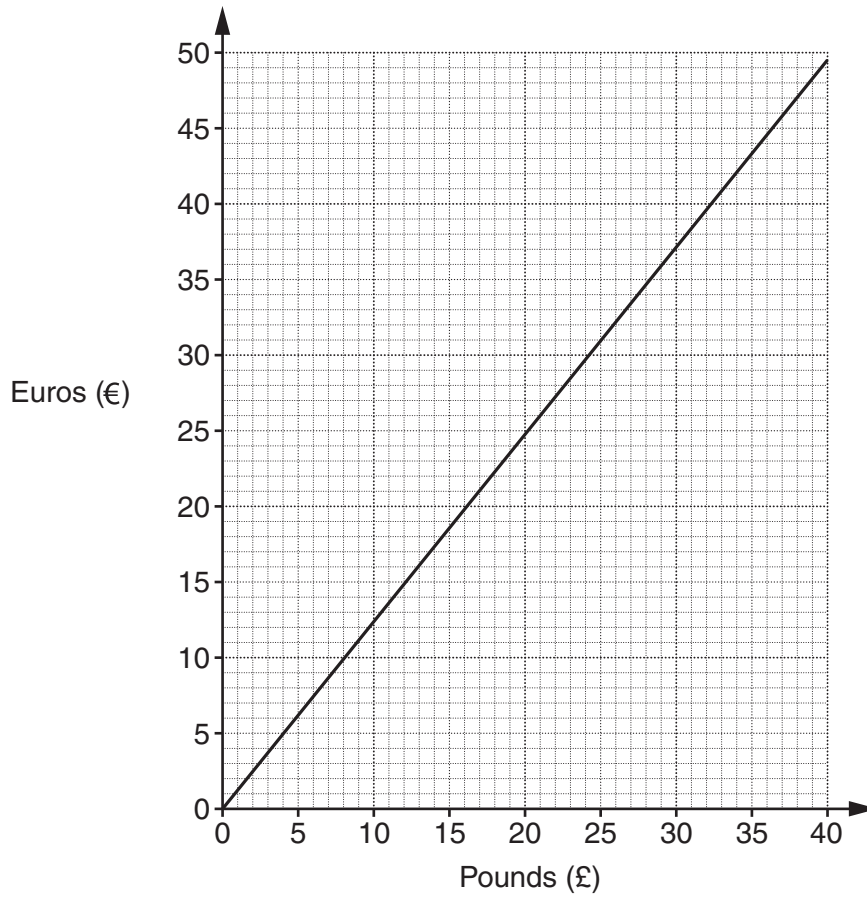
(b) Another shape, **P**, has a perimeter of 20 cm and is enlarged by a scale factor of 5 to form shape **Q**.

Write down the perimeter of shape **Q**.

(b) .... cm **[1]**

Turn over

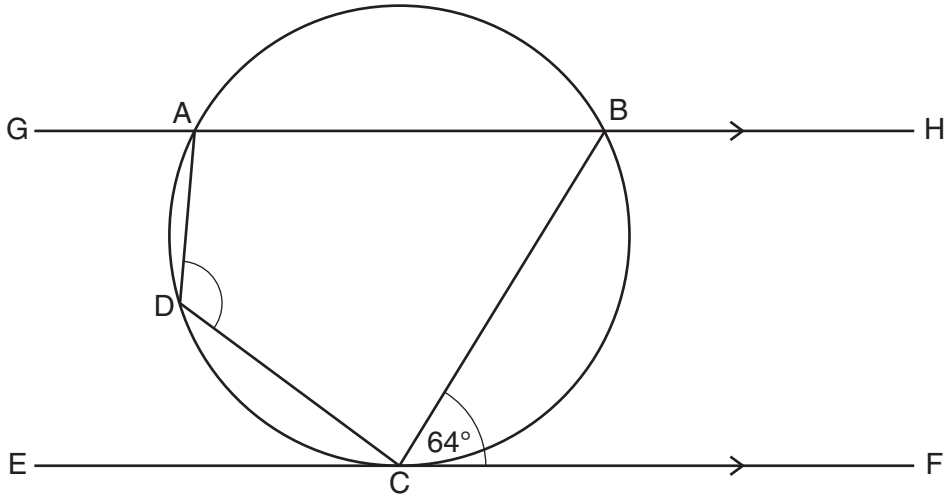**8*** This conversion graph can be used to change between prices in pounds (£) and prices in euros (€).

