Surname

Other Names

Candidate Signature

AQA

General Certificate of Secondary Education
Higher Tier
June 2013

Mathematics (Linear)   **43652H**

Paper 2

H

Friday 14 June 2013   9.00 am to 11.00 am

For this paper you must have:
- a calculator
- mathematical instruments.

Time allowed
- 2 hours

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 105.
- The quality of your written communication is specifically assessed in Questions 5, 7 and 16. These questions are indicated with an asterisk (*).
- You may ask for more answer paper, tracing paper and graph paper. These must be tagged securely to this answer book.

Advice
- In all calculations, show clearly how you work out your answer.

43652H

Formulae Sheet: Higher Tier

Area of trapezium = $\frac{1}{2}(a+b)h$
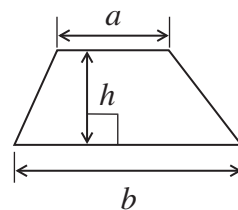
Volume of prism = area of cross-section × length
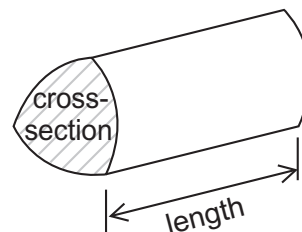
Volume of sphere = $\frac{4}{3}\pi r^3$

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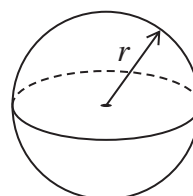
Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$
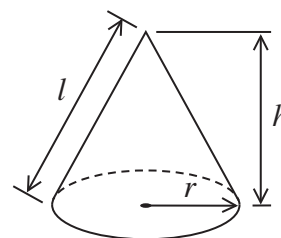
In any triangle ABC

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

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

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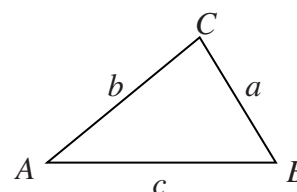
The Quadratic Equation

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

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

Answer all questions in the spaces provided.

1 This formula is used for working out the cost, £ *C*, of repairing a car.

$$C = nL + 1.2P$$

n is the number of hours worked

L is the labour rate (£)

P is the cost of parts (£)

1 (a) Work out the cost of repairing a car when

n = 3

L = 18

P = 110

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Answer £ .... *(2 marks)*

1 (b) Complete this table for another repair.

C	*n*	*L*	*P*
£ 235		£ 22	£ 150

(3 marks)

