AQA

Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE MATHEMATICS

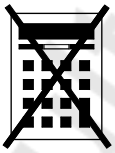
H

Higher Tier Paper 1 Non-Calculator

Thursday 15 May 2025 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	
TOTAL	

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

Do not write outside the box

1 Solve the simultaneous equations

$$2x + 5y = 18$$
$$2x + y = 6$$

[3 marks]

$2x - 2x + 5y - y = 18 - 6$

$4y = 12$

$\div 4 \quad \div 4$

$y = 3$

$2x + 3 = 6$

$-3 \quad -3$

$2x = 3$

$\div 2 \quad \div 2$

$x = \frac{3}{2} = 1.5$

$x =$ 1.5 $y =$ 3

2 $1.07 < \frac{x}{9} < 1.17$ where x is an **integer**.

Work out the value of x.

[2 marks]

$1.07 \times 9 < \frac{x}{9} \times 9 < 1.17 \times 9$

$9.63 < x < 10.53$

$1.07 \times 9 = 9.63$

$1.17 \times 9 = 10.53$

$x =$ 10

Do not write outside the box

3 A metal solid has volume 11 cm^3

The density of the metal is 8.5 g/cm^3

Work out the mass of the solid.

[2 marks]

Density = $\frac{\text{mass}}{\text{volume}}$

× volume × volume

Density × volume = mass

8·5 × 11 = mass

$$\begin{array}{r} {\scriptstyle 1\ 1} \\ \times\ 8\cdot5 \\ \hline 5\ 5 \\ +\ 8\ 8 \\ \hline 9\ 3\cdot5 \end{array}$$

Answer 93.5 g

4 Here are 11 numbers.

2 8 | 10 | 12 12 | 14 | 19 23 | 26 | 31 33

median

Q_1 Q_2 Q_3

Work out the inter-quartile range.

[2 marks]

$Q_3 - Q_1 = 26 - 10 = 16$

Answer 16

9

Do not write outside the box

5 The table shows information about the marks of students in a test.

	Mean mark	Range of marks
School A	61	14
School B	56	21

Tick **one** box for each statement.

[3 marks]

	True	May be true	Not true
On average, School A had higher marks	✓		
There are more students in School B		✓	
School B had a greater spread of marks	✓		

Do not write outside the box

6 (a) Work out $0.6 \div 100$

Give your answer in standard form.

[2 marks]

$0.6 \div 100$

$0.6 \times \frac{1}{100} = 0.006$

Answer 6×10^{-3}

6 (b) Work out $40 \times 30 \times 10^5$

Give your answer in standard form.

[2 marks]

1200×10^5

$1.2 \times 10^3 \times 10^5$

$1.2 \times 10^{3+5}$

Answer 1.2×10^8

Turn over for the next question

7

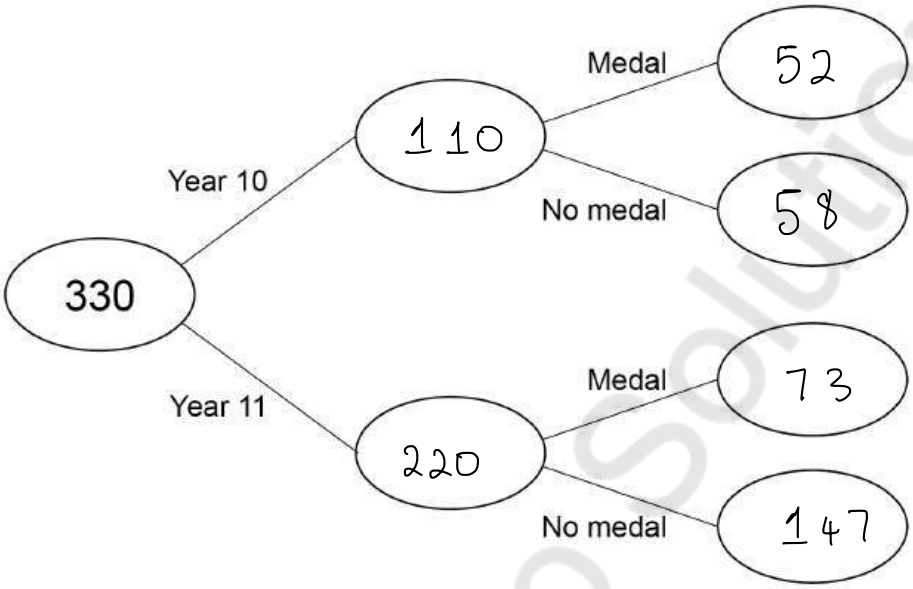
Do not write outside the box

7 330 students from Year 10 and Year 11 take part in a competition.