Phoebe can buy a watch from France for €40 plus 5% for delivery.

She can buy the same watch in the UK for £30 plus $\frac{1}{6}$ of this price for delivery.

Work out which is cheaper.

.... **[5]**

9 The diagram shows a cyclic quadrilateral, ABCD.

Not to scale
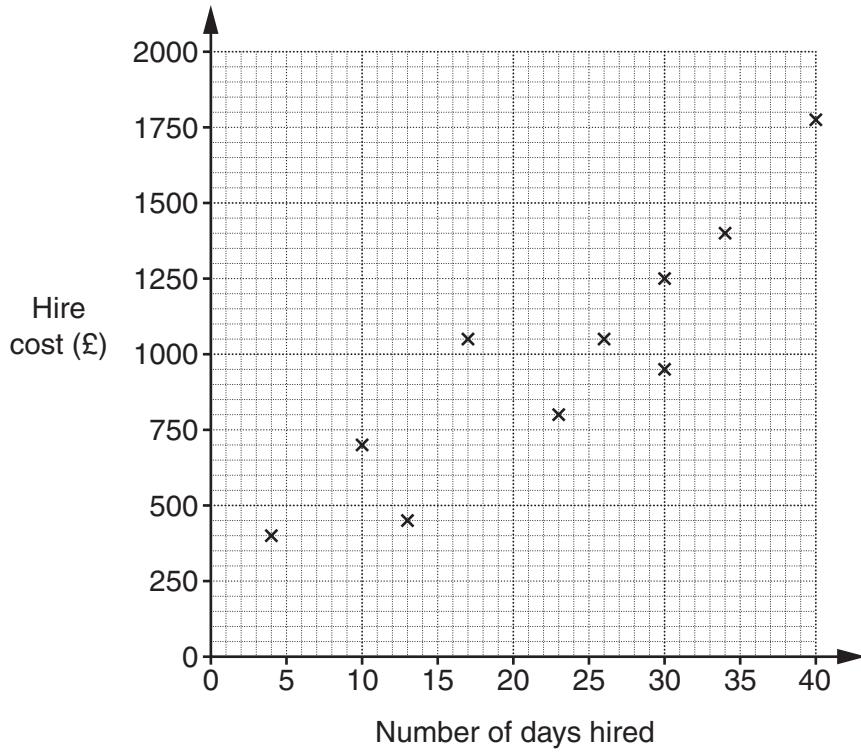

Lines GABH and ECF are parallel.
Angle BCF = 64°.

Work out angle ADC.
Give a reason for each angle you work out.

....° **[4]**

10 Eddie records the cost of hiring a lorry from different companies.

Number of days hired	10	26	17	30	4	40	23	13	34	30	15	37
Hire cost (£)	705	1054	1049	1251	402	1772	801	448	1403	950	750	1500

(a) Complete the scatter diagram. The first ten points have already been plotted. **[1]**

(b) State the type of correlation shown in the scatter diagram.

(b) .... **[1]**

(c) Draw a line of best fit on the diagram. **[1]**

(d) The total cost is the hire cost added to the fuel cost.

Eddie estimates the cost of fuel to be 50p per mile.
He needs a lorry for 20 days and will travel 2400 miles.

Estimate the total cost.
Show your working clearly.

(d) £ .... **[3]**

11 Adnum Accountants share their profit equally amongst their employees.
In 2010 their profit was £1.8×10^8 and they had 3×10^4 employees.