5

Turn over ▶

2   The scatter diagram shows the scores of 10 students in their Oral and Written tests.
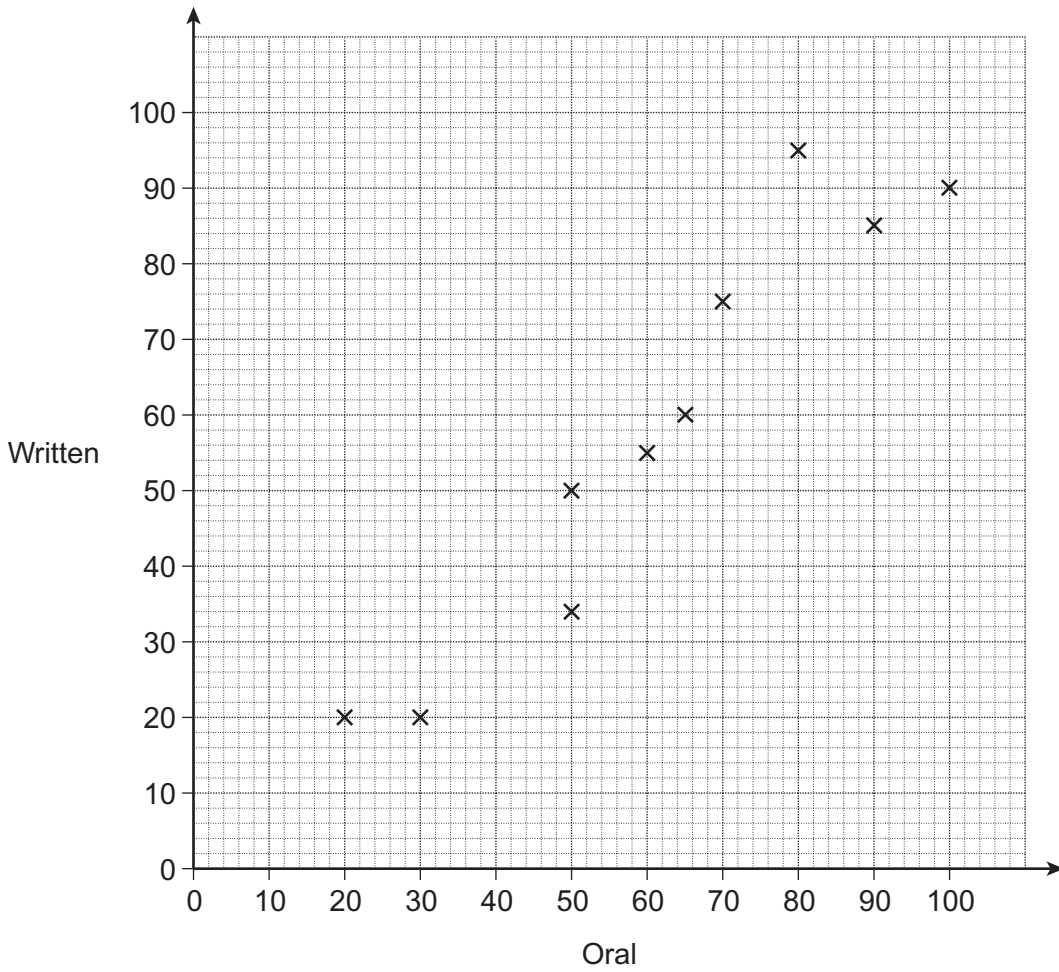
Written

Oral

2 (a)   How many students scored 50 in their Oral test?

Answer .... *(1 mark)*

2 (b)   Four **more** students take the same tests.
The table shows their scores.

Oral	10	94	52	84
Written	15	90	46	80

Plot the scores on the scatter diagram.

(2 marks)

2 (c) Draw a line of best fit on the scatter diagram.

(1 mark)

2 (d) Rob scored 40 in the Oral test.
He was absent for the Written test.

Use your line of best fit to estimate a score for him in the Written test.

Answer .... *(1 mark)*

3 Andrew is planning a survey about his local library.
Here is one of his questions with a response section.

How many times do you go to the library?

| 1 | 2 | 3 | 5 or more |

☐ ☐ ☐ ☐

3 (a) Give **one** criticism of the **question**.

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(1 mark)

3 (b) Give **two** criticisms of the **response** section.

Criticism 1 ....

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Criticism 2 ....

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(2 marks)

8

Turn over ▶

4   The diagram shows a kite.

Not drawn accurately

52°

144°
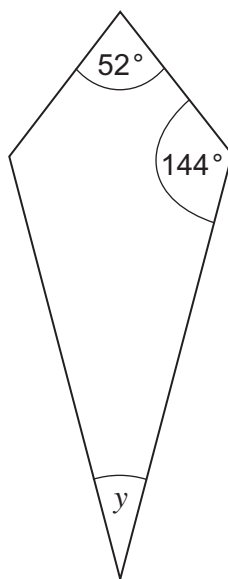
y

Work out the size of angle *y*.

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Answer .... degrees   *(2 marks)*