- number of students in Year 10 : number of students in Year 11 = 1 : 2
- 125 students win a medal.
- 73 of the students who win a medal are in Year 11

Complete the frequency tree.

[4 marks]



Y10 : Y11
1 : 2
3 parts
330 students

330 ⇒ 3
÷3 ÷3
110 ⇒ 1
×2 ×2
220 ⇒ 2

Y10 = 110
Y11 = 220

Y10 (No medal) = 110 − 52 = 58

Y10 (Medal) = 125 − 73
Y10 (Medal) = 52

Y11 (No medal) = 220 − 73 = 147

Do not write outside the box

8 Work out $\frac{4}{15} + \frac{1}{5} \div \frac{1}{2}$

Give your answer as a fraction.

[3 marks]

$\frac{4}{15} + \frac{1}{5} \times \frac{2}{1}$

$\frac{4}{15} + \frac{2}{5}$

$\frac{4}{15} + \frac{2 \times 3}{5 \times 3}$

$\frac{4}{15} + \frac{6}{15}$

$\frac{10 \div 5}{15 \div 5} = \frac{2}{3}$

Answer $\frac{2}{3}$

Turn over for the next question

7

Do not write outside the box

9 $y = \frac{1}{x}$

Which of these values of x gives the **greatest** value of y ?

Circle your answer.

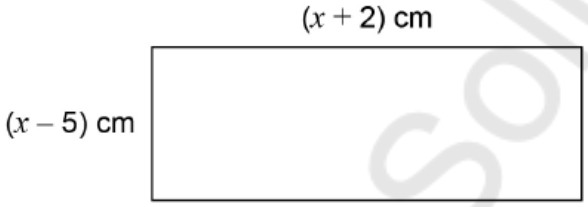
$\frac{8}{20} < \frac{9}{20}$

[1 mark]

$\frac{9}{20}$ $\frac{2\times4}{5\times4} = \frac{8}{20}$ -80 95

10

Not drawn accurately



The area of the rectangle is 120 cm^2

Work out the value of x.

[4 marks]

