

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCSE**

J567/04

MATHEMATICS B

Paper 4 (Higher Tier)

FRIDAY 13 JUNE 2014:

Morning

**DURATION: 1 hour 45 minutes
plus your additional time allowance
MODIFIED ENLARGED 24pt**

| | | | |
|-------------------------------|--|------------------------------|--|
| Candidate forename | | Candidate surname | |
|-------------------------------|--|------------------------------|--|

| | | | | | | | | | | |
|--------------------------|--|--|--|--|--|-----------------------------|--|--|--|--|
| Centre number | | | | | | Candidate number | | | | |
|--------------------------|--|--|--|--|--|-----------------------------|--|--|--|--|

Candidates answer on the Question Paper.

OCR SUPPLIED MATERIALS:

Loose sheet for question 11

OTHER MATERIALS REQUIRED:

Geometrical instruments

Tracing paper (optional)

Scientific or graphical calculator

| |
|---|
| YOU ARE PERMITTED TO USE A CALCULATOR FOR THIS PAPER |
|---|

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the boxes on the first page. 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).

INFORMATION FOR CANDIDATES

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

Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.

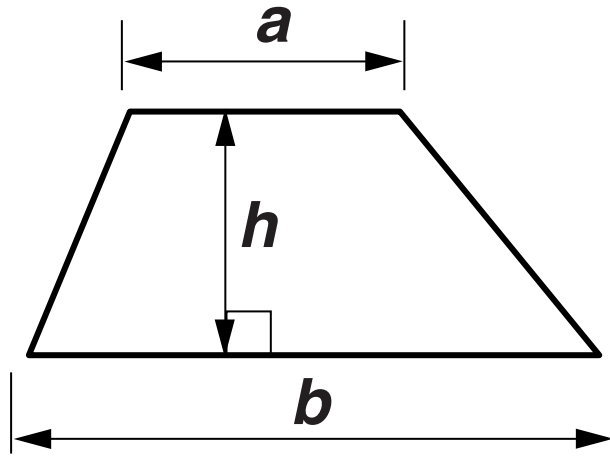
The quality of written communication is assessed in questions marked with an asterisk (*).

The total number of marks for this paper is 100.

Any blank pages are indicated.

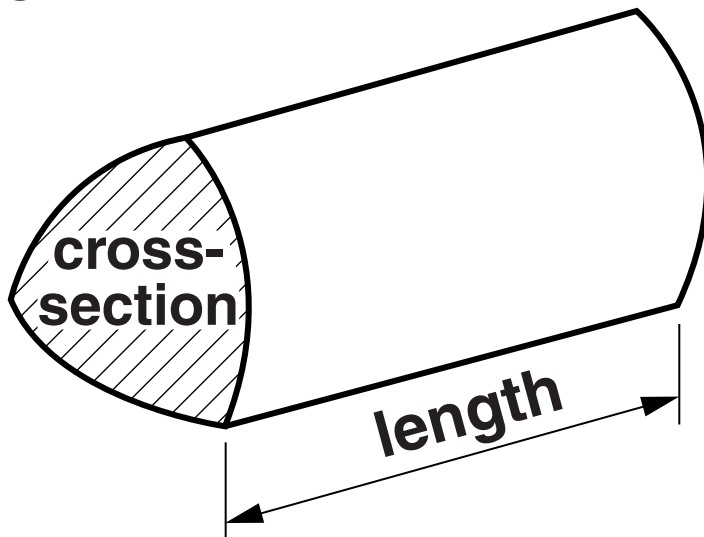
FORMULAE SHEET: HIGHER TIER

Trapezium



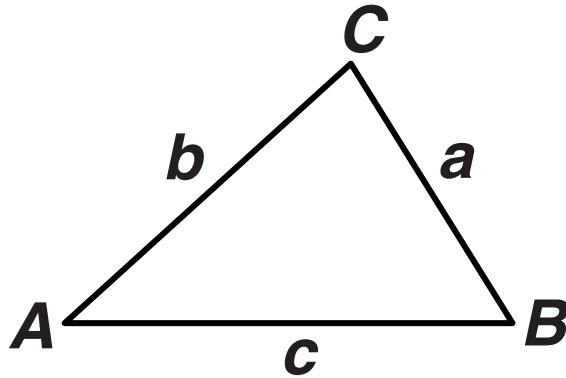
$$\text{Area of trapezium} = \frac{1}{2} (a + b)h$$

Prism



$$\begin{aligned} \text{Volume of prism} \\ = (\text{area of cross-section}) \times \text{length} \end{aligned}$$

In any triangle ABC

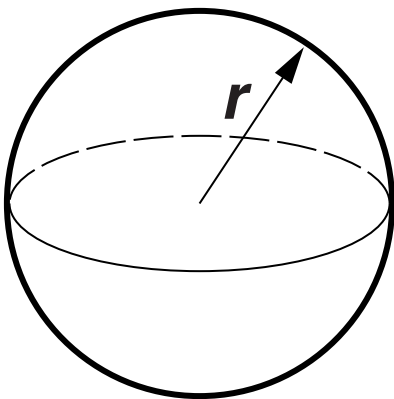


Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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

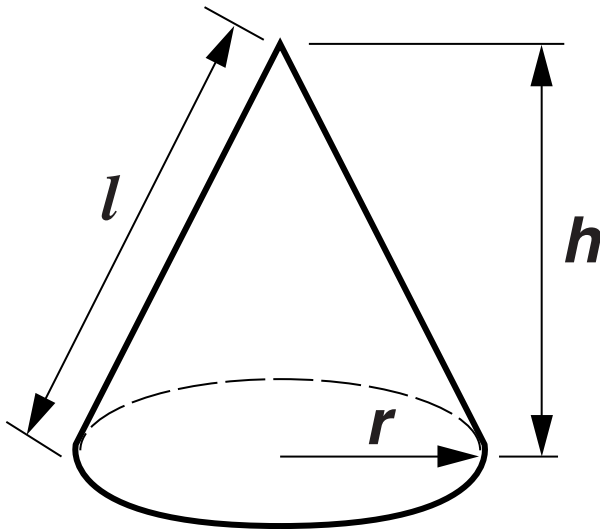
Sphere



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

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

Cone



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

$$\text{Curved surface area of cone} = \pi r l$$

The Quadratic Equation

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

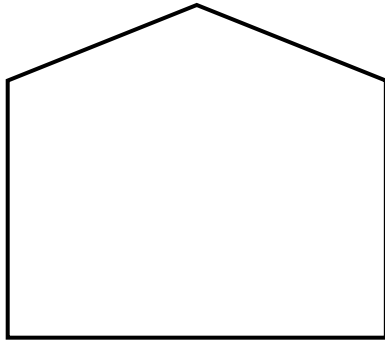
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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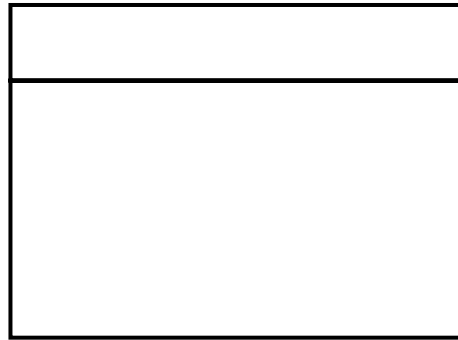
Answer ALL the questions.

- 1 The scale drawing below shows the front and side elevations of a shed.**

SCALE: 2 CM REPRESENTS 1 M



Front elevation

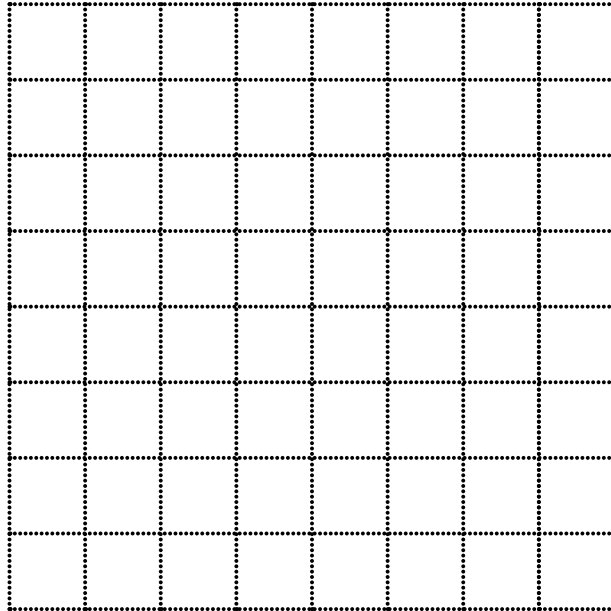


Side elevation

- (a) Work out the real height of the shed.**

(a)_____ m [2]

- (b) On the grid below, draw an accurate plan view of the shed.
Use the scale 2 cm represents 1 m.**



[2]

2 (a) Work out.

$$\sqrt{4.7 \times 2.5 - 1.8^2}$$

Give your answer correct to three significant figures.

(a) _____ [2]

(b) (i) For part of her homework Tara wrote

The time taken for a journey is 2.25 hours.

This time in hours and minutes is 2 hours and 25 minutes.

**Tara's answer is wrong.
Explain what is wrong with
Tara's answer.**

_____ **[1]**

**(ii) In another part of her homework
Tara wrote**

$$3570 \div 0.93 = 3391.5$$

**Tara's answer is wrong.
Without working out the exact
answer, explain how you can tell
her answer is wrong.**

[1]

- 3 Jayden makes a 5-sided spinner, numbered from 1 to 5. He records the number of times he scores a 3 from different numbers of spins. His results are shown in the following table.**

| | | | |
|---------------------------------|-----------|-----------|------------|
| Number of spins | 10 | 50 | 200 |
| Number of times 3 scored | 4 | 18 | 76 |
| Relative frequency | | | |

- (a) Complete the table above to show the relative frequencies of scoring 3. There are three missing numbers to fill in. [2]**

- (b) Which of the relative frequencies gives the best estimate of the probability of scoring 3? Give a reason for your answer.**

_____ because _____

_____ [1]

(c) Estimate the number of times Jayden would expect to score a 3 if he spins the spinner 500 times.

(c)_____ [1]

**(d) Is Jayden's spinner fair?
Give a reason for your answer.**

_____ because _____

_____ [1]

4 Northland School records the number of times students are late for morning and afternoon sessions of school.

(a) The following table summarises this information for the 30 students of class 11R in one week.

| Number of times late | Frequency | |
|-----------------------------|------------------|--|
| 0 | 11 | |
| 1 | 8 | |
| 2 | 6 | |
| 3 | 0 | |
| 4 | 3 | |
| 5 | 2 | |

Work out the mean number of times late.

(a) _____ **[3]**

(b) Each term, a letter is sent home if students are late for more than 15% of sessions.

Here is Karl's record for when he was in Year 10.

| | | |
|--------------------|---------------------|----------------|
| Autumn term | 140 sessions | 24 late |
| Spring term | 116 sessions | 19 late |
| Summer term | 128 sessions | 15 late |

**During which terms did Karl have a letter sent home about lateness?
Show all your working.**

(b) _____ [3]

5 (a) The n th term of a sequence is given by $8n - 5$.

(i) Write down the first three terms of this sequence.

(a)(i) _____ [2]

**(ii) Is 96 a term in this sequence?
Give a reason for your answer.**

_____ because _____
_____ [1]

(b) Here are the first four terms of a different sequence.

16

9

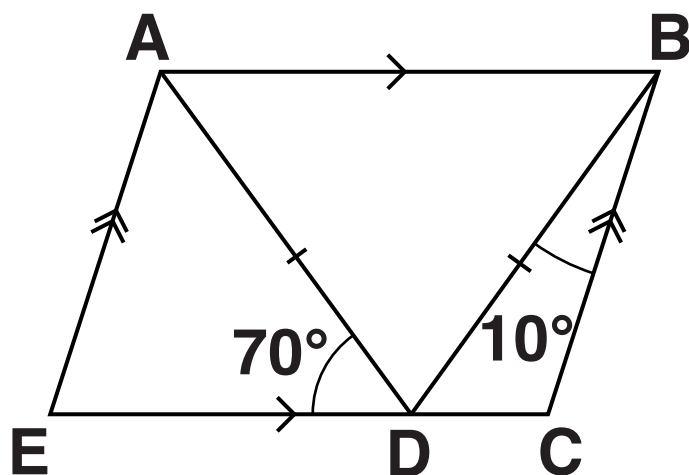
2

-5

Write an expression for the n th term of this sequence.

(b)_____ [2]

- 6 (a) The diagram below shows parallelogram ABCE.
D is a point on EC.
AD = BD, angle ADE = 70° and angle CBD = 10° .



NOT TO SCALE

**Work out angle BCD.
Give a reason for each angle you
work out.**

(a) Angle BCD = _____ ° [4]

(b) The interior angle of a regular polygon is 156° .

How many sides does the polygon have?

(b)_____ [2]

7 (a) Factorise fully.

$$6xy + 8y^2$$

(a)_____ **[2]**

(b) Expand and simplify.

$$(x - 5)(x - 3)$$

(b)_____ **[2]**

(c) Solve the inequality.

$$5x - 2 < 3x + 18$$

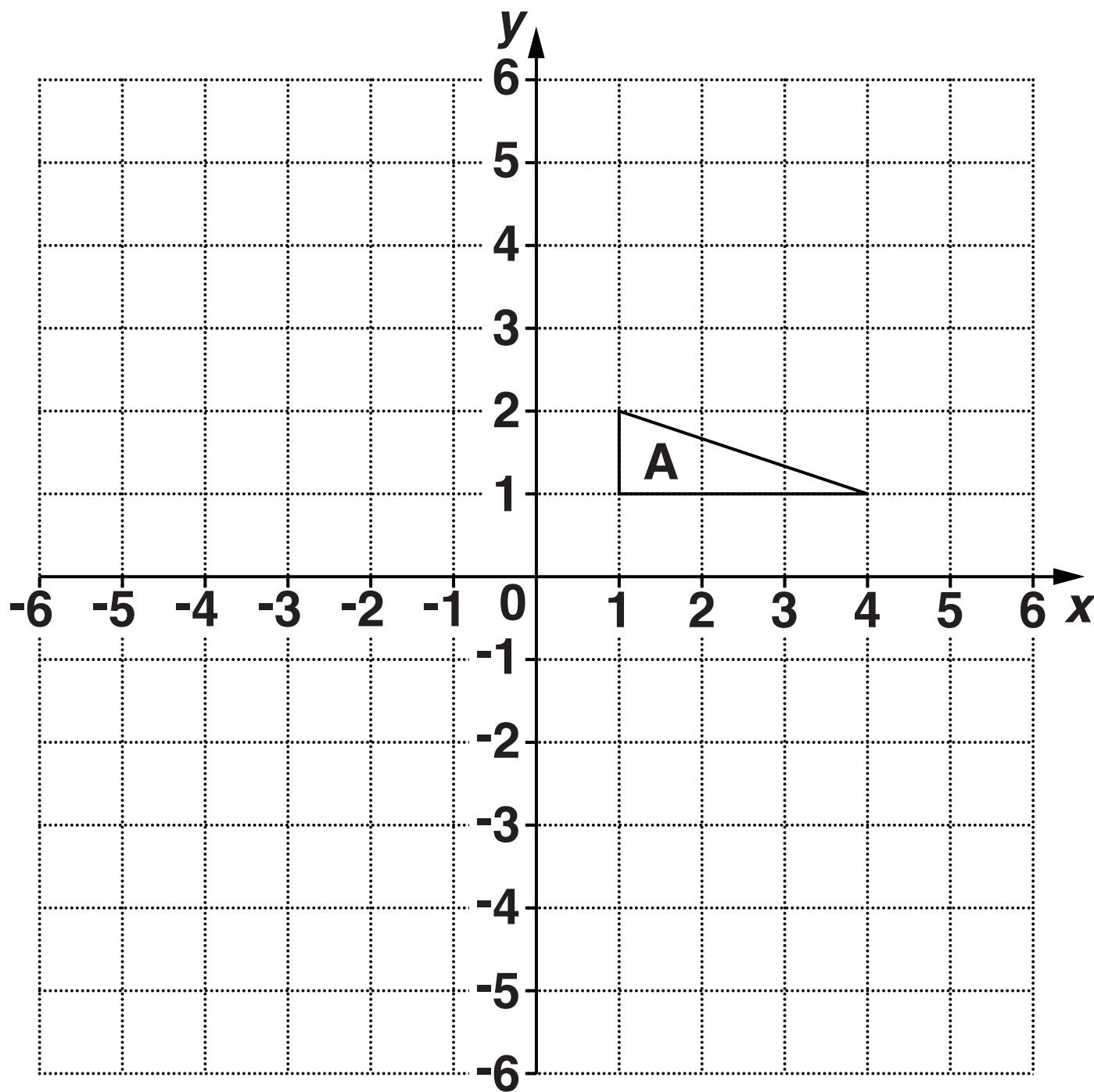
(c)_____ **[3]**

(d) Solve.

$$\frac{x}{4} = 2 - x$$

(d) $x =$ _____ [3]

8 Triangle A is drawn on the grid below.



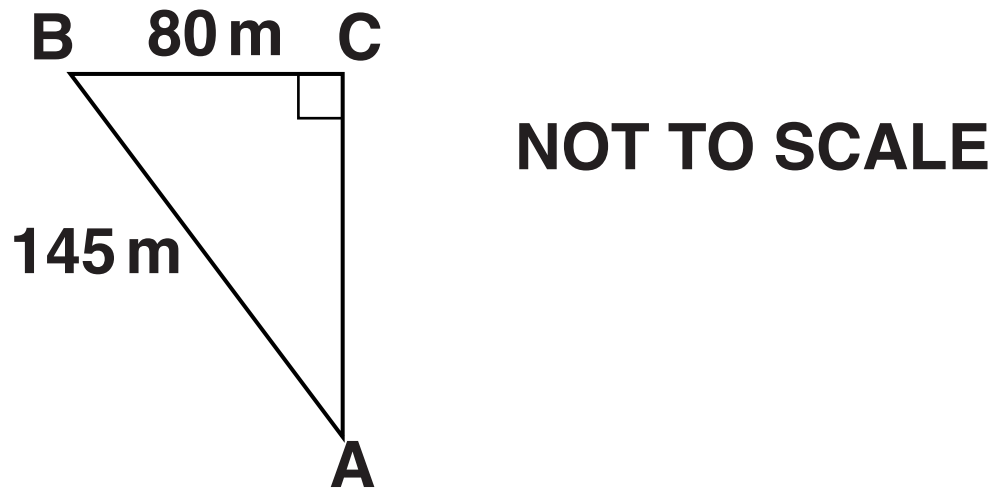
Describe fully the SINGLE transformation that is equivalent to:

a rotation of 90° anticlockwise about $(0, 0)$, followed by a reflection in the x -axis.

You may use the grid to help you.

[3]

- 9 The diagram below shows a swimming course set out on a lake.
Angle $BCA = 90^\circ$.



Swimmers go from A to B to C and then directly back to A .

- (a) Calculate the total length of the swimming course.

(a) _____ m [4]
28

(b) C is due north of A.

Calculate the bearing of B from A.

(b)_____ ° [4]

- 10 (a) (i) Complete the following table for $y = x^2 - 3x$ by filling in the missing number.

| | | | | | | | |
|-----|----|----|---|----|----|---|---|
| x | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| y | | 4 | 0 | -2 | -2 | 0 | 4 |