*5 DVD cases are packed in this box.
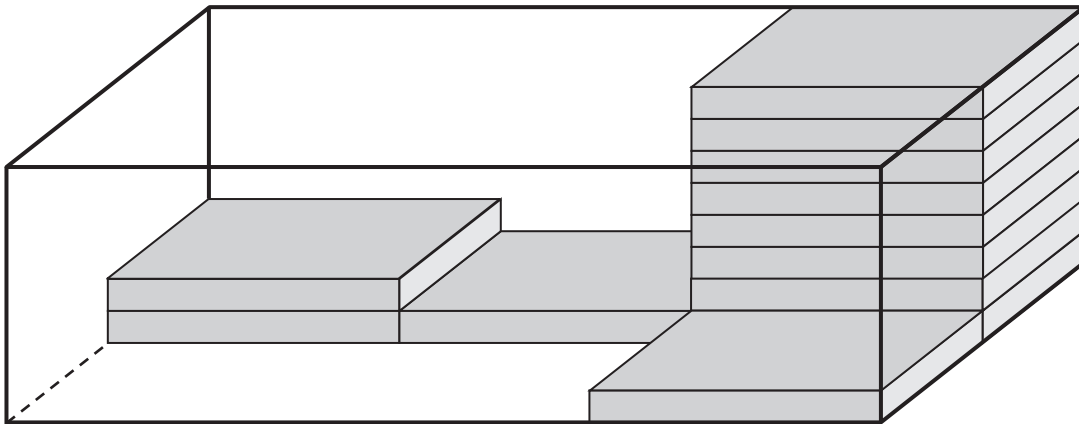
Jenny buys a **full** box of cases for £2.43
She sells all the cases for 11 pence each.
She saves **two-thirds** of the profit.

How much money does she save?

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Answer £ .... *(5 marks)*

Turn over ▶

6 The perimeter of this triangle is 48 cm.

$2x$ cm

$3x$ cm

$(x + 9)$ cm
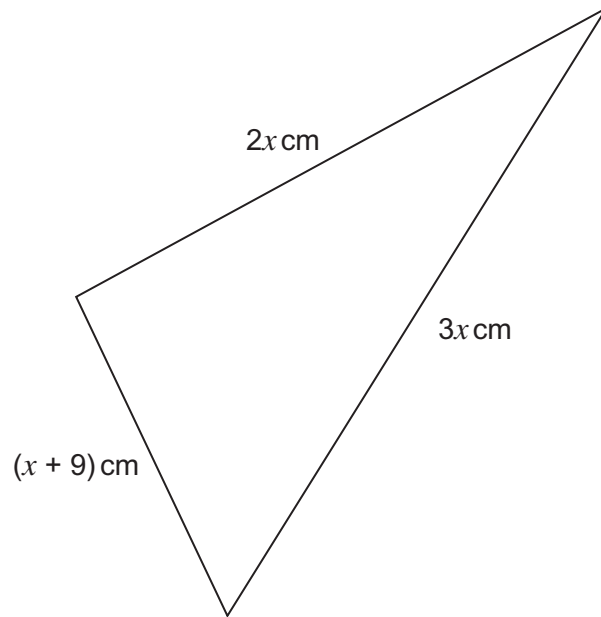
Work out the value of x.

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x = ... cm   *(4 marks)*

*7 Here are two ways of having a car for one year.

Buy and sell Buy it for £12 000 Sell it for £10 000 after one year	**Rent** Normal Price: £195 per month **Special Offer** 15% off

Which way is cheaper?
You **must** show your working.

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Answer .... *(5 marks)*

Turn over for the next question

8 (a) A speed camera takes two photographs of a car.

Photograph 1

0.6 m

Photograph 2

0.6 m
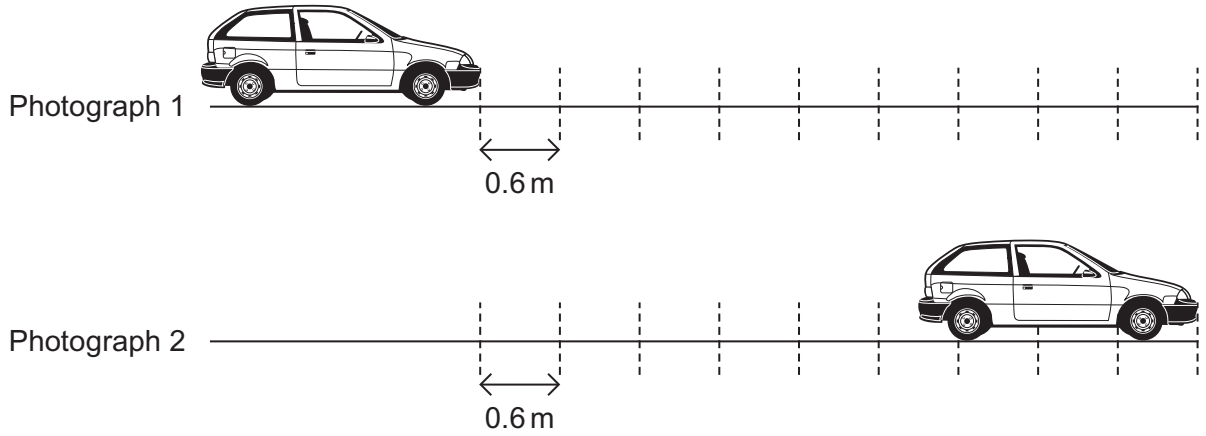
Photograph 2 was taken 0.5 seconds after Photograph 1.
Marks on the road are 0.6 metres apart.

