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

Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:
- mathematical instruments

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	
24–25	
26	
TOTAL	

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

Do not write outside the box

1 Simplify $\left(a^5\right)^3$

Circle your answer.

[1 mark]

$8a$ $15a$ a^8 a^{15}

2 $x \neq 0.4$

Circle the possible value of x.

[1 mark]

$\frac{4}{10}$ $\frac{20}{50}$ $\frac{26}{70}$ $\frac{120}{300}$

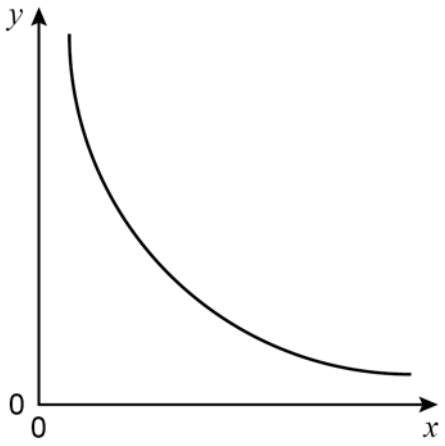
3 Circle the solid that has 7 vertices.

[1 mark]

hexagonal prism | hexagon-based pyramid | pentagonal prism | pentagon-based pyramid

Do not write outside the box

4 Here is a sketch of a graph.



Circle the equation of the graph.

k is a constant.

[1 mark]

$y = kx$ $\quad$ $y = k + x$ $\quad$ $y = k - x$ $\quad$ $y = \frac{k}{x}$

5 Write 200 as a product of prime factors.

Give your answer in index form.

[3 marks]

Answer _____

7

Do not write outside the box

6 Lily's age is 2 years and 4 months.

Hugo's age is 1 year and 8 months.

Write Lily's age in months as a fraction of Hugo's age in months.

Give your fraction in its simplest form.

[2 marks]

Answer _____

7 Use approximations to estimate the answer to $\dfrac{\sqrt{97} + 2.014^3}{0.49}$

[3 marks]

Answer _____

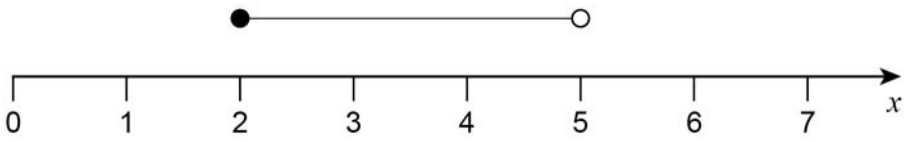
Do not write outside the box

8 (a) Solve $5x + 6 > 3x + 15$

[3 marks]

Answer _____

8 (b) Write down the inequality represented by the number line.



[2 marks]

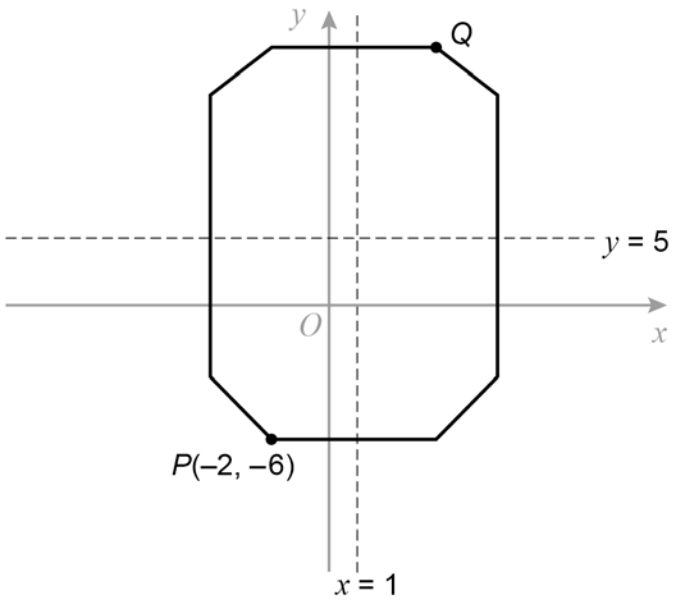
Answer _____

10

Turn over ►

Do not write outside the box

9 The diagram shows an octagon.



Not drawn accurately

$x = 1$ and $y = 5$ are lines of symmetry.

Work out the coordinates of point Q.

[2 marks]

Answer (_____ , _____)

Do not write outside the box

10 (a) Work out $2000 \times 70\,000$

Give your answer in standard form.

[2 marks]

Answer _____

10 (b) Work out $\dfrac{1.8 \times 10^{2}}{3 \times 10^{-1}}$

Give your answer as an ordinary number.

[2 marks]

Answer _____

6

Turn over ►

Do not write outside the box

11 *A*, *B*, *C* and *D* are junctions on a motorway.

Not drawn accurately

distance *CD* = 3 × distance *AB*

distance *BC* = 25 miles

Salma drives from *A* to *C*.

She drives for 30 minutes at an average speed of 62 miles per hour.

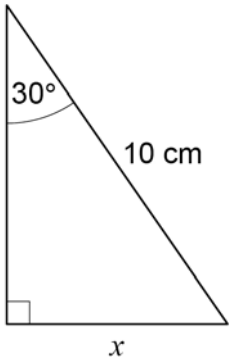
Work out the distance *AD*.

[4 marks]

Answer _____ miles

Do not write outside the box

12 Here is a right-angled triangle.



Not drawn accurately

Use trigonometry to work out the value of x.

[3 marks]

Answer _____ cm

Turn over for the next question

7

Do not write outside the box

13 Convert $\frac{5}{6}$ to a recurring decimal.

[2 marks]

Answer _____

14 Simplify $\frac{3}{x} + \frac{4}{x}$

Circle your answer.

[1 mark]

$\frac{7}{x}$ $\frac{7}{2x}$ $\frac{12}{x}$ $\frac{12}{x^2}$

Do not write outside the box

15 $(x + a)(x + 3a) \equiv x^2 + bx + 75$

Work out the **two** possible values of b.

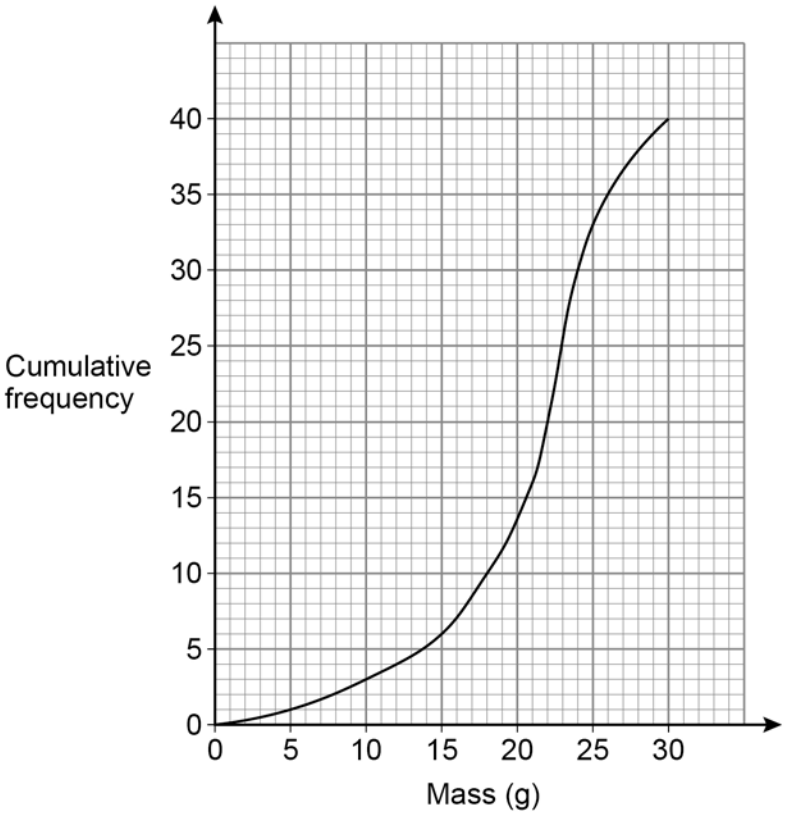
[3 marks]

Answer _____ and _____

6

Do not write outside the box

16 The cumulative frequency graph represents the masses of 40 necklaces.



16 (a) A jeweller buys every necklace with mass **greater than** 21 grams.

Use the graph to estimate how many she buys.

[2 marks]

Answer _____

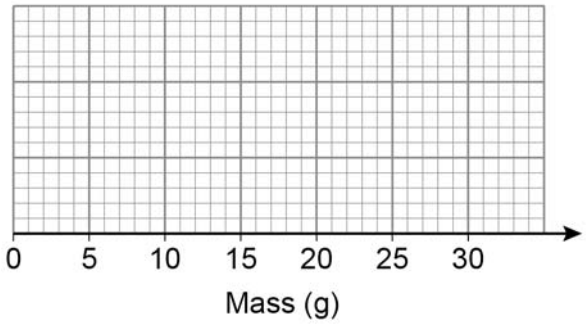
Do not write outside the box

16 (b) The lowest mass was 3 grams.

The highest mass was 28 grams.

Draw a box plot to represent the data.

[3 marks]



17 Circle the vector that translates the point (–2, 7) to the point (3, –1)

[1 mark]

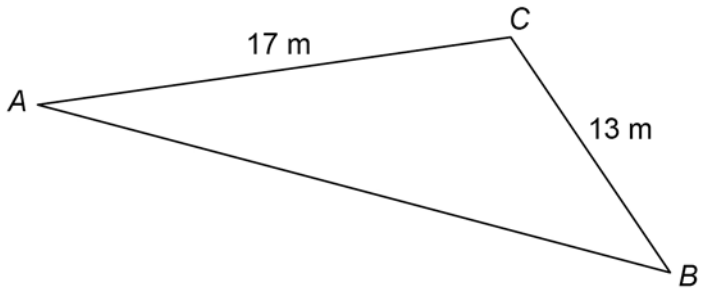
$\begin{pmatrix} 5 \\ -6 \end{pmatrix}$ $\begin{pmatrix} 5 \\ -8 \end{pmatrix}$ $\begin{pmatrix} -5 \\ 8 \end{pmatrix}$ $\begin{pmatrix} -5 \\ 6 \end{pmatrix}$

Turn over for the next question

6

18 (a) Here is a triangle.

Not drawn accurately



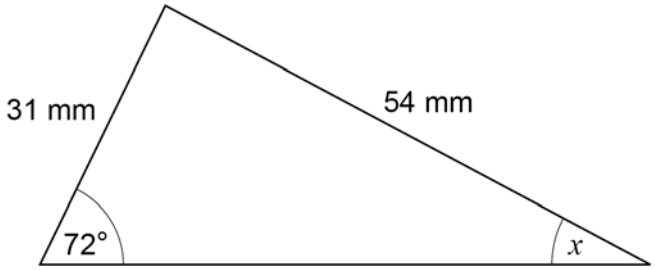
Give a reason why the length of side *AB* **cannot** be 35 m

[1 mark]

Do not write outside the box

18 (b) Here is a different triangle.

Not drawn accurately



Leah tries to use the sine rule to work out the size of angle x.

Here are the first two lines of her working.

$$\frac{x}{\sin 31} = \frac{54}{\sin 72}$$

$$x = \frac{54 \sin 31}{\sin 72}$$

What error has she made in this working?

[1 mark]

2

Do not write outside the box

19 Items made at a factory have to pass two checks.

90% pass the first check.

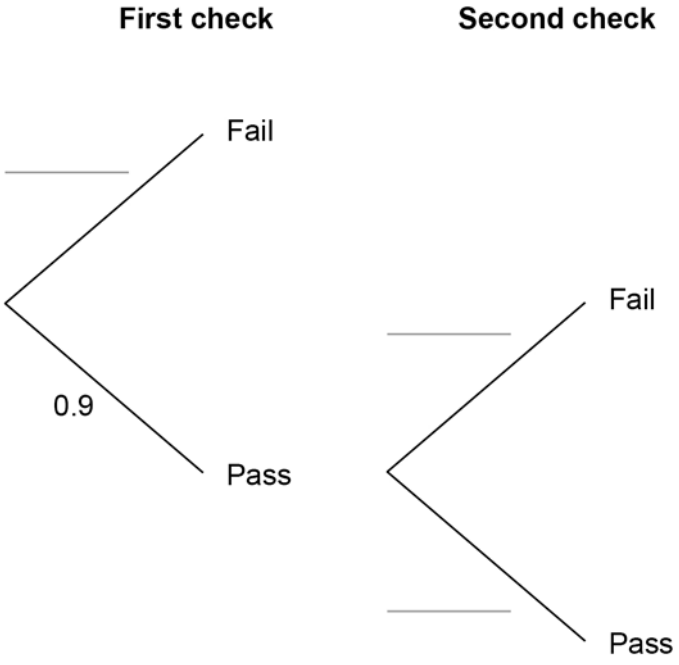
The items that fail are scrapped.

99% of the items that pass the first check pass the second check.

The items that fail are scrapped.

19 (a) Complete the tree diagram.

[2 marks]



Do not write outside the box

19 (b) An item is chosen at random before the checks.

Work out the probability that the item is scrapped.

[3 marks]

Answer _____

20 Which **one** of these is a unit of density?

Circle your answer.

[1 mark]

cm^2/g cm^3/g g/cm^2 g/cm^3

Turn over for the next question

6

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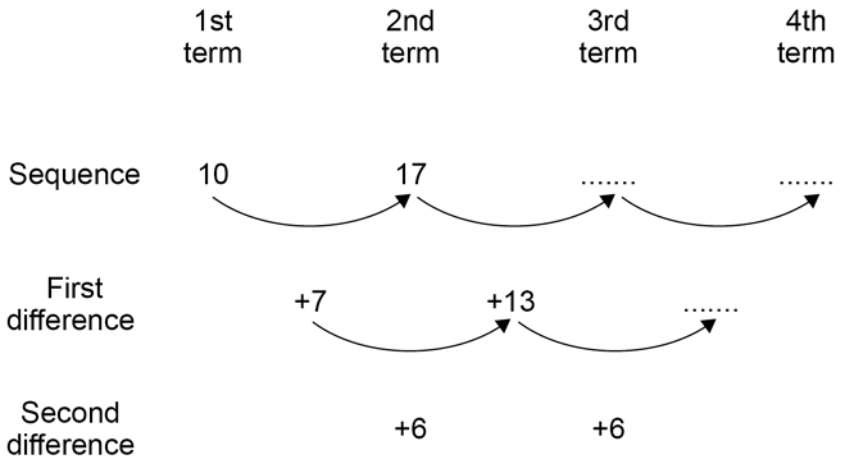
21 The first two terms of a quadratic sequence are 10 and 17

Here is some information about the sequence.



Work out an expression for the nth term of the sequence.

[4 marks]

Answer _____

Do not write outside the box

22 Work out the value of $\left(\frac{5}{7}\right)^{-2}$

Give your answer as a mixed number.

[3 marks]

Answer _____

23 Rearrange $y = \frac{1}{\sqrt{x+1}}$ to make x the subject.

[3 marks]

Answer _____

10

Do not write outside the box

24 (a) $f(x) = cx + d$

$f(4) = 7$

$f(10) = 22$

Work out the values of c and d.

[3 marks]

$c =$ _____ $d =$ _____

Do not write outside the box

24 (b) $g(x) = 2x$ and $h(x) = \dfrac{x-1}{2}$

Circle the expression for $hg(x)$

[1 mark]

$\dfrac{2x^2 - x}{2}$ $\dfrac{2x-1}{2}$ $x^2 - x$ $x - 1$

25 Show that $\dfrac{\sqrt{150} - \sqrt{6}}{\sqrt{2} \times \sqrt{3}}$ simplifies to an integer.

[3 marks]

Turn over for the next question

7

Do not write outside the box

26 $d = 2f$

$$\frac{e-f}{d-e} = \frac{1}{4}$$

Work out the ratio $e : f$

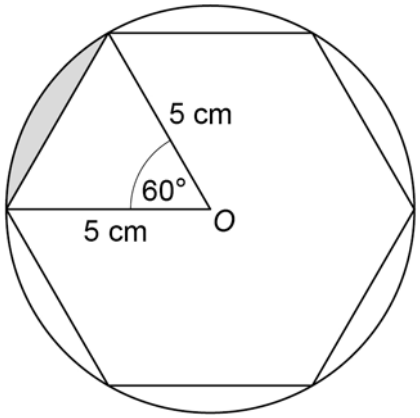
[3 marks]

Answer _____ : _____

Do not write outside the box

27 The vertices of a regular hexagon lie on a circle with centre O and radius 5 cm

Not drawn accurately



Work out the shaded area.

Give your answer in the form $\dfrac{a\pi - b\sqrt{c}}{12}$ where a, b and c are integers.

[4 marks]

Answer _____ cm^2

7

Turn over ►

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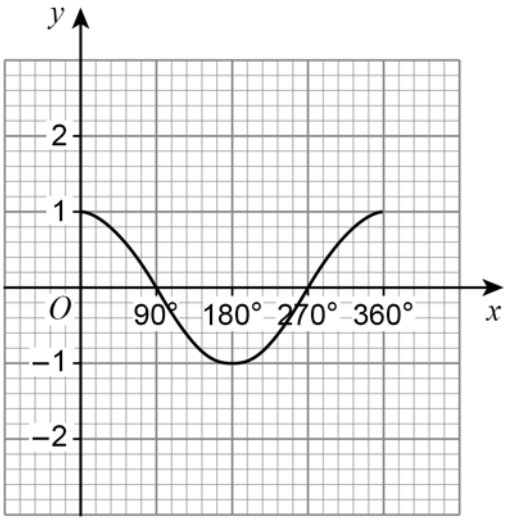
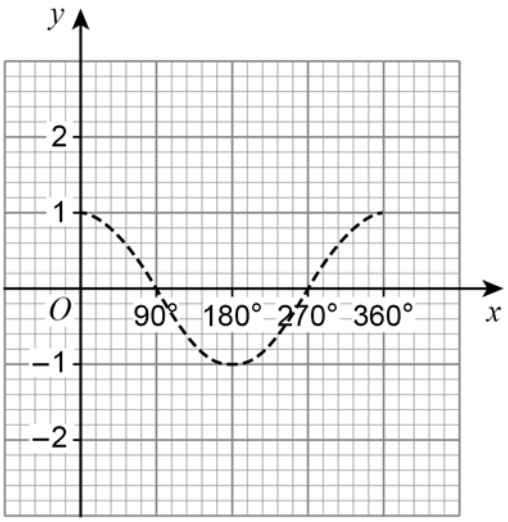
28 Here is the graph of $y = \cos x$ for $0° \leqslant x \leqslant 360°$



In parts (a) and (b) the graph of $y = \cos x$ is shown as a dashed line.

28 (a) On the grid below, draw the graph of $y = \cos (x - 90°)$ for $0° \leqslant x \leqslant 360°$

[1 mark]



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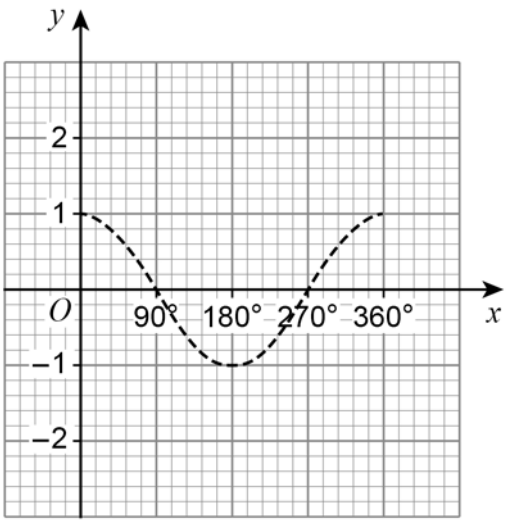
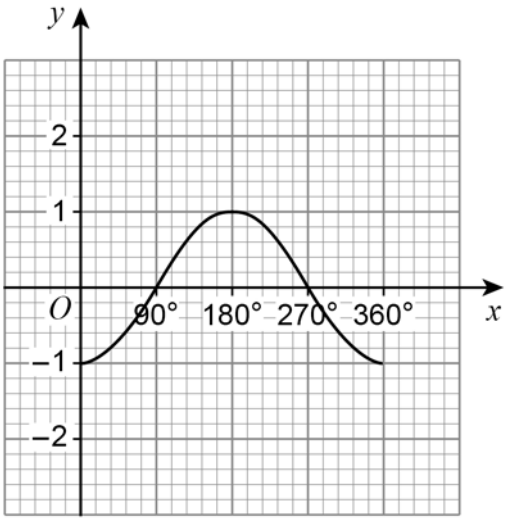
28 (b) On the grid below, draw the graph of $y = 1 + \cos x$ for $0° \leqslant x \leqslant 360°$

[1 mark]



28 (c) Rita tries to draw the graph of $y = \cos(-x)$ for $0° \leqslant x \leqslant 360°$

Here is her graph.



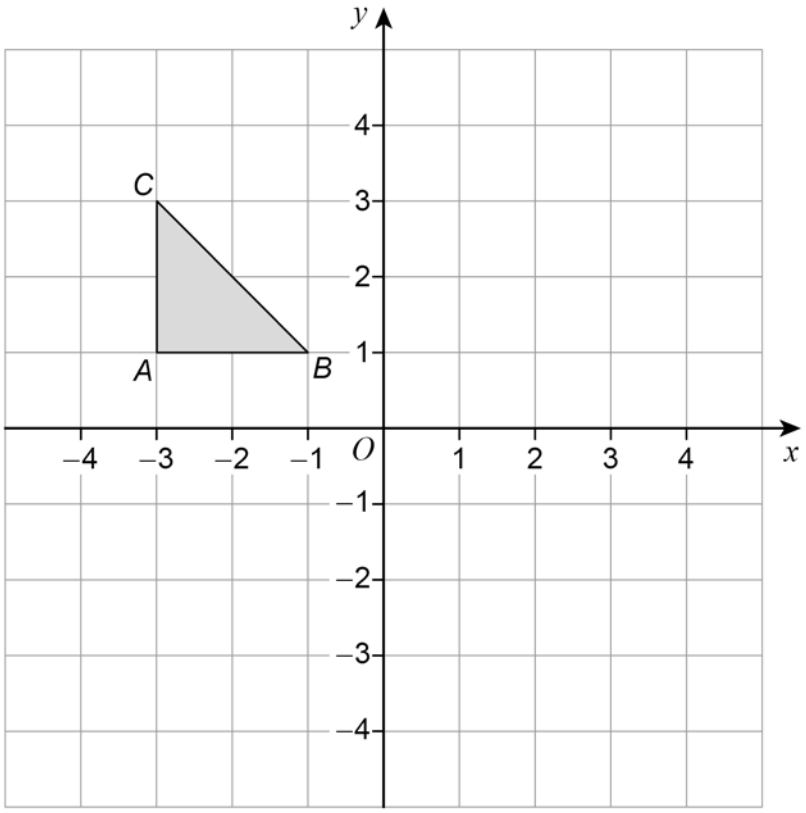
Give a reason why Rita's graph is incorrect.

[1 mark]

3

Do not write outside the box

29 Here is triangle *ABC* on a grid.



Describe a **single** transformation of the triangle so that

point *B* is invariant

point *A* moves to (1, 1)

point *C* moves to (1, –1)

[3 marks]

END OF QUESTIONS

3

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