$A = l \times w$

$120 = (x+2)(x-5)$

	x	$+2$
x	x^2	$+2x$
-5	$-5x$	-10

$120 = x^2 + 2x - 5x - 10$

$120 = x^2 - 3x - 10$

$-120 \quad -120$

-130

$+1, -130$

$+10, -13$

$0 = x^2 - 3x - 130$

$0 = x^2 + 10x - 13x - 130$

$0 = x(x+10) - 13(x+10)$

$0 = (x - 13)(x+10)$

$x - 13 = 0$ $\quad x + 10 = 0$

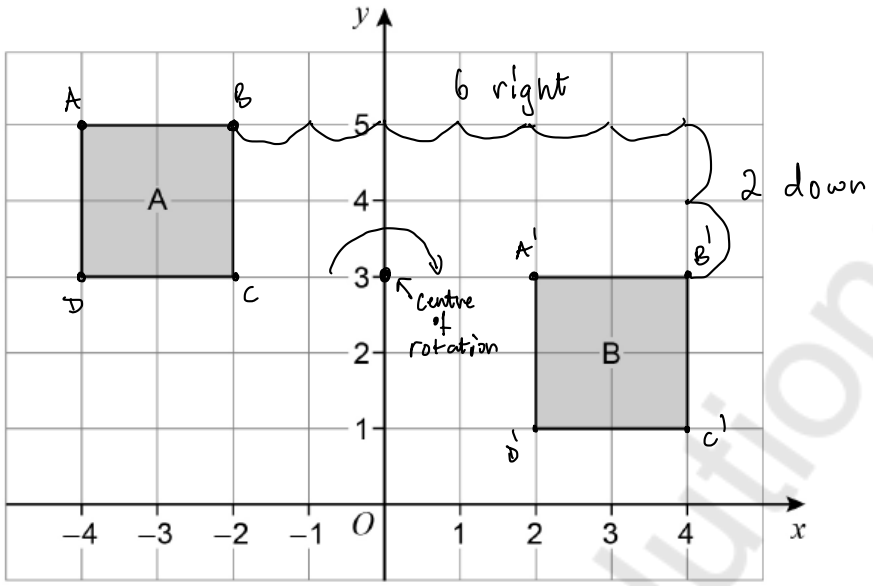
$+13 \quad +13$ $\quad -10 \quad -10$

$x = 13$ $\quad x = -10$ reject

$x =$ 13

Do not write outside the box

11



11 (a) Write down the **translation vector** that maps shape A to shape B.

[1 mark]

Answer $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$

11 (b) Describe fully a **rotation** that maps A to B.

[2 marks]

180° Clockwise rotation with a centre of rotation at (0, 3)

8

Do not write outside the box

12 Oscar and Nikita share some money in the ratio 8 : 5

Oscar has £27 **more** than Nikita.

How much do they have altogether?

[3 marks]

8 - 5 = 3

3 parts = £27

÷3 ÷3

1 part = £9

Oscar = 8 x 9 = £72

Nikita = 5 x 9 = £45 +

£117

Answer £ 117

13 c and d are **consecutive cube numbers**, where $c < 4.5^3 < d$

Work out the value of $d - c$

[2 marks]

$C = 4^3$ $d = 5^3$

$C = 64$ $d = 125$

$d - c = 125 - 64$

125
− 64
61

Answer 61

Do not write outside the box

14 (a) Complete the table of values for $y = 2^x$

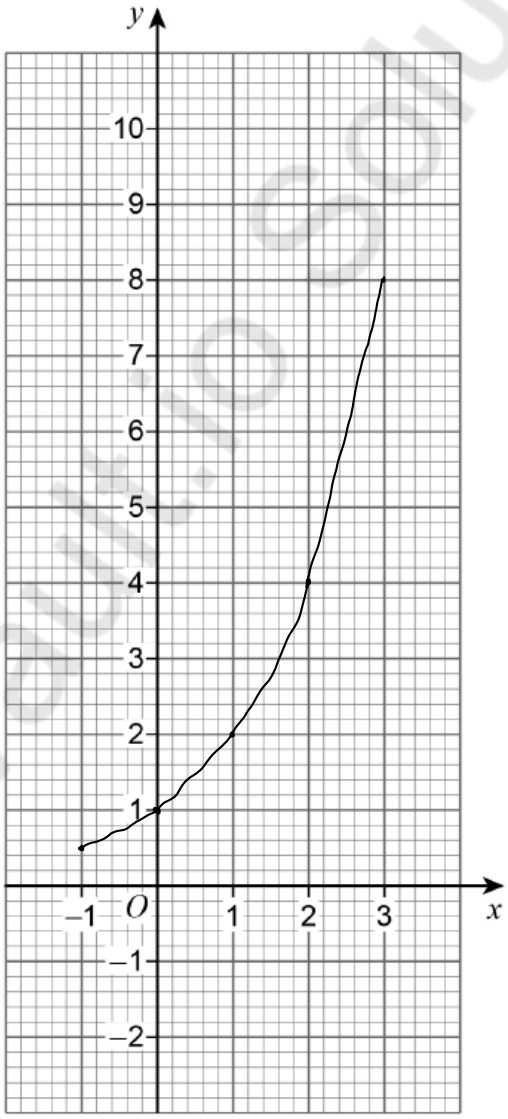
At $x = -1$
$y = 2^{-1} = \frac{1}{2}$

[2 marks]

x	–1	0	1	2	3
y	0.5	1	2	4	8

14 (b) Draw the graph of $y = 2^x$ for values of x from –1 to 3

[2 marks]