Calculate the average speed of the car in m/s.

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Answer .... m/s   *(3 marks)*

8 (b) You are given that

1 kilometre $=$ 1000 metres

and

1 hour $=$ 3600 seconds

A lorry is travelling at 13.6 m/s.
The speed limit is 50 km/h.

Show that the lorry is travelling below the speed limit.

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(3 marks)

9 A tank contains 0.6 m³ of water.
The water is used to fill pots.
Each pot can hold 1250 cm³ of water.

How many pots can be filled?

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Answer .... *(3 marks)*

9

Turn over ▶

10 150 boys and 160 girls sit an examination.
The table shows some of the probabilities that they came with or without a calculator.

	With calculator	**Without calculator**
Boy	0.92	0.08
Girl	0.95	

10 (a) What is the probability that a girl came **without** a calculator?
Write your answer in the table.

(1 mark)

10 (b) How many of the 150 boys came **with** a calculator?

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Answer .... *(2 marks)*

11 These two triangles are congruent.

Not drawn accurately
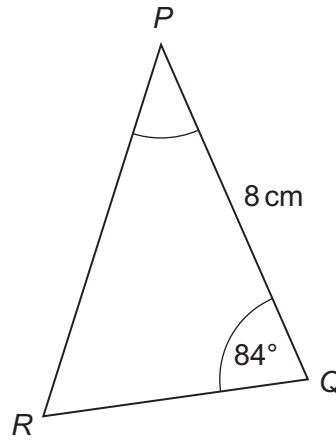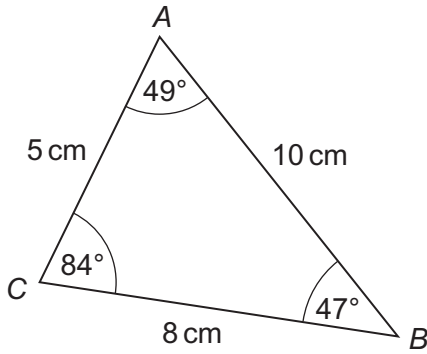
11 (a) What is the size of angle *P*?
Circle your answer.

47°   49°   84°   none of these

(1 mark)

11 (b) What is the length of *PR*?
Circle your answer.

5 cm   8 cm   10 cm   none of these

(1 mark)

Turn over for the next question

5

Turn over ▶

12 The perimeter of this square is 48 cm.
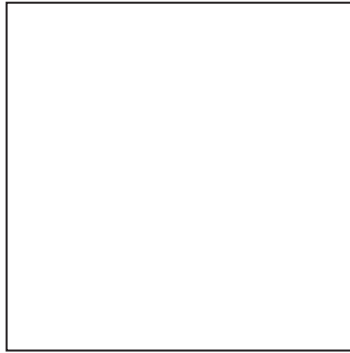
Semicircles are joined to two sides of the square.