(a) Work out how much each employee got in 2010.

(a) £ .... **[2]**

(b) In 2011 their profit was £7.5×10^8.
In 2012 their profit was double that of 2011.

Work out their profit in 2012.
Write your answer in standard form.

(b) £ .... **[2]**

Turn over

12 (a) Work out.

$$\frac{3}{5} \div \frac{2}{3}$$

(a) .... **[2]**

(b) Work out.

$$3\frac{1}{5} + 2\frac{3}{4}$$

Write your answer as a mixed number.

(b) .... **[3]**

13 Three towns, Alet (A), Binley (B) and Swin (S), are shown in the diagrams below.
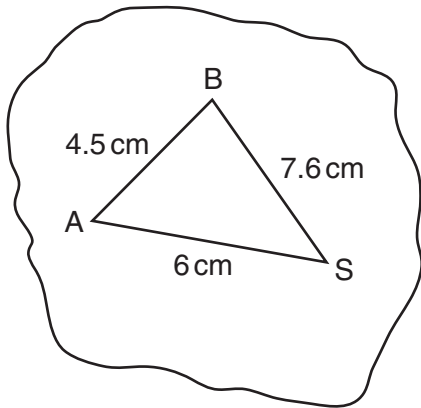
Not to scale
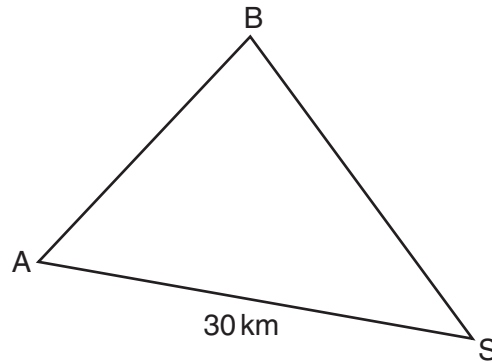
The distances between the towns on a map are shown in the diagram on the left.
The real distance between Alet and Swin is shown in the diagram on the right.

The two triangles are similar.

(a) Work out the actual distance between Binley and Swin.

(a) .... km **[3]**

(b) Bella walks the 30 km between Alet and Swin at an average speed of 4 km/hour.

Work out the time taken for her to complete the walk.

(b) .... hours **[2]**

Turn over

14 Benny buys a new washing machine.
In the first year the probability that this machine has a fault is $\frac{1}{20}$.
In the second year the probability that it has a fault is:

* $\frac{1}{5}$ if it had a fault in the first year

* $\frac{1}{10}$ if it did not have a fault in the first year.

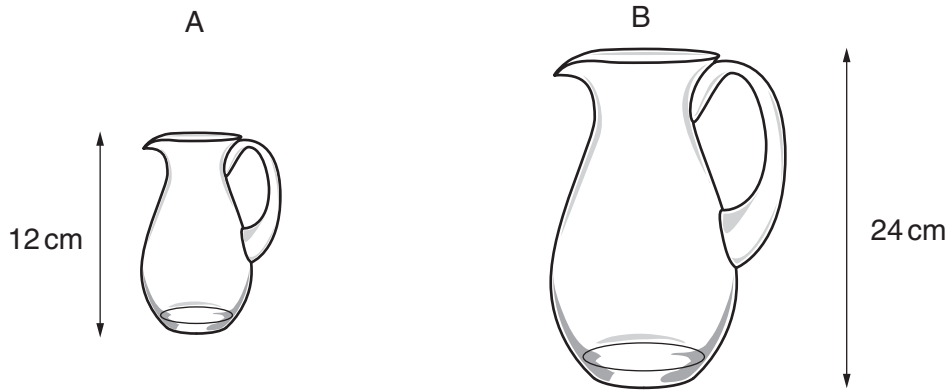**(a)** Complete the tree diagram to show these events.

First Year   Second Year

```
                                        .......... ── fault
                              fault ◁
                      ..........          ..........── no
                    ◁                              fault
                      ..........          .......... ── fault
                              no    ◁
                              fault        ..........── no
                                                    fault
```
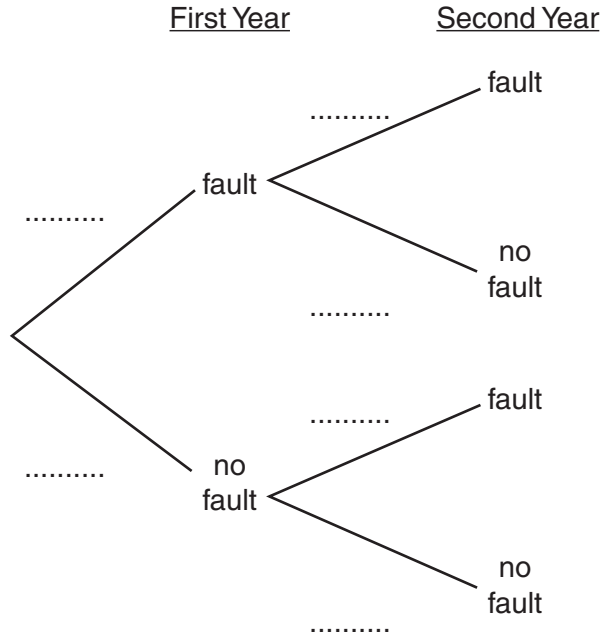
[3]

(b) Work out the probability of this machine having **at least** one fault in the first two years.

(b) .... **[3]**

15 Jugs A and B are similar in shape.
The height of jug A is 12 cm and the height of jug B is 24 cm.

A   B

12 cm   24 cm

Jug A holds 500 ml.

How many litres does jug B hold?

.... litres **[4]**

16 Write $x^2 + 6x - 3$ in the form $(x + a)^2 + b$.

.... **[3]**

Turn over

17 **(a)** In the table y is **inversely** proportional to x.

x	1	4
y	40	a

Work out the value of a.

(a) .... **[2]**
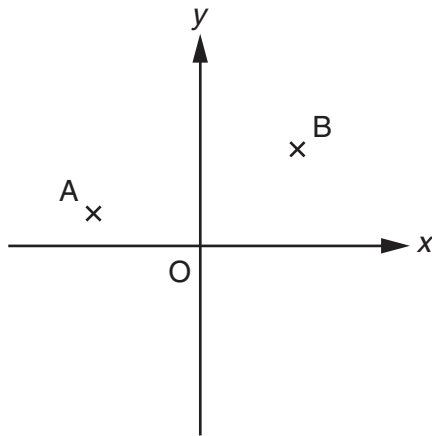
(b) In the table y is **directly** proportional to x^2.

x	10
y	250

Find an equation connecting y and x.

(b) $y =$ .... **[3]**

18 In the sketch below, A is the point (⁻6, 1) and B is the point (3, 4).

(a) Write down the coordinates of the midpoint of AB.

(a) (.......................... , ...) **[2]**

(b) Write down the vector $\overrightarrow{AB}$.

(b) $\begin{pmatrix} \\ \end{pmatrix}$ **[2]**

(c) Work out the length AB.
Write your answer as a surd in its simplest form.

(c) .... **[4]**

19 Work out the values of *a* and *b* in the vector sum below.

$$a\begin{pmatrix} 4 \\ 3 \end{pmatrix} + b\begin{pmatrix} 1 \\ -1 \end{pmatrix} = \begin{pmatrix} 10 \\ 11 \end{pmatrix}$$

a = ...

b = ... **[3]**

20 Express as a single fraction in its simplest form.

$$\frac{2x}{x-1} + \frac{5}{x+2}$$

.... **[4]**

TURN OVER FOR QUESTION 21

21 Solve algebraically these simultaneous equations.

$y = 2x^2 + 3x - 10$

$y = 2x + 5$

x = ... y = ...

x = ... y = ... **[6]**

END OF QUESTION PAPER

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