9

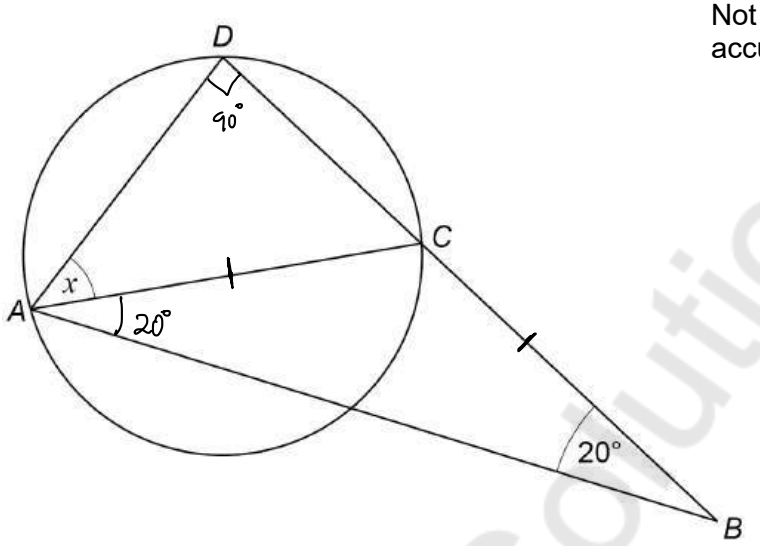
Do not write outside the box

15 *A*, *C* and *D* are points on a circle, diameter *AC*.

ABC is an isosceles triangle with *AC* = *BC*

BCD is a straight line.

Not drawn accurately



Work out the size of angle x.

[4 marks]

$A\hat{D}C = 90^\circ$ (Angle in a semicircle is 90°)

$B\hat{A}C = 20^\circ$ (Base angles in isosceles triangle are equal)

$180^\circ = 20 + 90 + x + 20$ (Sum of angles in a triangle = 180°)