Not drawn accurately
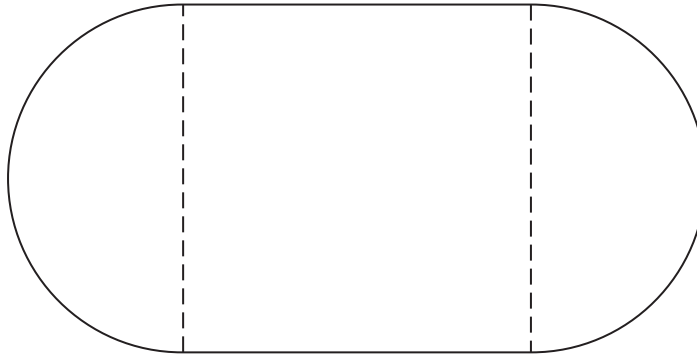
Work out the perimeter of this shape.

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Answer .... cm   *(4 marks)*

13 Amy raised £ n for charity.
Chris raised £ 18 more than Amy.

The **mean** amount raised by the two of them is £ 45.

Work out how much money each one of them raised.

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Amy £ ....

Chris £ .... *(5 marks)*

Turn over for the next question

9

Turn over ▶

14 (a) Work out $(6.45 \times 10^6) \times (2.5 \times 10^{-4})$

Write your answer in standard form.

Answer .... *(2 marks)*

14 (b) Here is a number machine.
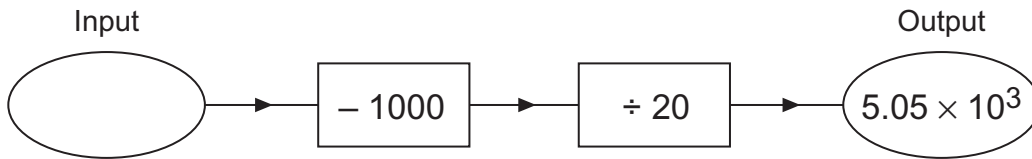
Input

Output

Work out the **input** when the output is 5.05×10^3

Write your answer in standard form.

Answer .... *(3 marks)*

15 (a) Work out the value of $x^3 - 2x + 7$ when $x = -2.5$

Answer .... *(1 mark)*

15 (b) Factorise fully $4x^2 + 6xy$

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Answer .... *(2 marks)*

*16   Here is part of a shopping bill for clothing.

1 jacket at

1 shirt at £29

Total **cost** before discount =

10% discount

Total to pay **after** discount = £80.10

Work out the cost of the jacket **before** the discount.

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Answer £ ....   *(5 marks)*

Turn over for the next question

17   *A* is the point with coordinates (x, $2y$).
B is the point with coordinates ($3x$, $4y$).
The midpoint of *AB* has coordinates (−4, 15).

Work out the values of x and y.

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$x =$ ....

$y =$ ....   *(4 marks)*

18 (a) Work out the size of angle x.

Not drawn accurately

7 cm

12 cm

x

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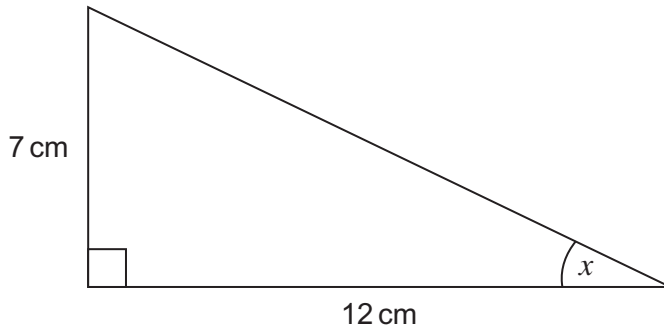
Answer .... degrees   *(3 marks)*

18 (b) Work out the length BC.

Not drawn accurately

B

110°

C

40°

18 cm

A

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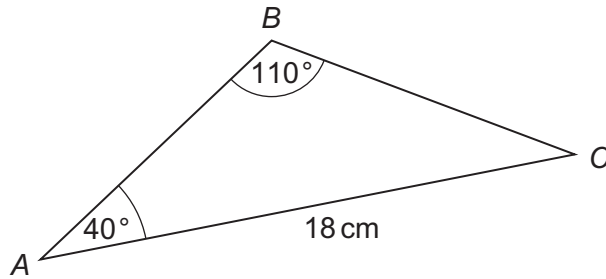
Answer .... cm   *(3 marks)*

10

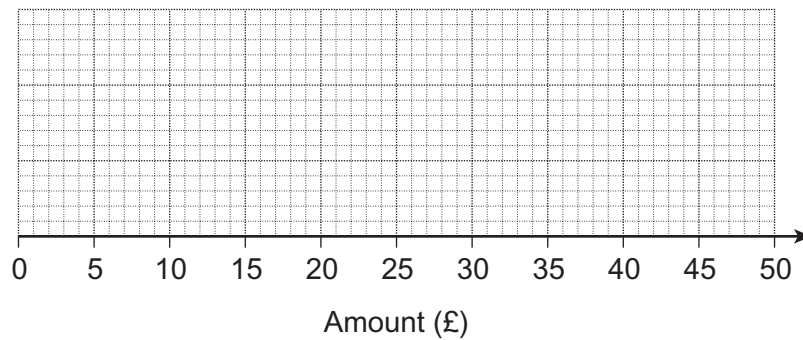**Turn over ▶**

19 (a) The table shows information about the travel expenses of employees at a company.

All amounts are in £.

Minimum	Lower quartile	Median	Upper quartile	Maximum
9	18	23	30	45

Draw a box plot to show this information.

0 5 10 15 20 25 30 35 40 45 50

Amount (£)

(2 marks)

19 (b) This table shows information about the distances the employees travel to work.

Distance, D (km)	Frequency
$0 < D \leqslant 10$	17
$10 < D \leqslant 15$	12
$15 < D \leqslant 30$	3
$30 < D \leqslant 60$	9

Draw a histogram to show this information.
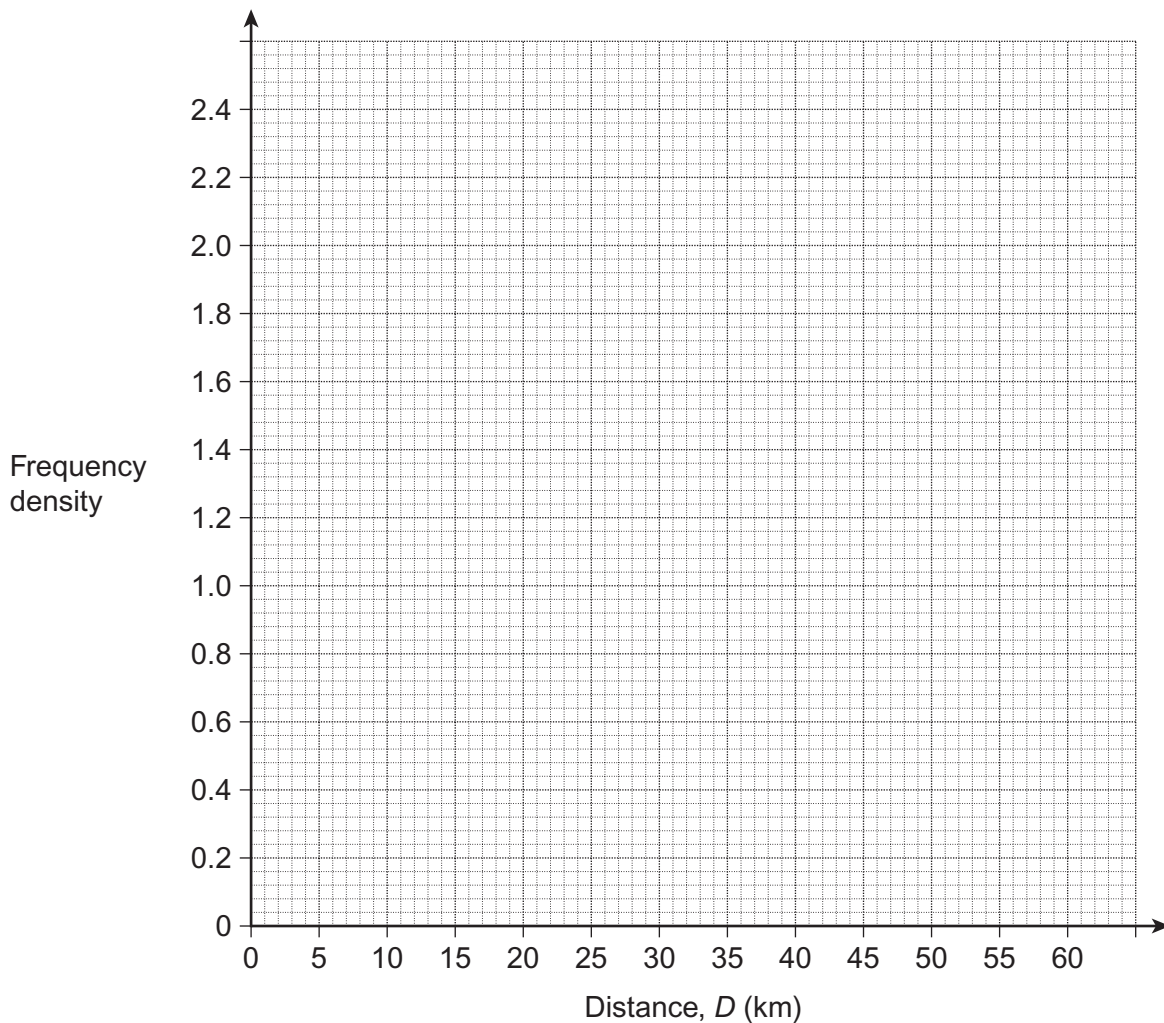
(3 marks)

