Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

# GCSE MATHEMATICS

**H**

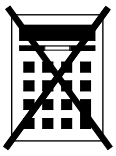
Higher Tier Paper 1 Non-Calculator

Thursday 16 May 2024 Morning Time allowed: 1 hour 30 minutes

## Materials

For this paper you must have:

- mathematical instruments
- the Formulae Sheet (enclosed).



You must **not** use a calculator.

## 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.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.

## Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.

## Advice

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

| For Examiner's Use | |
|---|---|
| Pages | Mark |
| 2–3 | |
| 4–5 | |
| 6–7 | |
| 8–9 | |
| 10–11 | |
| 12–13 | |
| 14–15 | |
| 16–17 | |
| 18–19 | |
| 20–21 | |
| 22–23 | |
| 24 | |
| **TOTAL** | |

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

*Do not write outside the box*

**1** Work out $12^2 \div \left(\frac{1}{3} \times \sqrt{36}\right)$

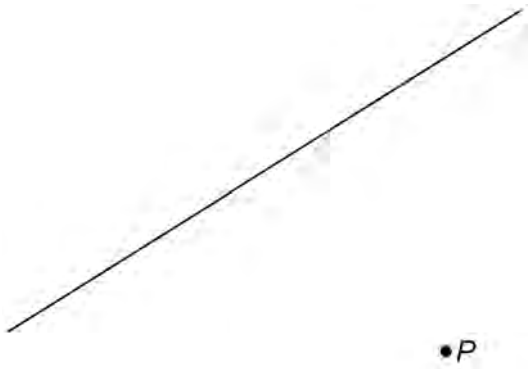
**[3 marks]**

Answer _____

**2** Measure the **shortest** distance from point *P* to the line.

Give your answer in millimetres.

**[1 mark]**




Answer _____ mm

*Do not write outside the box*

**3** The vector $\begin{pmatrix} -3 \\ 7 \end{pmatrix}$ translates A to B.

Write down the vector that translates B to A.

**[1 mark]**

Answer $\begin{pmatrix} \quad \\ \quad \end{pmatrix}$

**4** The attendance for a rugby match is 8400 people to the nearest 100

**4 (a)** Write down the minimum possible attendance.

**[1 mark]**

Answer _____

**4 (b)** Write down the maximum possible attendance.

**[1 mark]**

Answer _____

**Turn over for the next question**

**7**

*Do not write outside the box*

**5** A school year has 78 students.

28 wear glasses.

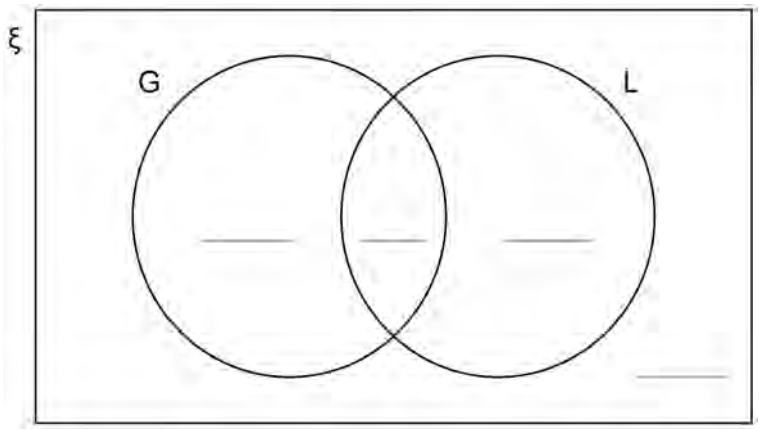
$\frac{1}{4}$ of the students who wear glasses are left-handed.

30% of the students who do **not** wear glasses are left-handed.

**5 (a)** ξ = students in the school year

G = wears glasses

L = left-handed




Complete the Venn diagram.

**[3 marks]**

**5 (b)** A left-handed student is chosen at random.

Work out the probability that the student wears glasses.

**[1 mark]**

Answer _____

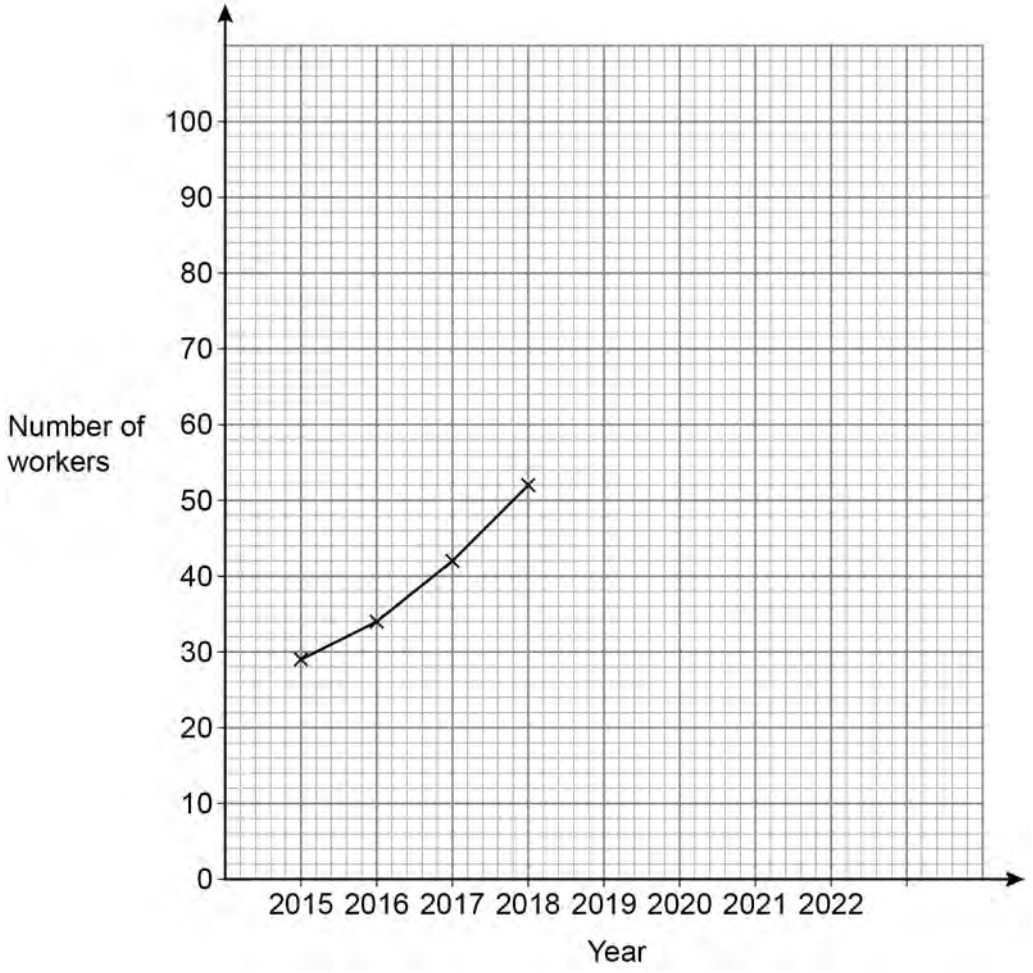
Do not write outside the box

**6** The table shows the number of workers at a company in different years.

| **Year** | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|
| **Number of workers** | 29 | 34 | 42 | 52 | 62 | 70 | 76 | 80 |

A time-series graph is drawn to represent the data.

The first four points have been plotted.




**6 (a)** Complete the graph.

**[2 marks]**

**6 (b)** Estimate the number of workers at the company in 2023

**[1 mark]**

Answer _____

7

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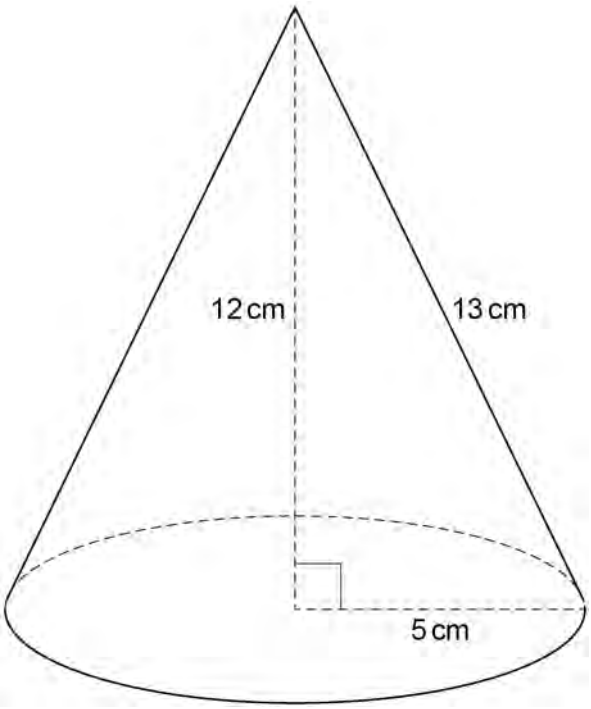
**7** Here is a cone.




**7 (a)**

Curved surface area of a cone = $\pi rl$

where $r$ is the radius and $l$ is the slant height

Beth tries to work out the curved surface area in terms of $\pi$

Curved surface area of the cone = $\pi \times 5 \times 12$

$= 60\pi \text{ cm}^2$

What mistake has she made?

**[1 mark]**

*Do not write outside the box*

**7 (b)** Adam uses $\pi = 3$ to estimate the area of the **base** of the cone.

Work out his estimate.

**[2 marks]**

Answer _____ $cm^2$

**7 (c)** Beth uses $\pi = 3.14$ to estimate the area of the **base** of the cone.

Is Beth's estimate more than or less than Adam's estimate?

Tick a box.

More than ☐ Less than ☐

Give a reason for your answer.

**[1 mark]**

**Turn over for the next question**

**4**

Do not write outside the box

**8** Solve $7x - 22 = 4x + 29$

**[3 marks]**

$x =$ _____

**9** In a house

the floor area of the living room is $26\,m^2$

the floor area of the kitchen is $16.4\,m^2$

Express the area of the living room as a fraction of the area of the kitchen.

Give your answer in its simplest form.

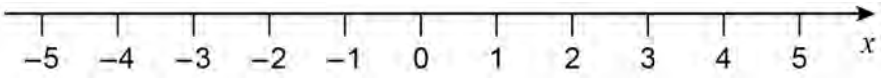
**[3 marks]**

Answer _____

*Do not write outside the box*

**10 (a)** Represent $-2 < x < 4$ on the number line.

**[1 mark]**




**10 (b)** Solve $5y + 14 \geqslant 11$

**[2 marks]**

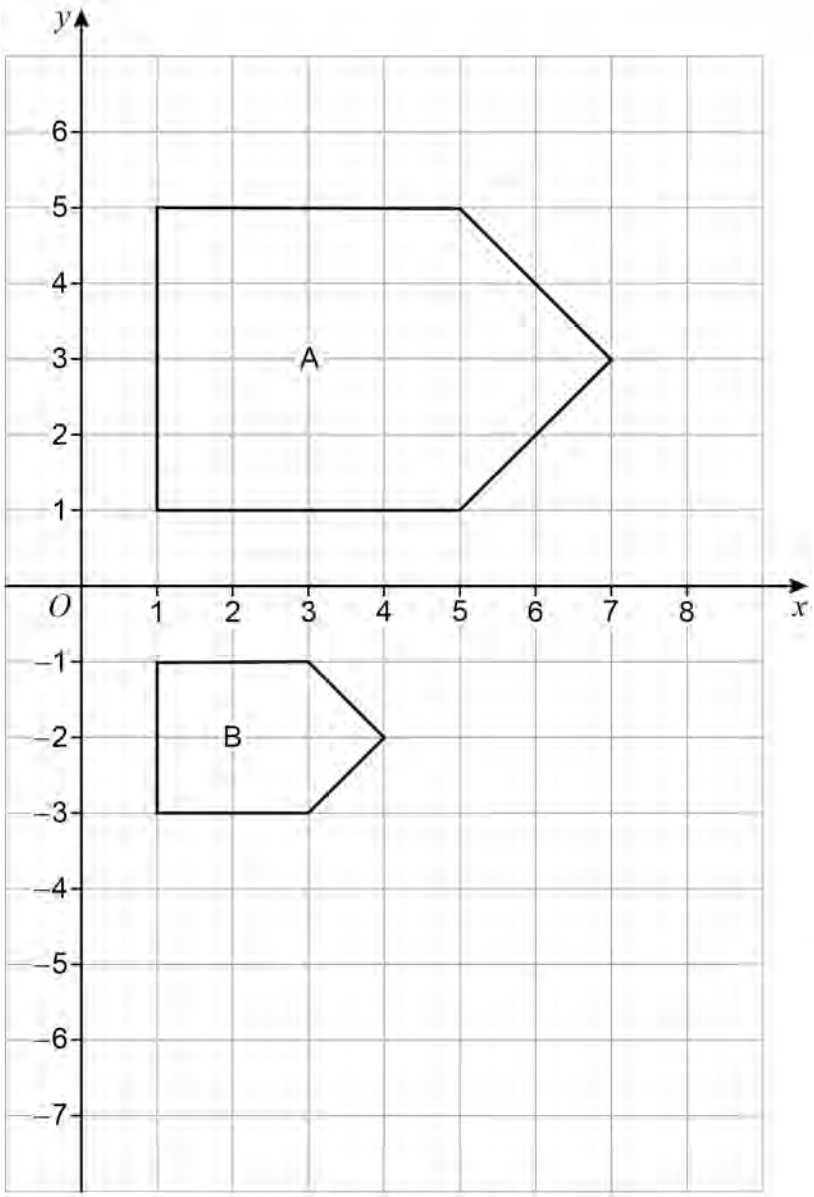
Answer _____

**Turn over for the next question**

**9**

Do not write outside the box

**11**

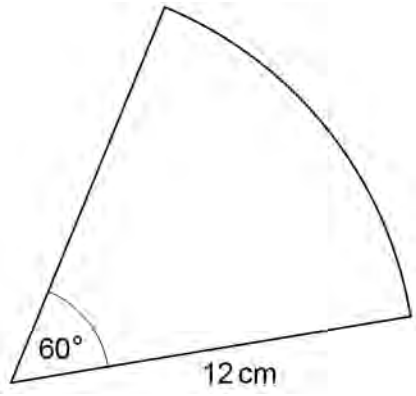



Describe fully the **single** transformation that maps shape A to shape B.

**[3 marks]**

*Do not write outside the box*

**12** A sector has radius 12 cm and angle 60°




Not drawn accurately

Work out the length of the arc.

Give your answer in terms of $\pi$

**[3 marks]**

Answer _____ cm

**Turn over for the next question**

6

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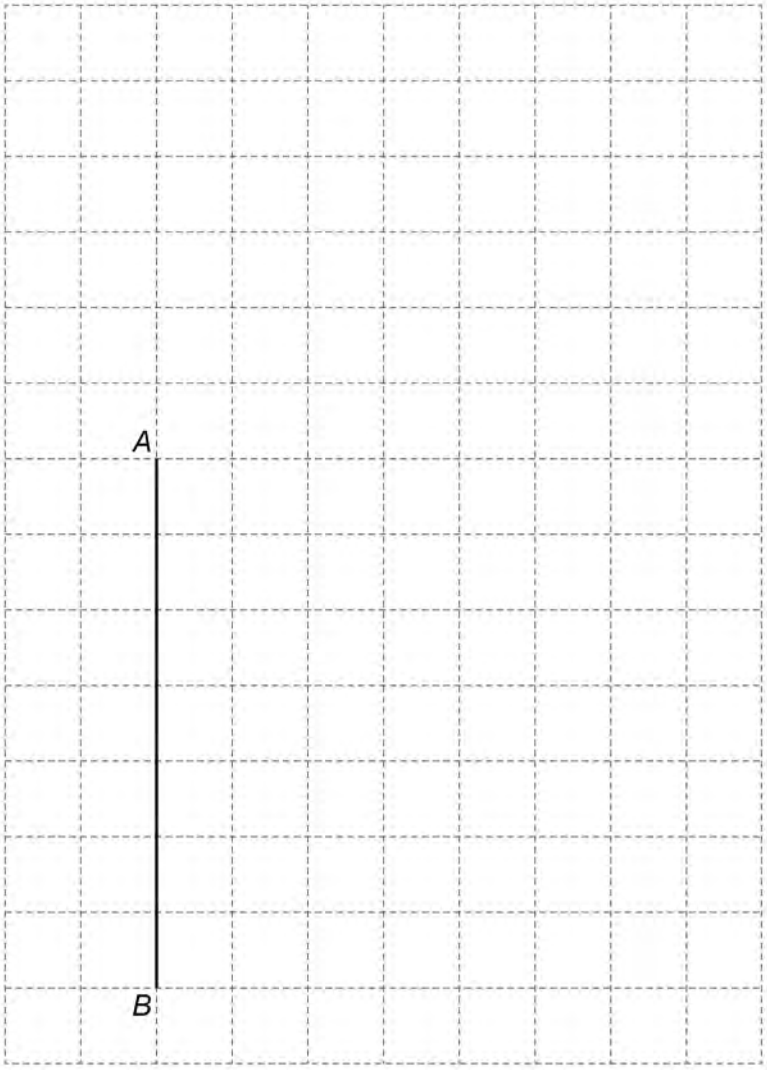
**13** *ABCDE* is a pentagon with $AB = 7\,\text{cm}$

- $BC = 6\,\text{cm}$
- *AB* and *BC* are perpendicular.
- *AB* and *DC* are equal **and** parallel.
- Area of the pentagon = $54\,\text{cm}^2$
- The pentagon has exactly **one** line of symmetry.

Complete a **labelled** drawing of the pentagon.

**[4 marks]**



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**14** 4 chocolate bars and 3 packets of mints cost £4.70

5 chocolate bars and 1 packet of mints cost £4.50

Work out the cost of a chocolate bar and the cost of a packet of mints.

**[4 marks]**

chocolate bar _____

packet of mints _____

**Turn over for the next question**

**8**

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**15 (a)** Between which two **consecutive** integers does the square root of 210 lie?

**[1 mark]**

Answer _____ and _____

**15 (b)** Here are two calculations, A and B.

| **A** | **B** |
|---|---|
| $1.92^7 + 6.9^3$ | $5 \times \sqrt[3]{1\,000\,350}$ |

Use approximations to show that answer to A < answer to B

**[3 marks]**

Do not write outside the box

**16** The table shows information about the ages of members of two clubs.

| | **Median age (years)** | **Interquartile range of ages (years)** |
|---|---|---|
| Swimming club | 21.2 | 7.3 |
| Cycling club | 29.7 | 4.6 |

Compare the average age and consistency of ages for the members of the two clubs.

**[2 marks]**

Average _____

Consistency _____

**Turn over for the next question**

6

Do not write outside the box

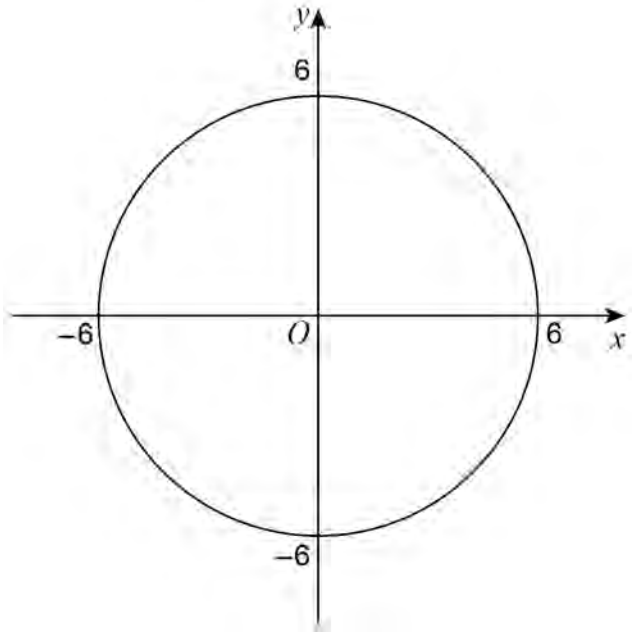
**17** Rearrange $y = \dfrac{3x + 7}{x}$ to make $x$ the subject.

**[4 marks]**

Answer _____

Do not write outside the box

**18** A circle has centre $O$ and passes through (0, 6)




Write down the equation of the circle.

**[1 mark]**

Answer _____

**Turn over for the next question**

5

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**19** $A$, $B$ and $C$ are numbers.

Here is some information about $B$ and $C$.

| | |
|---|---|
| $\boldsymbol{B}$ | $\frac{7}{4}$ of $A$ |
| $\boldsymbol{C}$ | $A$ **increased** by 150% |

Work out $C$ as a fraction of $B$.

**[4 marks]**

Answer _____

Do not write outside the box

**20** $5x^3 + ax^2 + bx + c \equiv kx^3 + (2 - k)x^2 + (a^2 - 1)\,x + \frac{b}{2}$

Work out the values of $a$, $b$ and $c$.

**[3 marks]**

$a =$ _____ $b =$ _____ $c =$ _____

**Turn over for the next question**

7

*Do not write outside the box*

**21** Prove algebraically that $1.0\dot{1}\dot{8} = \frac{56}{55}$

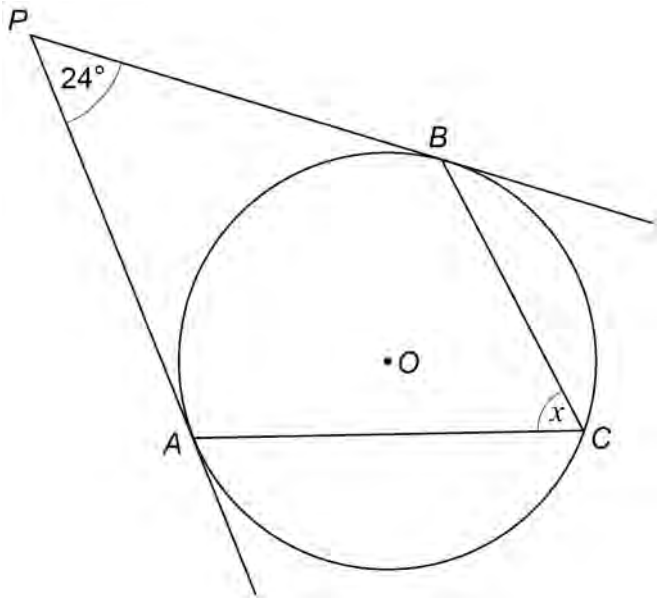
**[3 marks]**

Do not write outside the box

**22** *A*, *B* and *C* are points on a circle, centre *O*.

*AP* and *BP* are tangents to the circle.

Not drawn accurately




Work out the size of angle $x$.

**[3 marks]**

Answer _____ °

6

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**23 (a)** The first three terms of a geometric progression are $\frac{\sqrt{5}}{2}$ $\frac{5}{4}$ $\frac{5\sqrt{5}}{8}$

Work out the next term.

**[1 mark]**

Answer _____

**23 (b)** The $n$th term of a sequence is $(2+\sqrt{3})^n$

Show that the third term is $26 + 15\sqrt{3}$

**[3 marks]**

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**24 (a)** $9k + 7$ and $2k^2 + 3$ are consecutive integers.

$9k + 7$ is the smaller integer.

Work out the value of the **next** consecutive integer.

**[5 marks]**

Answer _____

**24 (b)** $x$ is a square number.

Show that the **next** square number is $x + 2\sqrt{x} + 1$

**[2 marks]**

11

**25** Show that the value of $6 \sin 30° + 2 \cos 30° \times 4 \tan 30°$ is an integer.

**[4 marks]**

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**END OF QUESTIONS**

4

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**ANSWER IN THE SPACES PROVIDED**

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| Question number | **Additional page, if required.**<br>**Write the question numbers in the left-hand margin.** |
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