$180 = 130 + x$

$-130 \quad -130$

$50 = x$

$x =$ 50 °

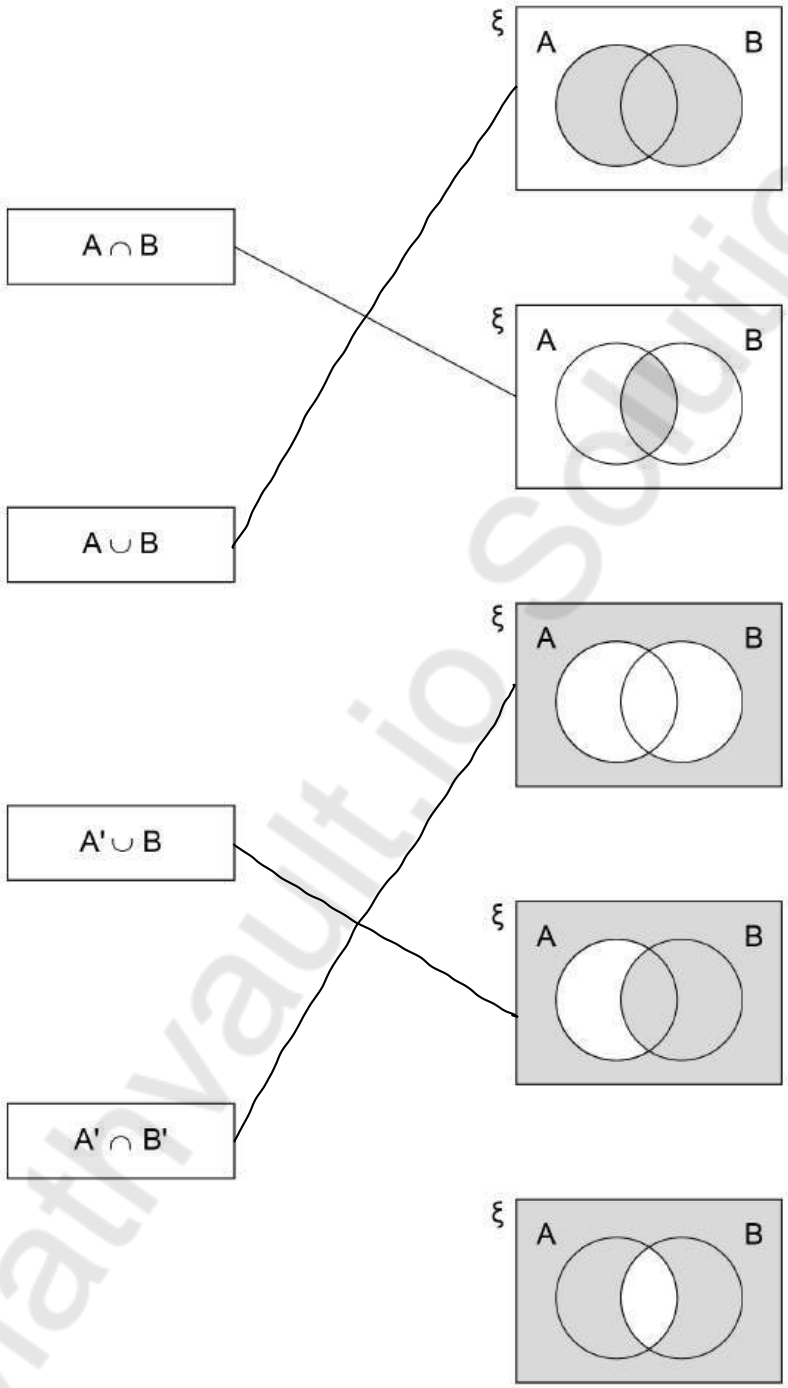
Do not write outside the box

16 A and B are two events.

Match each box on the left to the correct **shaded** area on the Venn diagrams.

One has been done for you.

[3 marks]



7

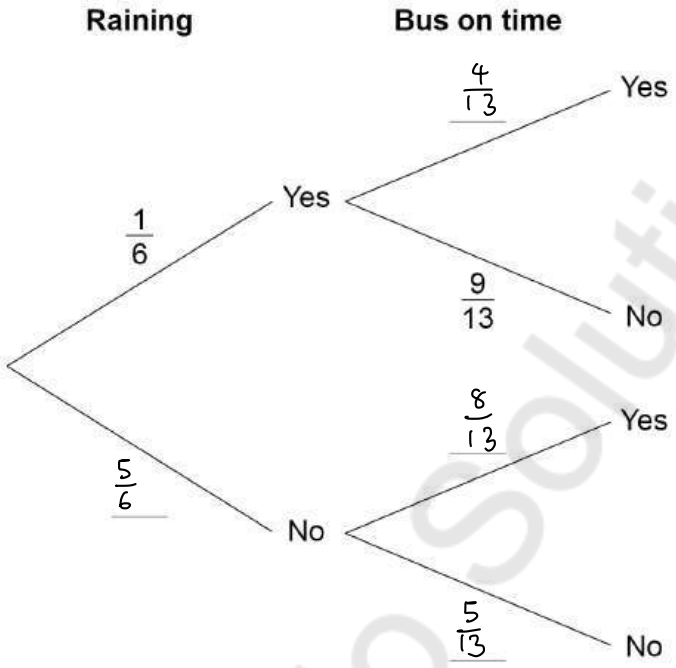
Do not write outside the box

17 A bus is due to arrive at a bus stop at 1 pm

The probability that the bus is on time is **halved** when it is raining.

17 (a) Complete the tree diagram.

[2 marks]



$1 - \frac{9}{13} = \frac{13}{13} - \frac{9}{13}$

$\frac{4}{13}$

$\frac{4}{13} \times 2 = \frac{8}{13}$

$1 - \frac{8}{13} = \frac{13}{13} - \frac{8}{13}$

$\frac{5}{13}$

17 (b) Work out the probability that at 1 pm it is raining and the bus is **not** on time.

[2 marks]

$P(\text{Rain and Not ontime}) = \frac{1}{6} \times \frac{9}{13} = \frac{9}{78}$

$13 \times 6 = 78$

Answer $\frac{9}{78}$

Do not write outside the box

18 Show that $\dfrac{\sin 30° \times \cos 45°}{\tan 60°}$ can be written in the form $\dfrac{\sqrt{a}}{b}$

where a and b are integers.

[3 marks]

$\sin 30 = \frac{1}{2}$ $\quad \cos 45 = \frac{1}{\sqrt{2}}$

$\tan 60 = \sqrt{3}$

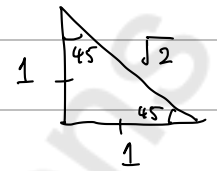
$$\frac{\frac{1}{2} \times \frac{1}{\sqrt{2}}}{\sqrt{3}}$$

$$\frac{1}{2\sqrt{2}} \div \sqrt{3}$$

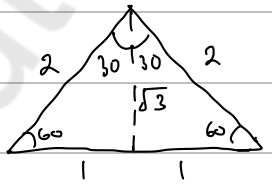
$$\frac{1}{2\sqrt{2}} \times \frac{1}{\sqrt{3}}$$

$$\frac{1}{2\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}}$$

$$\frac{\sqrt{6}}{12}$$



$\cos 45 = \frac{1}{\sqrt{2}}$



$\tan 60 = \frac{\sqrt{3}}{1}$

Turn over for the next question

7

Do not write outside the box

19 (a) Work out the value of $\left(\frac{9}{16}\right)^{-\frac{3}{2}}$

[3 marks]

$\left(\frac{16}{9}\right)^{3/2}$

$\left(\frac{\sqrt{16}}{\sqrt{9}}\right)^{3}$

$\left(\frac{4}{3}\right)^{3} = \frac{64}{27}$

Answer $\frac{64}{27}$

19 (b) $\sqrt{125} = 5^n$

Work out the value of n.

[2 marks]

$125^{1/2} = 5^n$

$(5^3)^{1/2} = 5^n$

$5^{3 \times 1/2} = 5^n$

$5^{3/2} = 5^n$, $3/2 = n$

$n =$ $3/2$

Do not write outside the box

20 Express $\sqrt{44} + \sqrt{99} + \sqrt{275}$ in the form $a\sqrt{n}$ where a and n are integers.

[3 marks]

$\sqrt{4 \times 11} + \sqrt{9 \times 11} + \sqrt{25 \times 11}$

$\sqrt{4} \times \sqrt{11} + \sqrt{9} \times \sqrt{11} + \sqrt{25} \times \sqrt{11}$

$2\sqrt{11} + 3\sqrt{11} + 5\sqrt{11}$

$10\sqrt{11}$

$25 \overline{)275}$ → 11

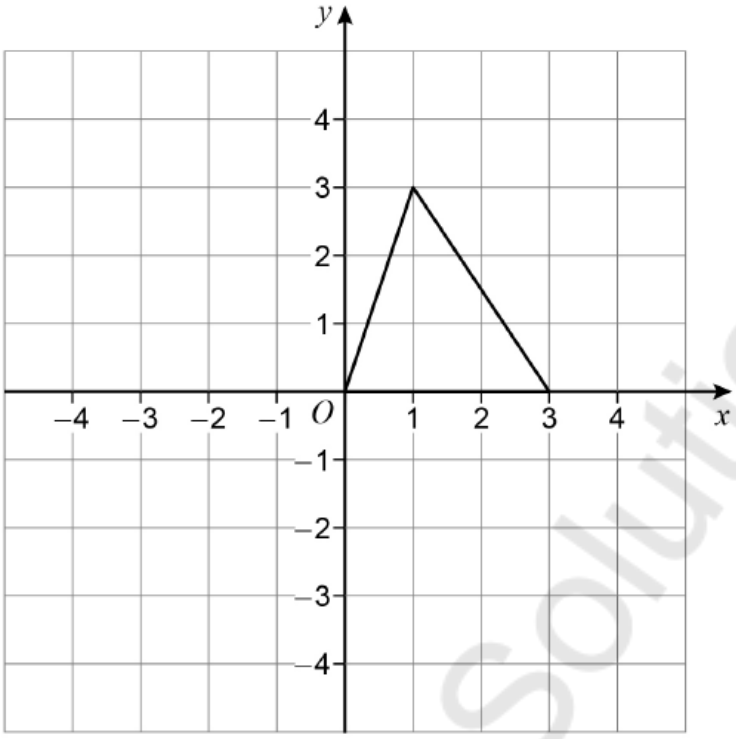
Answer $10\sqrt{11}$

Turn over for the next question

8

Do not write outside the box

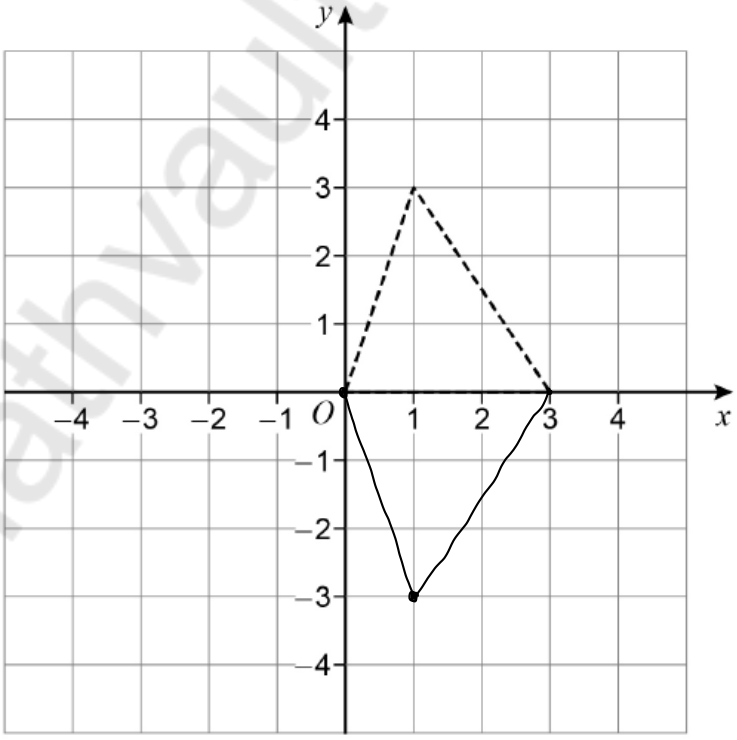
21 The graph of $y = f(x)$ for $0 \leqslant x \leqslant 3$ is shown.



21 (a) On the grid below, draw the graph of $y = -f(x)$ for $0 \leqslant x \leqslant 3$

The graph of $y = f(x)$ is shown to help you.

[1 mark]

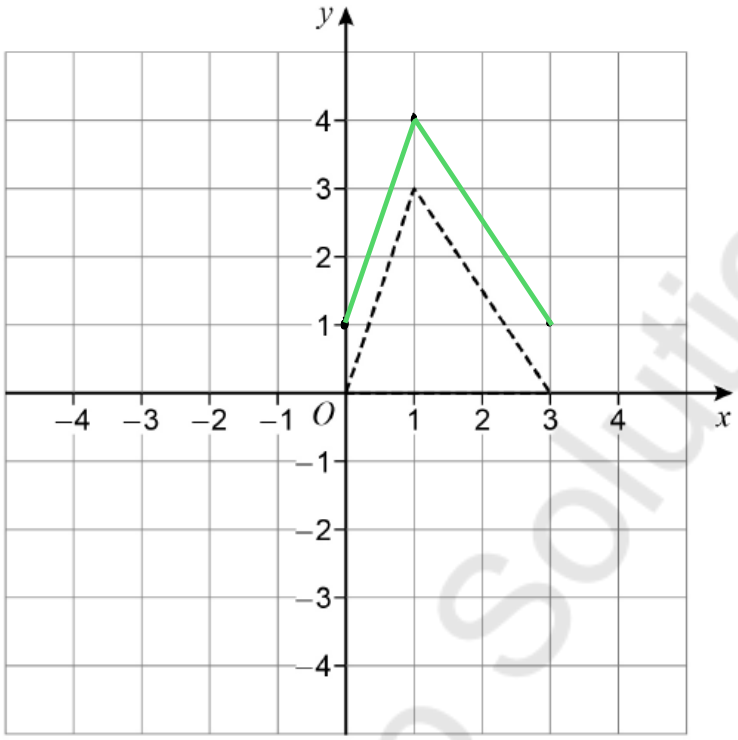


Do not write outside the box

21 (b) On the grid below, draw the graph of $y = f(x) + 1$ for $0 \leqslant x \leqslant 3$

The graph of $y = f(x)$ is shown to help you.