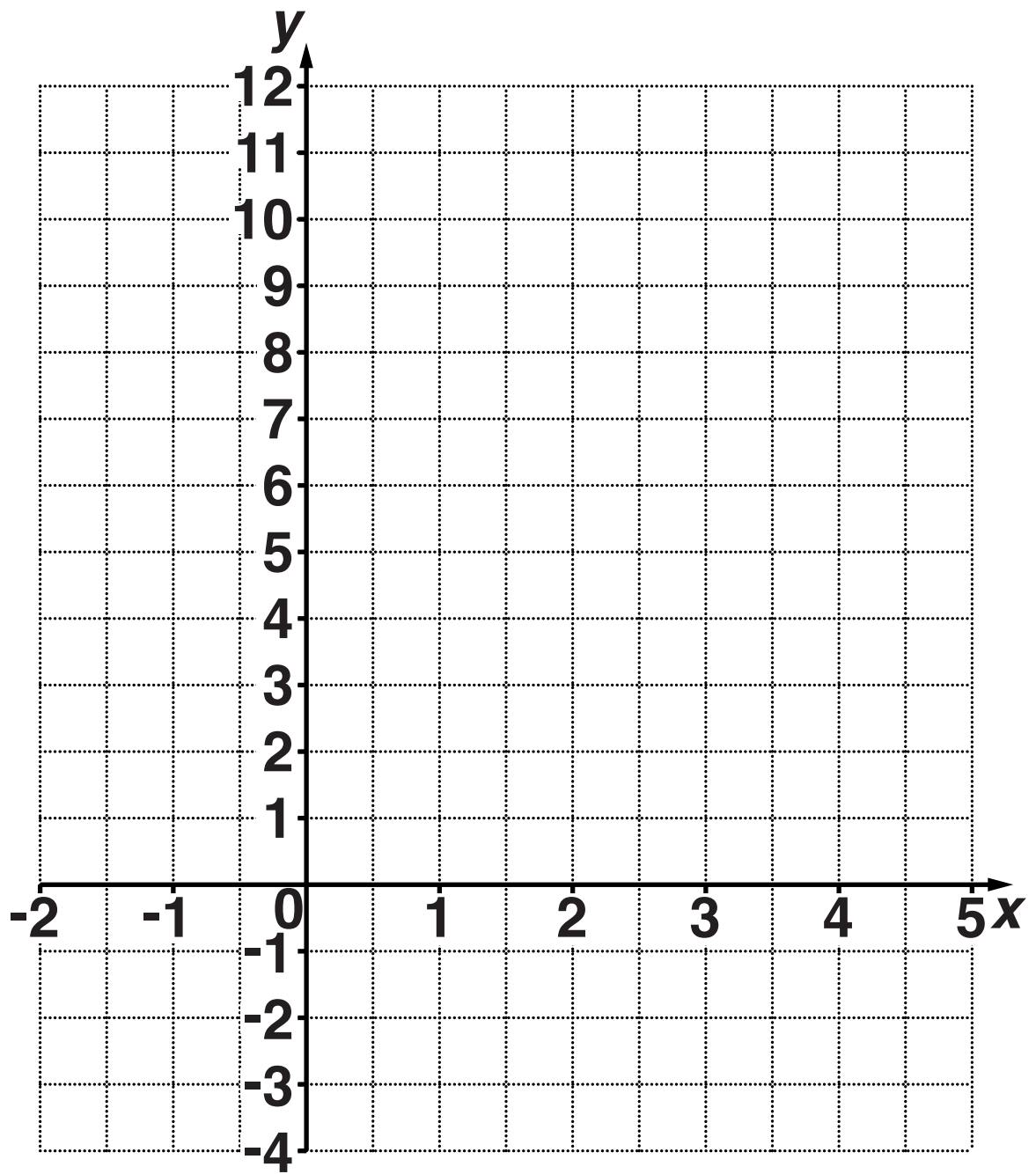
[1]

- (ii) On the grid opposite draw the graph of $y = x^2 - 3x$ for values of x from -2 to 4.

[2]

- (b) On the same set of axes, plot the graph of $x + y = 5$.

[3]



(c) Use your graphs to find the solutions to these simultaneous equations.

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

$$x + y = 5$$

(c) $x =$ _____ $y =$ _____

$x =$ _____ $y =$ _____

[2]

11 The loose sheet provided for this question shows a table. The table shows the quarterly visitor numbers at a museum. It also shows some four-quarter moving averages.

(a) Calculate the next three moving averages.

(a) _____ [3]

(b) Describe the trend in the visitor numbers.

_____ [1]

12* Chris has £2500 to invest for 3 years. He finds this information about two savings accounts paying compound interest.

BONUS ACCOUNT

**3.5% interest for first year
then 3% interest per year**

FIXED RATE ACCOUNT

**3.25% interest per year
fixed rate for 3 years**

Advise Chris which account he should choose, and find how much money he will have at the end of the 3 years.

_____ **account**
£ _____ **[5]**

13 For each of the three graphs below, select the correct equation from this list.

$$y = 2x + 2$$

$$y = x^2 + 2x$$

$$y = 2x - x^2$$

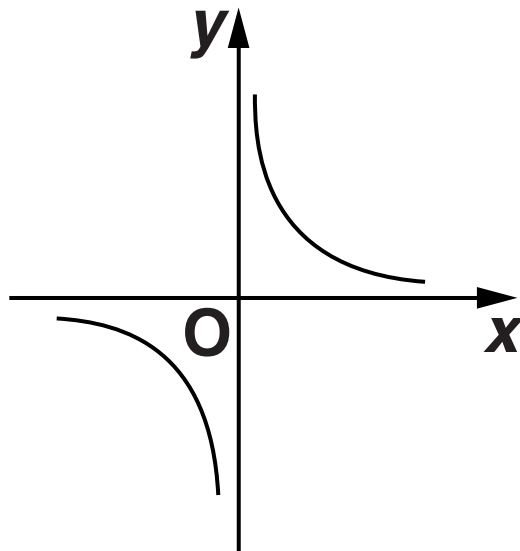
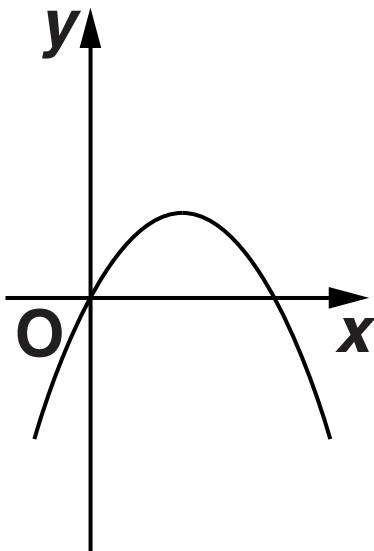
$$y = 2x$$

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

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

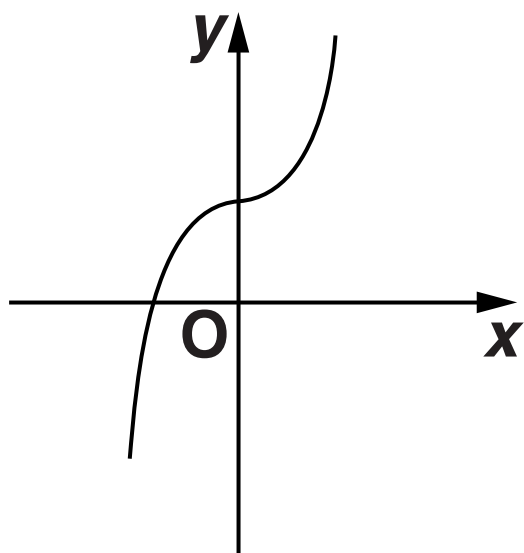
$$y = x^3 + 2$$

$$y = 2 - x^3$$



$y =$ _____

$y =$ _____

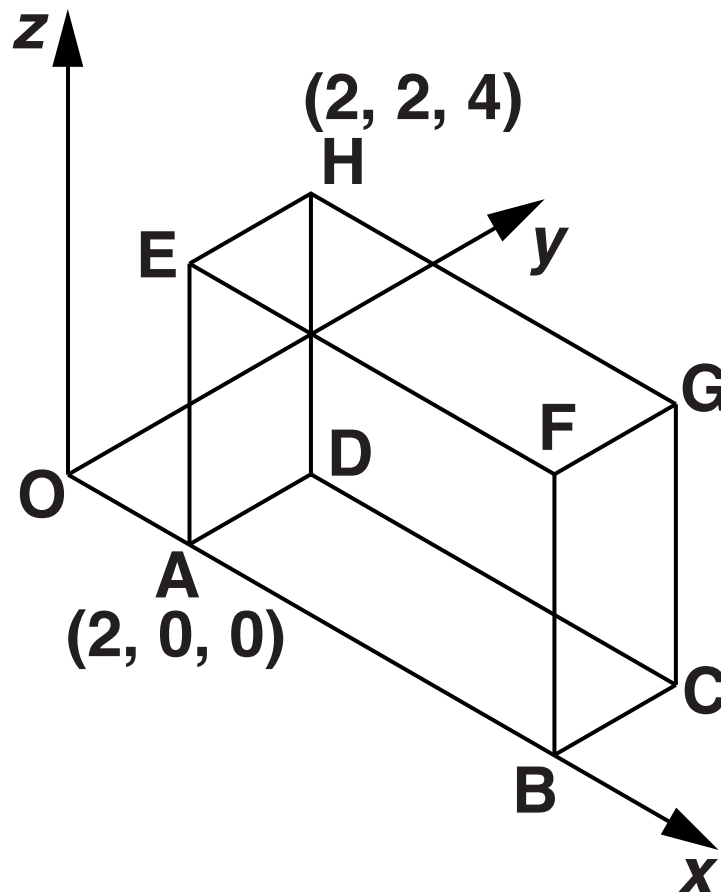


$y =$ _____

[3]

14 The cuboid shown in the diagram below has sides of length 6 units, 2 units and 4 units.

The coordinates of A are $(2, 0, 0)$ and the coordinates of H are $(2, 2, 4)$.



(a) Find the coordinates of F.

(a) (_____ , _____ , _____) [1]

(b) Calculate the length AG.

(b)_____ [2]

15 (a) Maryam is doing a survey asking girls their opinion about becoming a mother.

(i) Here is one of her questions.

At what age will you have your first baby?

**Do you think this is a good question?
Explain your answer.**

_____ **because** _____

_____ **[1]**

(ii) The table below summarises the number of girls in each year in the school.

| Year | 7 | 8 | 9 | 10 | 11 |
|------------------|------------|------------|------------|------------|------------|
| Frequency | 140 | 145 | 180 | 165 | 170 |

Maryam decides to interview a representative stratified sample of 50 girls.

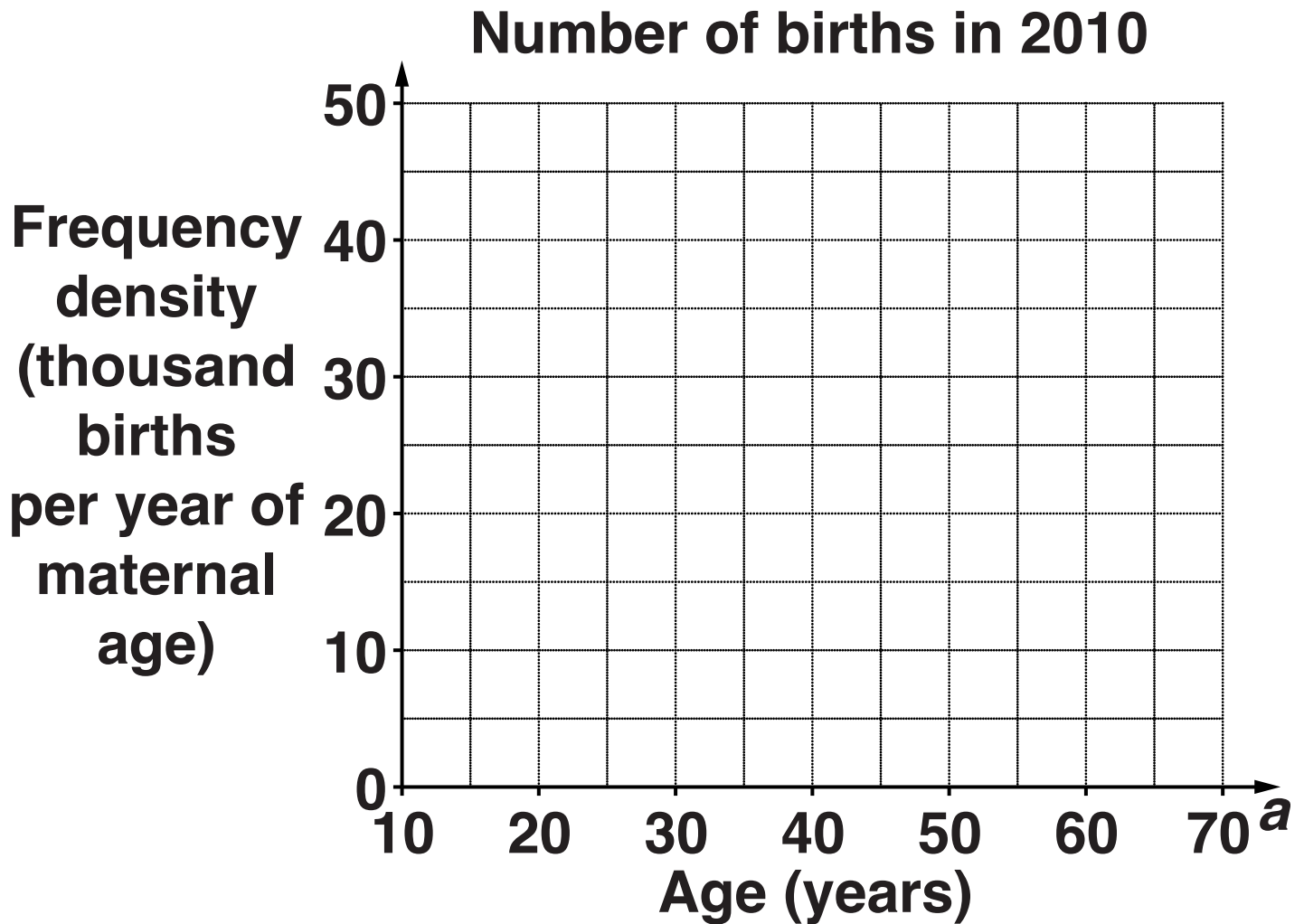
How many girls from Year 9 should she interview?

(a)(ii)_____ [2]

(b) The table below summarises the number of births to women of different ages in England and Wales in 2010.

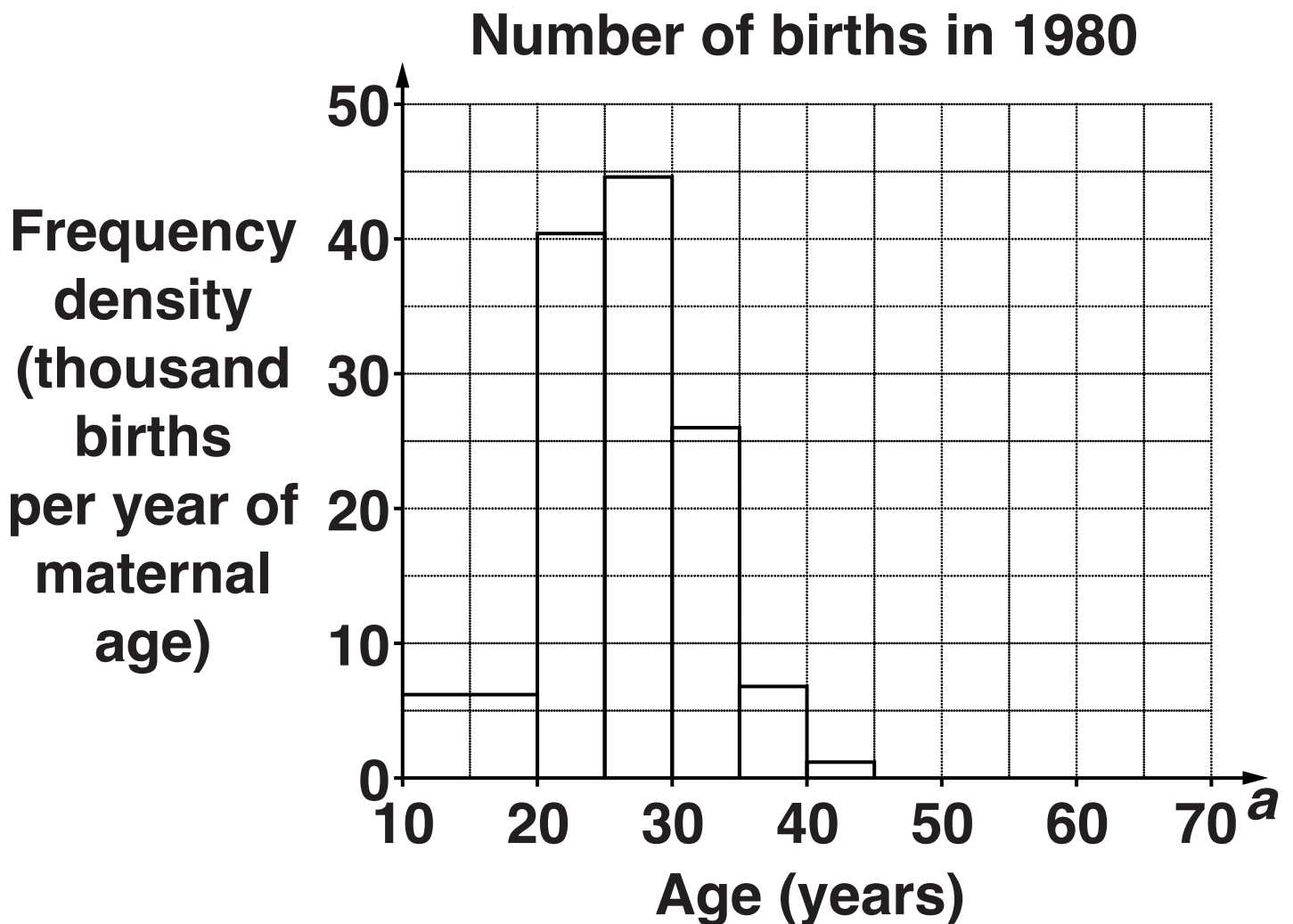
| Age (a years) | Number of births (thousands) |
|---------------------------------------|---|
| $10 \leq a < 20$ | 41 |
| $20 \leq a < 25$ | 137 |
| $25 \leq a < 30$ | 199 |
| $30 \leq a < 35$ | 202 |
| $35 \leq a < 40$ | 116 |
| $40 \leq a < 45$ | 26 |
| $45 \leq a < 65$ | 2 |

- (i) On the grid below draw a histogram to represent this distribution.



[3]

- (ii) The histogram below represents the distribution of the number of births to women of different ages in England and Wales in 1980.



Make two comparisons between the distributions for 2010 and 1980.

1 _____

2 _____

[2]

16 The current, I amps, in a wire is inversely proportional to the resistance, R ohms.

When the resistance is 10 ohms, the current is 1.2 amps.

(a) Find an equation connecting I and R .

(a) _____ [2]

(b) Find the resistance when the current is 0.5 amps.

(b) _____ ohms [1]

17 (a) Write as a single power of x .

(i) $x^6 \times x^2$

(a)(i)_____ [1]

(ii) $x^9 \div x^3$

(ii)_____ [1]

(b) Simplify.

$$\frac{9x^2 - 16}{3x^2 + 7x + 4}$$

(b)_____ [4]

18 The population, P , of an island t years after the start of 2010 is given by $P = 9200 \times 0.96^t$.

(a) Write down the population of the island at the start of 2010.

(a)_____ [1]

(b) Work out the population of the island at the start of 2013.

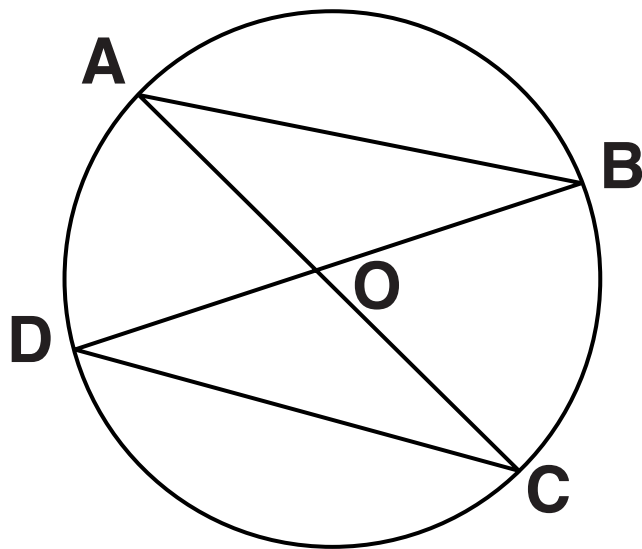
(b)_____ [2]

(c) The population continues to decrease at the same rate.

At the start of which year is the population first below half of its level at the start of 2010?

(c)_____ [3]

- 19 In the diagram below AC and BD are diameters of the circle, centre O.**



NOT TO SCALE

Prove that triangles OAB and ODC are congruent.

[3]

END OF QUESTION PAPER

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