20   Solve the equation $2x^2 + 8x + 5 = 0$

Give your answers to 2 decimal places.

Answer ....   *(3 marks)*

21   The expression $\dfrac{x^2 - 9}{x^2 + bx - 15}$ simplifies to $\dfrac{x + 3}{x + 5}$

Work out the value of b.

$b = $ ....   *(3 marks)*

22 *A* and *B* are two similar solids.

10 cm

12 cm

A

B
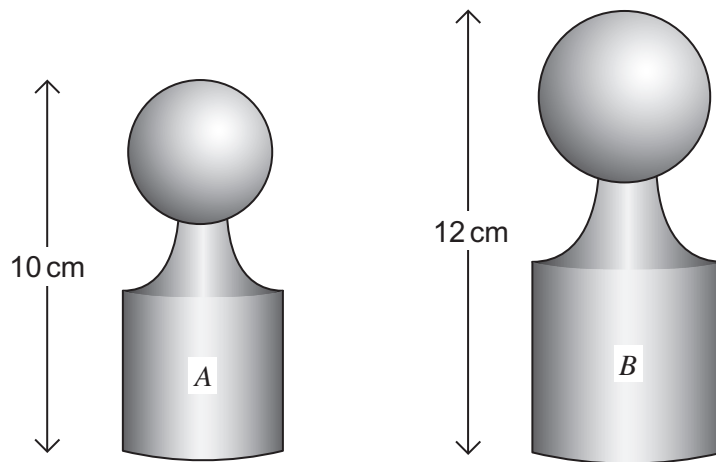
The volume of *A* is 500 cm^3.

Work out the volume of *B*.

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Answer .... cm^3 *(3 marks)*

9

Turn over ▶

23 A bag contains 12 counters.
Five of the counters are white.

A counter is taken out of the bag at random and **not** replaced.
A second counter is taken out of the bag at random.

Calculate the probability that **only one** of the two counters is white.

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Answer .... *(3 marks)*

24   *AB* is parallel to *DC*.
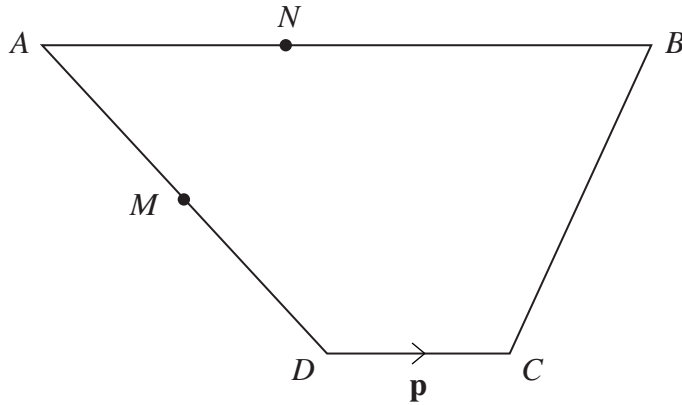
Not drawn accurately

$\overrightarrow{AB}$ = 5**p**

$\overrightarrow{DC}$ = **p**

$\overrightarrow{DA}$ = 2**q** – **p**

24 (a)   Show that $\overrightarrow{CB}$ = 2**q** + 3**p**

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(1 mark)

24 (b)   *M* is the midpoint of *AD*.

$\overrightarrow{AN} : \overrightarrow{NB}$ = 2 : 3

Show that *MN* is parallel to *CB*.

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(4 marks)

8

Turn over ▶

25 (a) On this grid draw the graph of $y = 1 + \sin x$ for values of x from 0º to 360º.

The graph of $y = \sin x$ has been drawn to help you.

(1 mark)

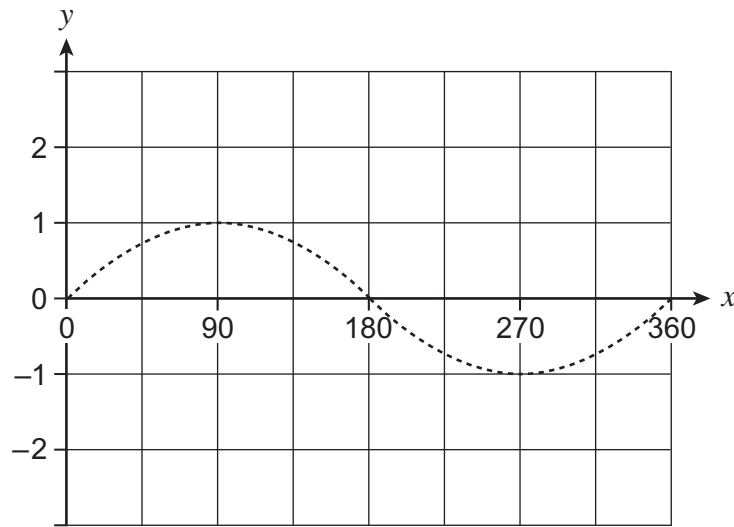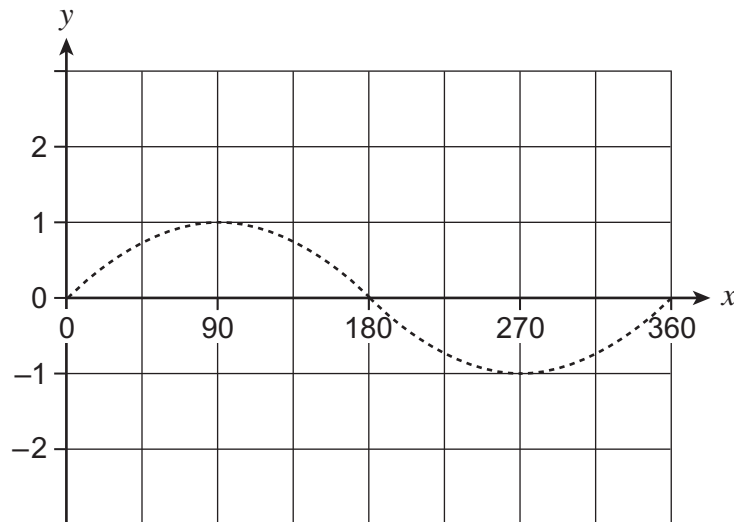**25 (b)** On this grid draw the graph of $y = 2\sin x$ for values of x from 0º to 360º.

The graph of $y = \sin x$ has been drawn to help you.

(1 mark)

26 Solve the equation $\dfrac{5}{x+2} + \dfrac{4}{x+1} = 2$

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Answer .... *(6 marks)*

END OF QUESTIONS

There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED