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**

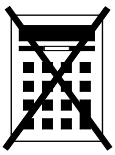
Higher Tier Paper 1 Non-Calculator

Wednesday 8 November 2023 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 | |
| 24–25 | |
| 26 | |
| **TOTAL** | |

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

*Do not write outside the box*

**1** Work out the lowest common multiple (LCM) of 20 and 25

**[1 mark]**

Answer _____

**2** Work out the size of an **exterior** angle of a regular hexagon.

**[1 mark]**

Answer _____ °

**3** *A* is (2, 0) and *B* is (0, –4)

Work out the midpoint of *AB*.

**[1 mark]**

Answer ( _____ , _____ )

Do not write outside the box

**4** Simplify $a + 3a \div a$

**[1 mark]**

Answer _____

**5** Work out the value of $(8^2 \times 8) \div (8^9 \div 8^5)$

Give your answer as a decimal.

**[3 marks]**

Answer _____

**Turn over for the next question**

7

*Do not write outside the box*

**6** A music company releases 10 albums.

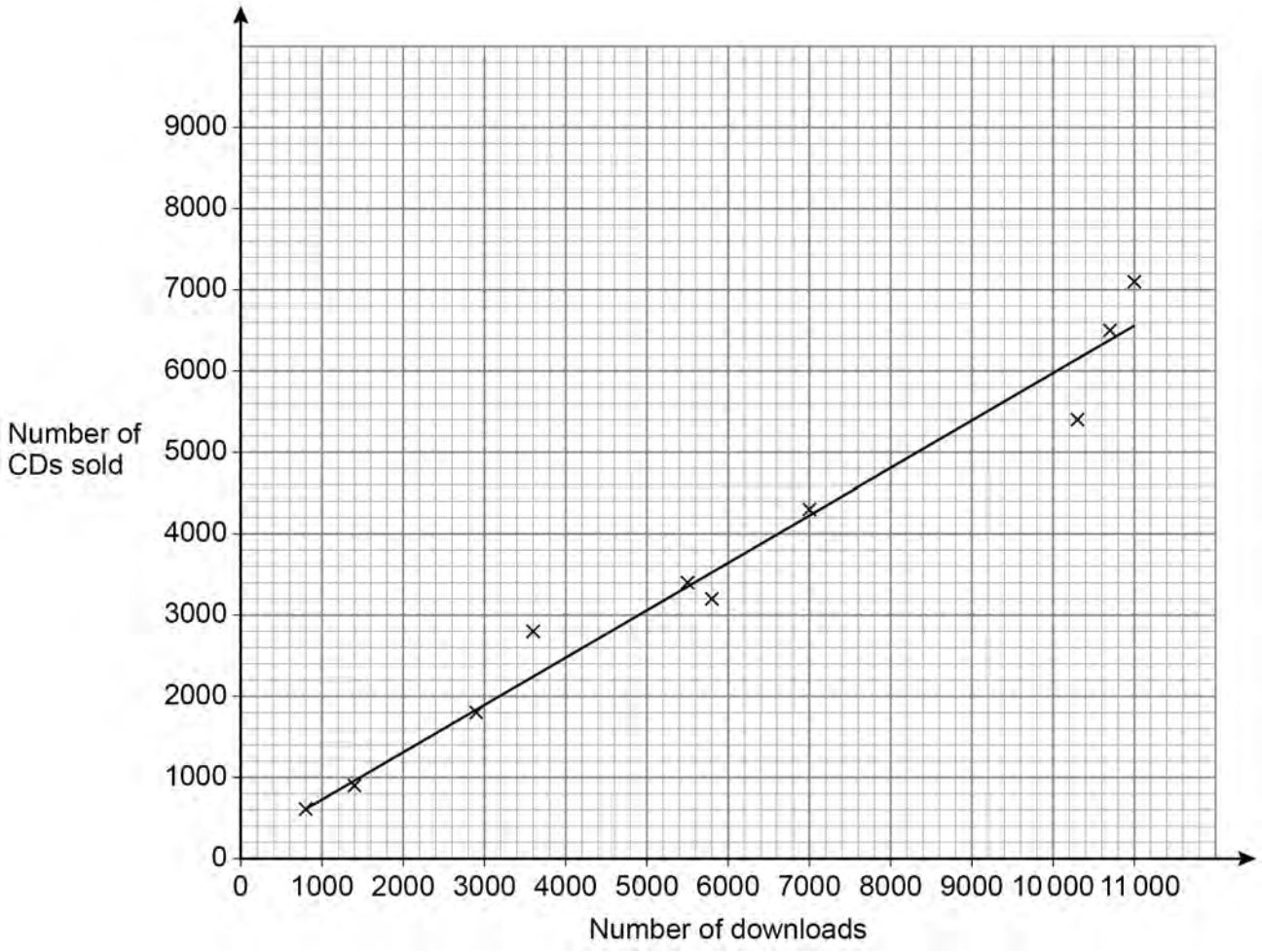
The scatter graph shows, for each album,

the number of downloads on the first day

and

the number of CDs sold on the first day.

A line of best fit has been drawn on the scatter graph.



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**6 (a)** The scatter graph shows positive correlation.

Describe the relationship between number of downloads and number of CDs sold.

**[1 mark]**

**6 (b)** The company earns

£2.50 for each download

and

£3 for each CD sold.

The company releases another album.

On the first day it has 9000 downloads.

Estimate the **total** amount the company earns from downloads and CDs of the album that day.

**[3 marks]**

Answer £ _____

**4**

Do not write outside the box

**7** 70% of a number is 350

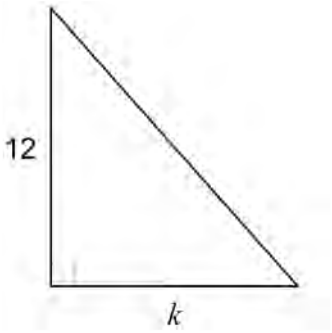
Work out 120% of the number.

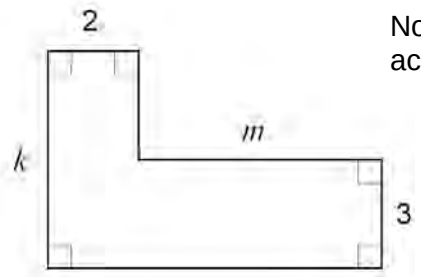
**[3 marks]**

Answer _____

Do not write outside the box

**8** In the diagrams, all lengths are in centimetres.




Not drawn accurately

The two shapes have equal areas.

Work out $k : m$

**[3 marks]**

Answer _____ : _____

**Turn over for the next question**

6

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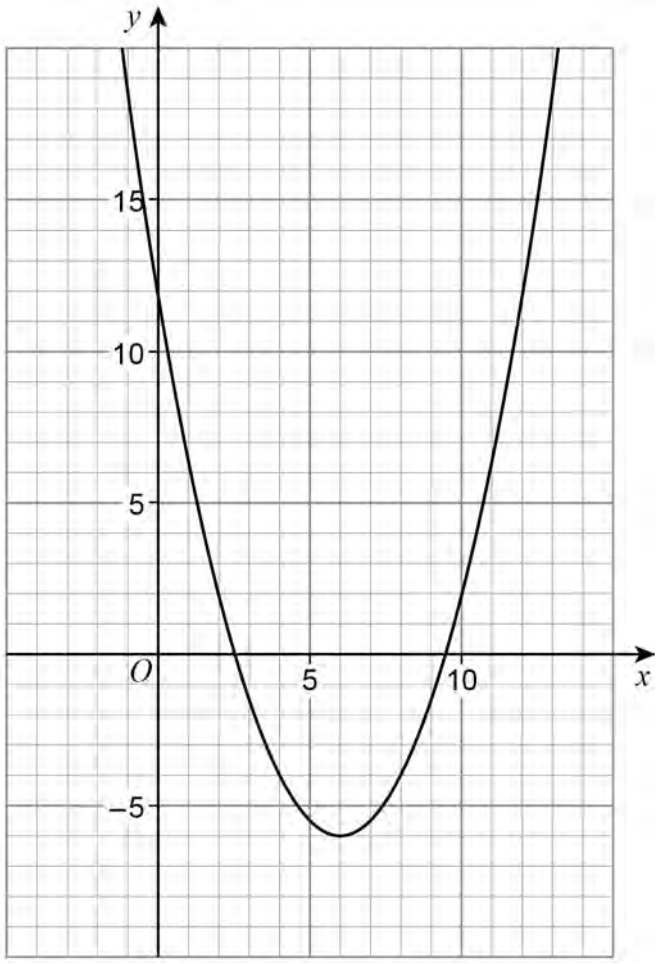
**9** Here is the graph of $y = 0.5x^2 - 6x + 12$




**Use the graph** to estimate the solutions of $0.5x^2 - 6x + 12 = 0$

**[2 marks]**

Answer _____

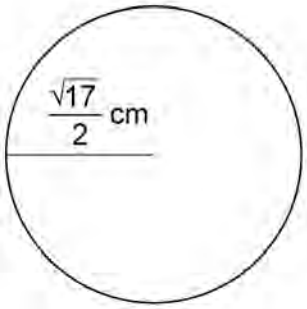
Do not write outside the box

**10** Shape A is a circle with radius $\frac{\sqrt{17}}{2}$ cm

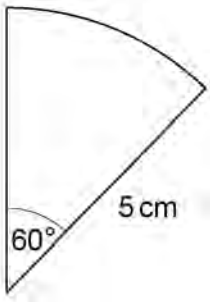
Shape B is a sector of a circle with radius 5 cm

Not drawn accurately

Shape A




Shape B




Which shape has the greater area, A or B?

You **must** show your working.

**[5 marks]**

Answer _____

7

**Turn over ►**

Do not write outside the box

**11** Factorise $x^2 + 2x - 24$

**[2 marks]**

Answer _____

**12 (a)** Write $2 \times 10^3$ as an ordinary number.

**[1 mark]**

Answer _____

**12 (b)** Simplify $(2 \times 10^3) : (5 \times 10^{-1})$

Give your answer in the form $n : 1$

**[2 marks]**

Answer _____ : 1

Do not write outside the box

**13** Here is an identity in $x$.

$$5(2x + d) \equiv cx + 30$$

Work out the values of $c$ and $d$.

**[3 marks]**

$c =$ _____ $d =$ _____

**14** Cora is revising for two subjects, History and French.

The time she spends revising is in the ratio

History : French = 7 : 2

The time she spends revising for History is 20 hours **more** than for French.

Work out the **total** time she spends revising.

**[3 marks]**

Answer _____ hours

**11**

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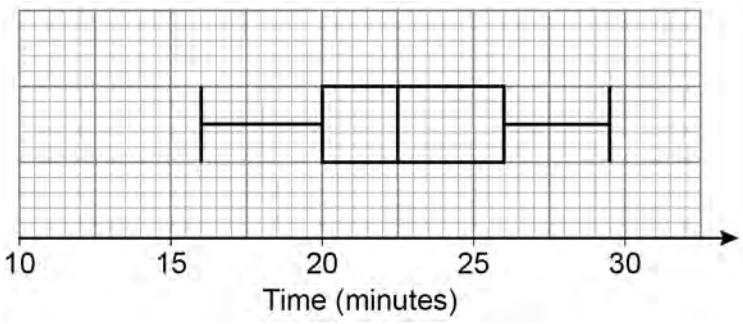
**15** A race was run in 2019 and in 2020

The box plot shows information about the finishing times in 2019




**15 (a)** In 2019, what was the fastest time?

**[1 mark]**

Answer _____ minutes

Do not write outside the box

**15 (b)** The table shows information about the finishing times in 2020

| | |
|---|---|
| **Lower quartile** | 21 minutes |
| **Median** | 24 minutes |
| **Upper quartile** | 27 minutes |

Use the data to comment on each of the following statements.

**[4 marks]**

On average, times were faster in 2019 than in 2020

Times were equally consistent in 2019 and 2020

5

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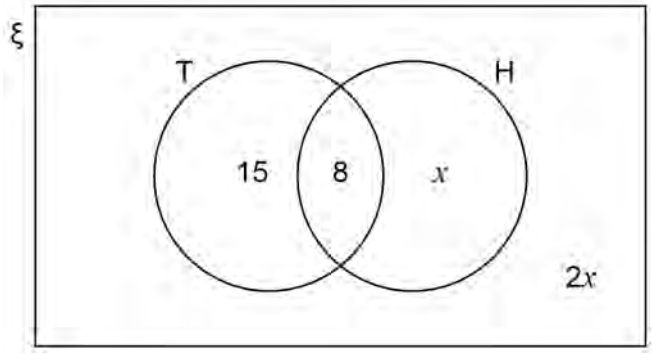
**16** The Venn diagram shows information about 80 people who visited an online shop.

ξ = 80 people

T = people who bought trainers

H = people who bought a hoodie




**16 (a)** One person is chosen at random.

Work out the probability that they bought a hoodie.

**[3 marks]**

Answer _____

**16 (b)** One person who bought trainers is chosen at random.

Work out the probability that they bought a hoodie.

**[1 mark]**

Answer _____

Do not write outside the box

**17** $x$ and $y$ are integers.

$8 \leqslant 4x \leqslant 20$ and $y - 3x < 12$

Work out the **largest** possible value of $y$.

**[3 marks]**

Answer _____

**Turn over for the next question**

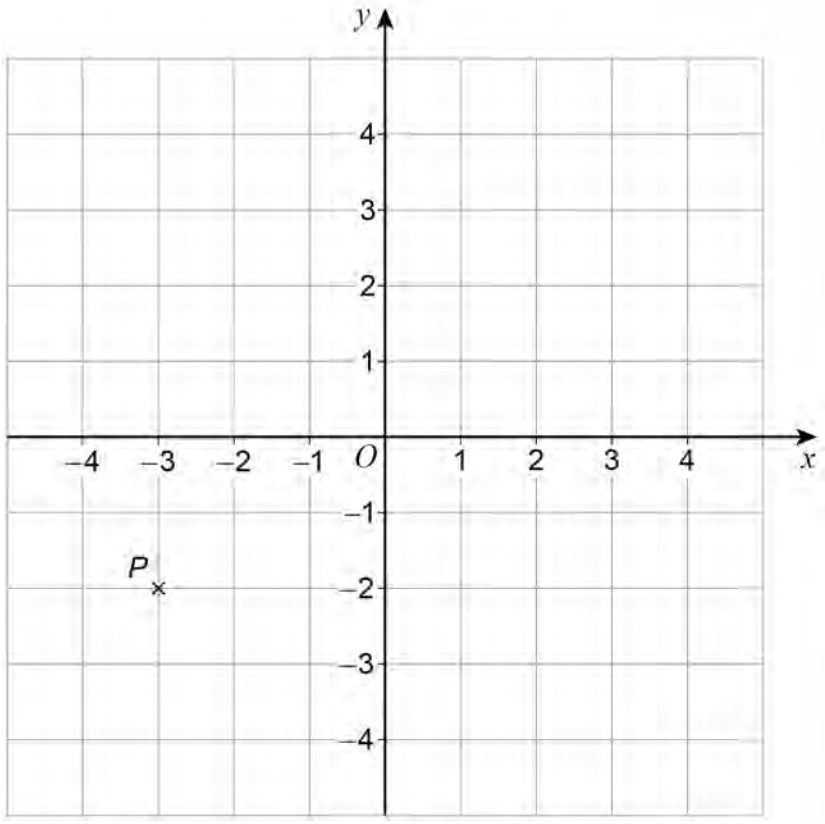
7

Do not write outside the box

**18 (a)** *P* and *Q* are points.

*P* (–3, –2) is mapped to *Q* by a rotation about (1, 0) through 90° clockwise.

*Q* is mapped back to *P* by a **single** transformation.




Complete these two **single** transformations that each map *Q* back to *P*.

**[2 marks]**

Rotation about (1, 0) _____

_____

Translation _____

_____

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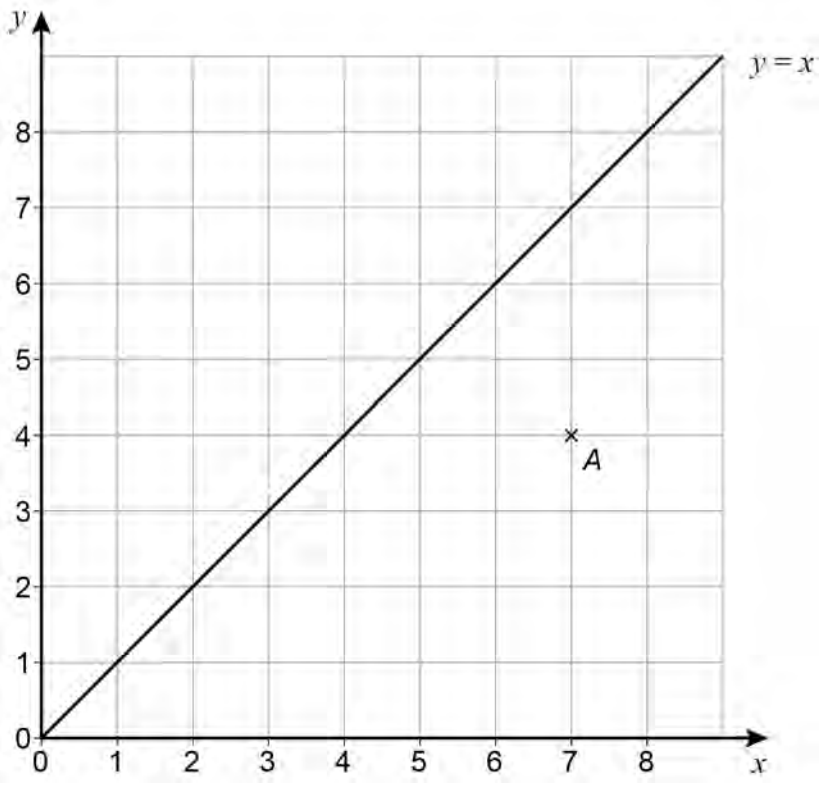
**18 (b)** Point $A$ (7, 4) and the line $y = x$ are shown on the grid.




$B$ and $C$ are points on the grid, each having positive **integer** coordinates.

$BAC$ is a right-angled triangle.

When $BAC$ is reflected in the line $y = x$ side $BC$ is invariant.

Work out **one** possible set of coordinates for $B$ and $C$.

**[1 mark]**

$B$ ( _____ , _____ ) $C$ ( _____ , _____ )

**3**

**Turn over ►**

Do not write outside the box

**19** When converted to a fraction $0.\dot{7} = \frac{7}{9}$

Work out $0.\dot{4} + 0.0\dot{7}$

Give your answer as a fraction.

**[3 marks]**

Answer _____

Do not write outside the box

**20** $x$ and $y$ are acute angles.

$$\sin x = \frac{\sqrt{3}}{2} \qquad \tan y = 1$$

$$w = 3x - 2y$$

Work out the value of $\cos w$

You **must** show your working.

**[3 marks]**

Answer _____

**Turn over for the next question**

6

Do not write outside the box

**21** $f(x) = \frac{x-9}{8}$ $g(x) = 2x^2 + 9$ $h(x) = 4x$

Solve $f^{-1}(x) = gh(x)$

**[5 marks]**

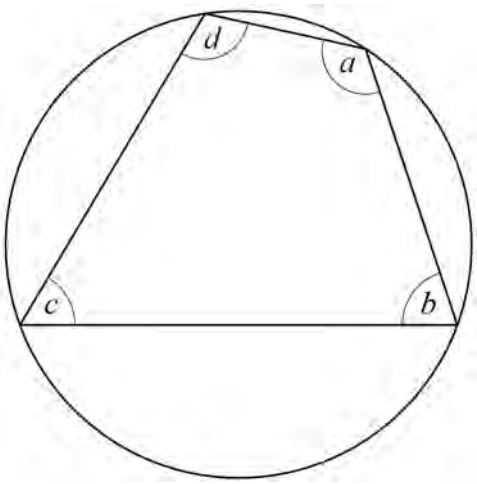
Answer _____

Do not write outside the box

**22** Here is a cyclic quadrilateral.

$a : b : c = 9 : 5 : 3$

Not drawn accurately




Work out the size of angle $d$.

**[3 marks]**

$d =$ _____ °

8

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**23** Work out $\frac{7}{\sqrt{2}} \times \frac{\sqrt{3}}{\sqrt{10}}$

Give your answer in the form $\frac{x\sqrt{15}}{y}$ where $x$ and $y$ are integers.

**[3 marks]**

Answer _____

Do not write outside the box

**24** Line A is perpendicular to line B.

The gradient of line A is –2

Work out the gradient of line B.

**[1 mark]**

Answer _____

**25** The $n$th term of a geometric progression is $r^n$ where $r > 0$

The second term is $\frac{8}{9}$

Work out the third term.

Give your answer in the form $\frac{c\sqrt{2}}{d}$ where $c$ and $d$ are integers.

**[2 marks]**

Answer _____

6

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**26 (a)** Work out the value of $\left(5\frac{1}{16}\right)^{\frac{1}{4}}$

**[2 marks]**

Answer _____

**26 (b)** Write $\left(49^{m}\right)^{2.5}$ as a power of 7 in terms of $m$.

**[2 marks]**

Answer _____

**27** Write down the solution of $x^2 < 16$

**[1 mark]**

Answer _____

Do not write outside the box

**28** *PQRS* is a quadrilateral.

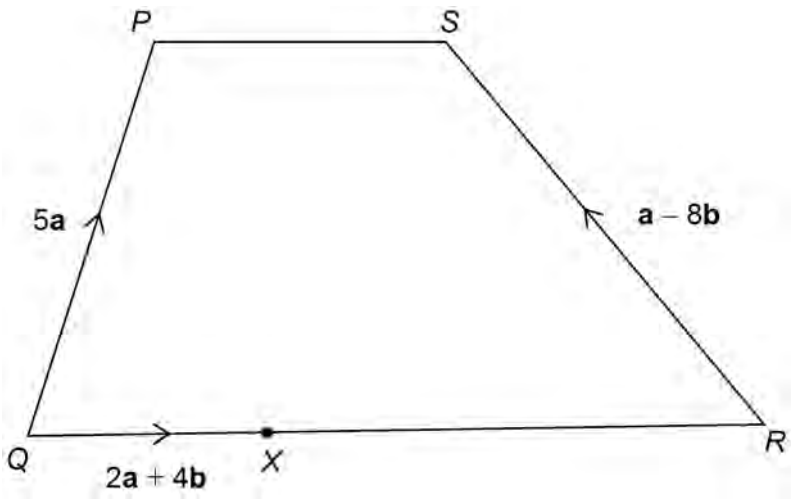
*PQ* is not parallel to *SR*.

*X* is a point on *QR*.

$QX : XR = 2 : 3$

$\overrightarrow{QX} = 2\mathbf{a} + 4\mathbf{b}$

Not drawn accurately




Prove that *PQRS* is a trapezium.

**[3 marks]**

8

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**29** Here are the equations of three graphs.

$y = \sin x$ $y = \cos x$ $y = \tan x$

**29 (a)** Which statement is true?

Tick **one** box.

**[1 mark]**

☐ $y = \sin x$ passes through (180°, –1)

☐ $y = \cos x$ passes through (180°, –1)

☐ $y = \tan x$ passes through (180°, –1)

☐ None of the graphs pass through (180°, –1)

**29 (b)** Which statement is true?

Tick **one** box.

**[1 mark]**

☐ $y = \sin x$ passes through (270°, 1)

☐ $y = \cos x$ passes through (270°, 1)

☐ $y = \tan x$ passes through (270°, 1)

☐ None of the graphs pass through (270°, 1)

**END OF QUESTIONS**

2

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