[1 mark]

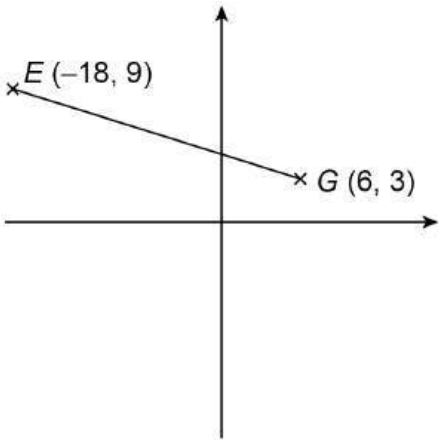


Turn over for the next question

2

Do not write outside the box

22 Here is a sketch of straight line EG.



F is a point on EG such that $EF = \frac{1}{3}EG$

Work out the coordinates of F.

[3 marks]

$EG_x = 6 - (-18) = 6 + 18 = 24$

$EG_y = 9 - 3 = 6$

$EF_x = \frac{1}{3} \times 24 = 8$

$EF_y = \frac{1}{3} \times 6 = 2$

$F(-18 + 8, 9 - 2)$

$F(-10, 7)$

Answer (−10 , 7)

Do not write outside the box

23 (a) Write $x^2 + 12x + 50$ in the form $(x + a)^2 + b$ where a and b are integers.

[2 marks]

$(x+6)^2 - 36 + 50$

$(x+6)^2 + 14$

$(x+6)^2 = x^2 + 12x + 36$

$-36 \quad -36$

$(x+6)^2 - 36 = x^2 + 12x$

$50 - 36 = 14$

Answer $(x+6)^2 + 14$

23 (b) A curve has the equation $y = (x - 3)^2 - 8$

Write down the coordinates of the turning point of the curve.

[2 marks]

Answer (3 , −8)

Turn over for the next question

7

Do not write outside the box

24 Prove that $\frac{60x^4 - 15x^2}{-2x - 1} \times \frac{1}{6x - 3}$ can never be positive.

[4 marks]

$$\frac{15x^2[4x^2 - 1]}{-1(2x + 1)} \times \frac{1}{3(2x - 1)}$$

$$\frac{15x^2(2x+1)(2x-1)}{-1(2x+1) \times 3(2x-1)}$$

$$\frac{15x^2}{-3}$$

$$-5x^2$$

x^2 is multiplied by -5 thus can never be positive

Do not write outside the box

25 There are n counters in a box.

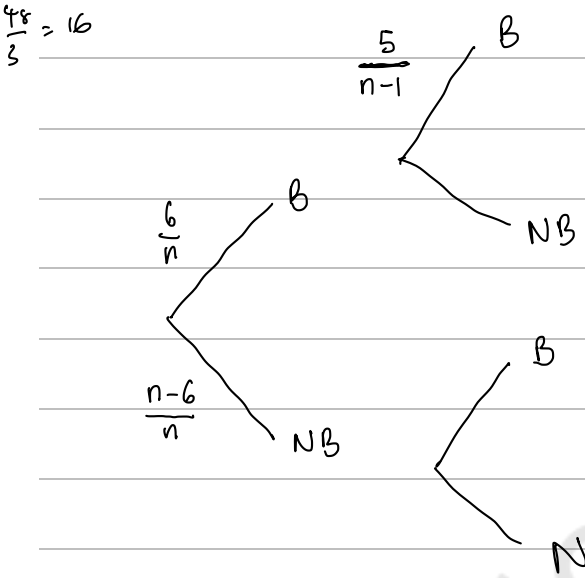
6 of the counters are black.

Two counters are chosen at random without replacement.

The probability that **both** counters are black is $\frac{1}{8}$

Use an algebraic method to work out the value of n.

[5 marks]



$P(B,B) = \frac{6}{n} \times \frac{5}{n-1} = \frac{1}{8}$

$\frac{30}{n(n-1)} = \frac{1}{8}$

$30 \times 8 = n(n-1)$

$240 = n^2 - n$

$0 = n^2 - n - 240$

$0 = n^2 - 16n + 15n - 240$

$0 = n(n-16) + 15(n-16)$

$0 = (n+15)(n-16)$

$n + 15 = 0$ $\quad n - 16 = 0$

$n = -15$ $\quad n = 16$

reject

$n =$ 16

END OF QUESTIONS

9

Do not write outside the box

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

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

Do not write outside the box

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

Do not write outside the box

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

Do not write outside the box

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED