AQA

Practice Paper 1

Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

GCSE Mathematics

H

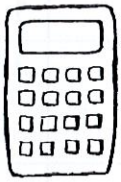
Higher Paper 2 Calculator

Summer 2019 Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:

- a calculator
- mathematical instruments.



Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- 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.
- 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 the answer book.

Advice

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

For Examiner's Use	
Pages	Mark
3	
4 - 5	
6 – 7	
8 – 9	
10 – 11	
12 – 13	
14 – 15	
16 – 17	
18 – 19	
20 – 21	
22 – 23	
24 – 25	
26 – 27	
TOTAL	

Teacher	Class

8300/MissB/2H

Practice Paper Overview

Q	Topic	Mark	Total
1	Resultant Vectors	1	
2	Midpoint	1	
3	Equation of a Line	1	
4	Bearing	1	
5	Inequalities	2	
6	Error Interval	2	
7	Direct Proportion	3	
8	Mean from a Table	4	
9	Expanding Triple Brackets	3	
10	Algebraic Ratio	3	
11	Draw Box Plot (from list of data)	5	
12	Compound Interest & Successive Percentage Change	5	
13	Proportional Reasoning	3	
14	Product Rule of Counting	1	
15	Speed, Distance Time	4	
16	Trigonometry	5	
17	Form and Solve Equations	4	
18	Interpret Histogram	4	
19	Circle Theorem	1	
20	Equation of a Circle	1	
21	Functions	6	
22	Venn Diagram	1	
23	Quadratic Sequence	3	
24	Area Underneath a Curve	4	
25	Iteration	6	
26	Invariance	2	
27	Transformation Graphs	4	
	Total		**80**

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

Do not write outside the box

1 Work out **[1 mark]**

$$\begin{pmatrix}-5\\4\end{pmatrix}-\begin{pmatrix}-7\\4\end{pmatrix}$$

Circle your answer.

$\begin{pmatrix}-13\\4\end{pmatrix}$ $\begin{pmatrix}-13\\0\end{pmatrix}$ $\begin{pmatrix}2\\0\end{pmatrix}$ $\begin{pmatrix}2\\4\end{pmatrix}$ $\begin{pmatrix}13\\0\end{pmatrix}$

2 P is $(6, 7)$ and Q is $(-4, 1)$

Circle the midpoint of PQ. **[1 mark]**

x) $\frac{6+-4}{2} = 1$

y) $\frac{7+1}{2} = 4$

$(5, 4)$ $(1, 4)$ $(-2, 6)$ $(2, 8)$

3 Circle the equation of a straight line which is parallel to **[1 mark]**

$$5y + 10x - 25 = 0$$

$5y = 25 - 10x$

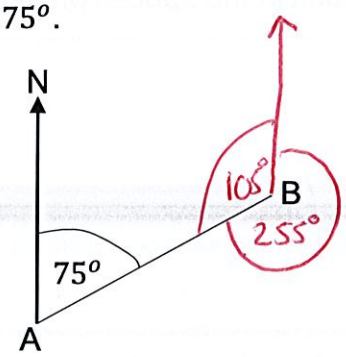
$y = 5 - 2x$

$y = 2x + 9$ $2x = 20 - y$ $2y = 12 - x$ $y = \frac{x}{2} - 10$

$y = 20 - 2x$ $y = 12 - \frac{3x}{2}$

3

4 The bearing of B from A is 075^o. **[1 mark]**



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Circle the bearing of A from B.

285^o 105^o 075^o 255^o

5 Solve the inequality

$$7 - \frac{x}{2} \leq 3$$

[2 marks]

Two methods

$-7 \quad -7$

$-\frac{x}{2} \leq -4$ (✓)

$\times -2 \quad \times -2$

$x \geqslant 8$

$7 \leq 3 + \frac{x}{2}$

$-3 \quad -3$

$4 \leq \frac{x}{2}$ (✓)

$8 \leq x$.

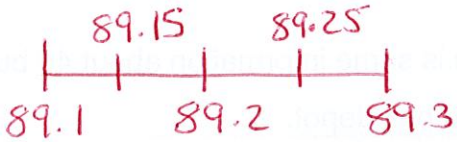
Answer $x \geqslant 8$ or $8 \leq x$ (✓)

Do not write outside the box

6 Sally won a race with a time of 89.2 seconds.

This time, t, is to the nearest tenth of a second.

Complete the error interval due to rounding. **[2 marks]**



$89.15 \leq t < 89.25$ ✓ ✓

7 y is directly proportional to the square of x.

x	6	a
y	9	16

$y \propto x^2$

$y = kx^2$ ✓

Work out the value of a. **[3 marks]**

$x = 6$ when $y = 9$

$9 = k(6^2)$

$9 = 36k$

$\frac{9}{36} = k$

$\frac{1}{4} = k$

$y = \frac{x^2}{4}$

what is x when $y = 16$

$16 = \frac{x^2}{4}$

$64 = x^2$

$\sqrt{64} = x$

$a =$ 8 ✓

5

Do not write outside the box

8 Here is some information about 40 buses arriving back at the bus depot.

Number of minutes late, t	Number of buses	Midpoint	fx
$0 \leq t < 5$	8	2.5	20
$5 \leq t < 15$	11	10	110
$15 \leq t < 20$	15	17.5	262.5
$20 \leq t < 30$	6	25	150
~~$t \geq 30$~~	~~0~~		
	40		542.5 ✓ (Total fx)

(✓ one value fx)

8 (a) Work out an estimate of the mean number of minutes late.

[3 marks]

$\frac{542.5}{40} = 13.56$

Answer 13.56 minutes late. ✓

accept [13.6 ~~to~~ 14]

3

Do not write outside the box

8 (b) The depot manager scrutinises the information in more detail.

Number of minutes late, t	Number of buses
$0 \leq t < 5$	8
$5 \leq t < 10$	0
$10 \leq t < 15$	11
$15 \leq t < 20$	15
$20 \leq t < 25$	1
$25 \leq t < 30$	5
$t \geq 30$	0

was 5-15 now all in 10-15. So higher than midpoint

$20 \leq t < 30$ mp 25 ← most people higher than mp.

She works out an estimate of the mean using this information.

How does her estimate compare with the answer to part (a)?

Tick **one** box.

[1 mark]

- ☐ Lower than part (a)
- ☐ Same as part (a)
- ☑ Higher than part (a)
- ☐ Not possible to tell

1

Do not write outside the box

9 Expand and simplify

$$(2x+3)^2(x-1)$$

[3 marks]

$(2x+3)(2x+3)(x-1)$

	$2x$	$+3$
$2x$	$4x^2$	$+6x$
$+3$	$+6x$	$+9$

✓ (Any two brackets expanded)

$(4x^2+12x+9)(x-1)$ ✓

	$4x^2$	$+12x$	$+9$
x	$4x^3$	$+12x^2$	$+9x$
-1	$-4x^2$	$-12x$	-9

✓

Answer $4x^3+8x^2-3x-9$

3

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10 The ratio of $x : y = 3 : 2$

$x : y$ $\quad \frac{x}{y} = \frac{3}{2}$

$3 : 2$

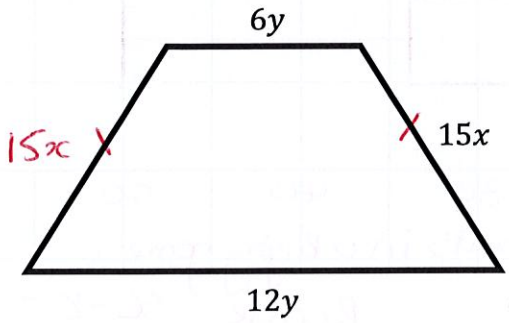
$2x = 3y$

10 (a) Circle the correct statement. **[1 mark]**

x is $\frac{3}{5}$ of y $\quad$ x is $\frac{2}{5}$ of y $\quad$ x is $\frac{3}{2}$ of y $\quad$ x is $\frac{2}{3}$ of y Change to fit Part (b)

y is $\frac{3}{5}$ of x $\quad$ y is $\frac{2}{5}x$ $\quad$ y is $\frac{3}{2}$ of x $\quad$ y is $\frac{2}{3}$ of x

10 (b) Here is an isosceles trapezium.



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$y = \frac{2}{3}x$.

Using your answer to part (a).

Write an expression for the perimeter in terms of x. **[2 marks]**

$P = 30x + 18y$ ✓ (Expression for perimeter)

$= 30x + 18(\frac{2}{3}x)$

$= 30x + 12x$

$= 42x$.

✓

Answer $42x$

3

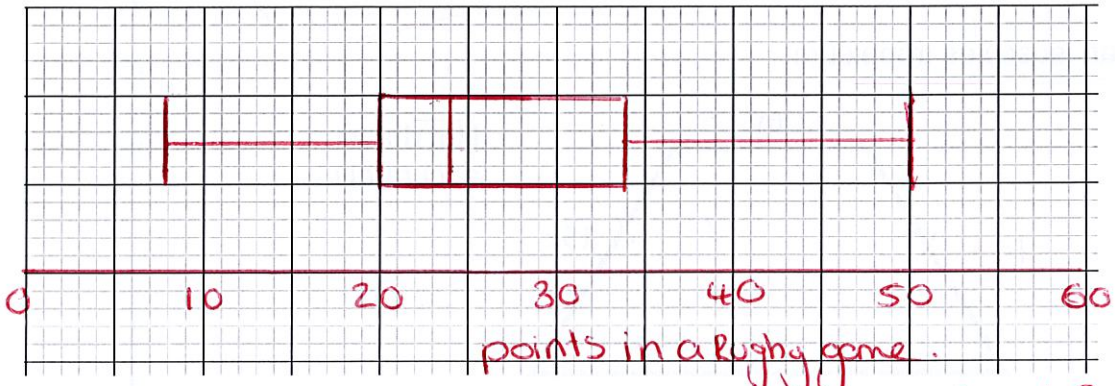
Do not write outside the box

11 The Glasgow Warriors played 15 games of rugby.

Here are the points they scored in each game.

Min →	8	9	10	(20) LQ	21	22	23	(24) ← median ✓ median.
	30	33	34	(34) UQ	35	43	50 ← max	✓ Drawn ✓ Scale

11 (a) Draw a box plot for this information. **[3 marks]**



Glasgow Warriors: median = 24 IQR = 34 − 20 = 14 Range: 50 − 8 = 42

Edinburgh Rugby plays against the same 15 teams in the league.

- The median number of points Edinburgh Rugby scored is 18.
- The interquartile range of these points is 14.
- The range of these points is 31.

11 (b) Which team is more consistent at scoring points, the Glasgow Warriors or Edinburgh Rugby?

You must give a reason for your answer. **[2 mark]**

- IQR's are both the same therefore both teams are as consistent as each other

or

- Range: Endinburgh has a lower range by 11 points Therefore they are more consistent.

5

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12 Here are the interest rates for two accounts.

Account A	Account B
Interest: 3% for the first year 1.03 1.5% for the second year 1.015 0.75% for the third year 1.0075	Interest: 1.8% per year compound interest. 1.018
Withdrawals allowed at any time.	No withdrawals allowed until the end of three years.

Headar has £10 000 he wants to invest.

12 (a) Calculate which account would give him the most money if he invests his money for 3 years. **[4 marks]**

Accant A.

$10000 \times 1.03 \times 1.015 \times 1.0075$

$= £10532.91$

Accant B

$10000 \times (1.018)^3$

$= £10549.78$

Answer Accant B

12 (b) Explain why he might not want to use Account B. **[1 mark]**

He might need to access and withdraw money in the three years. He can't do that in accant B.

5

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13 It takes 5 men 12 hours to build a wall.

13 (a) How long would it take 8 men to build the wall? **[2 marks]**

5 × 12 = 60 hours of work. ✓

60 ÷ 8 = 7.5 hours.

Answer 7.5 hours. ✓

13 (b) Comment on an assumption you made in part (a) and the impact this could have on the length of time taken to build the wall. **[1 mark]**

Assumed they all work at the same rate.
Some might work faster, which will mean it will take less time.

or
Some might work slower, which means it will take more time.

14 A menu has a choice of 3 starters, 4 mains and 5 desserts.
How many different choices of 3 course meals are there?
Circle your answer. **[1 mark]**

3 × 4 × 5 = 60

12 31 (60) 120 345

4

Do not write outside the box

15 The distance by road from Middlesbrough to Buxton is 120 miles.

A brass band travel by coach from Middlesbrough to Buxton.

The coach leaves Middlesbrough at 9:45 am

Speed = miles / hour

15 (a) The band assumes the coach will travel at an average speed of 50mph.

Use this assumption to work out the arrival time in Buxton. **[3 marks]**

$S = \frac{d}{t}$ $\quad$ Time $= \frac{d}{S} = \frac{120}{50} = 2.4$ hours ✓

2 hours and 24 mins. (0.4 × 60) ✓

9:45
11:45) 2 hours
12:00) 15 mins) 24
12:09) 9 mins

✓

Answer 12:09 pm.

15 (b) In fact, the coach has a higher average speed.

How does this affect the arrival time? **[1 mark]**

The coach will arrive in Buxton sooner/earlier.

4

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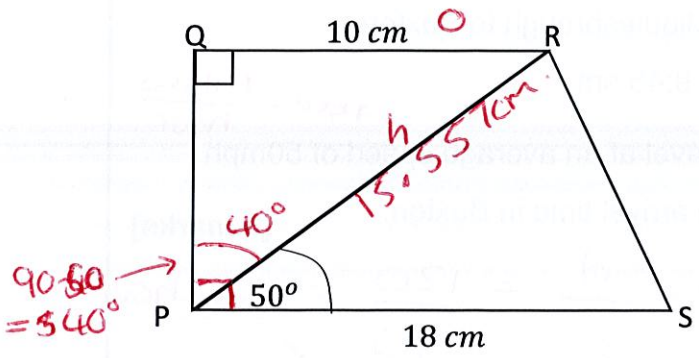
16 Here are two triangles.



Not drawn accurately

Lines PQ and PS are perpendicular to each other. meet at 90°

Work out the length of RS. Correct to 3 significant figures. **[5 marks]**

$\sin(40) = \frac{10}{h}$ (✓)

(✓)

$h = \frac{10}{\sin(40)} = 15.557\text{ cm}$

$a^2 = b^2 + c^2 - 2bc\cos A$ (✓)

$= (15.557)^2 + (18)^2 - 2 \times 15.557 \times 18 \times \cos(50)$

$= 206.027662\ldots$

$a = \sqrt{\text{ans}} = 14.35366$ (✓)

Answer 14.4 cm (✓)

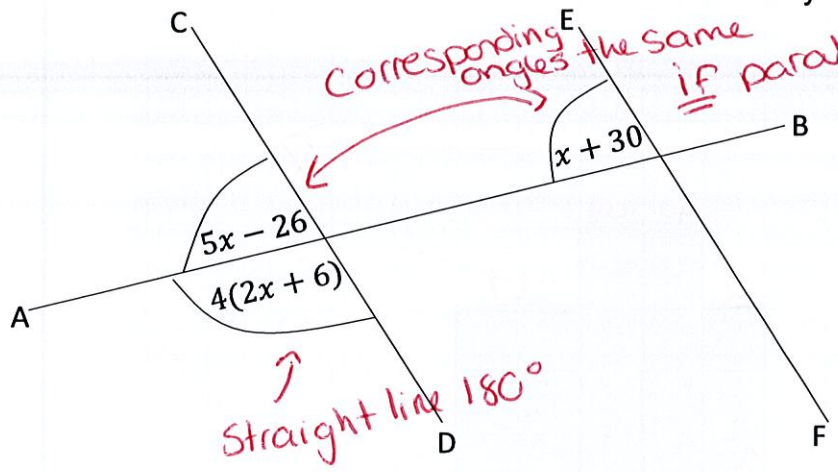
5

Do not write outside the box

17 AB, CD, EF are straight lines.

All angles are in degrees.

Not drawn accurately



Corresponding angles the same if parallel.

Straight line 180°

Show that CD is parallel to EF.

[4 marks]

$5x - 26 + 4(2x + 6) = 180$ ✓

$5x - 26 + 8x + 24 = 180$

$13x - 2 = 180$

$13x = 182$

$x = 14$ ✓

If the lines are parallel.

$5x - 26 = x + 30$ ✓ as they would be corresponding angles

$4x - 26 = 30$

$4x = 56$

$x = 14°$ ✓ So yes parallel

or sub in to show they are both the same when $x = 14$

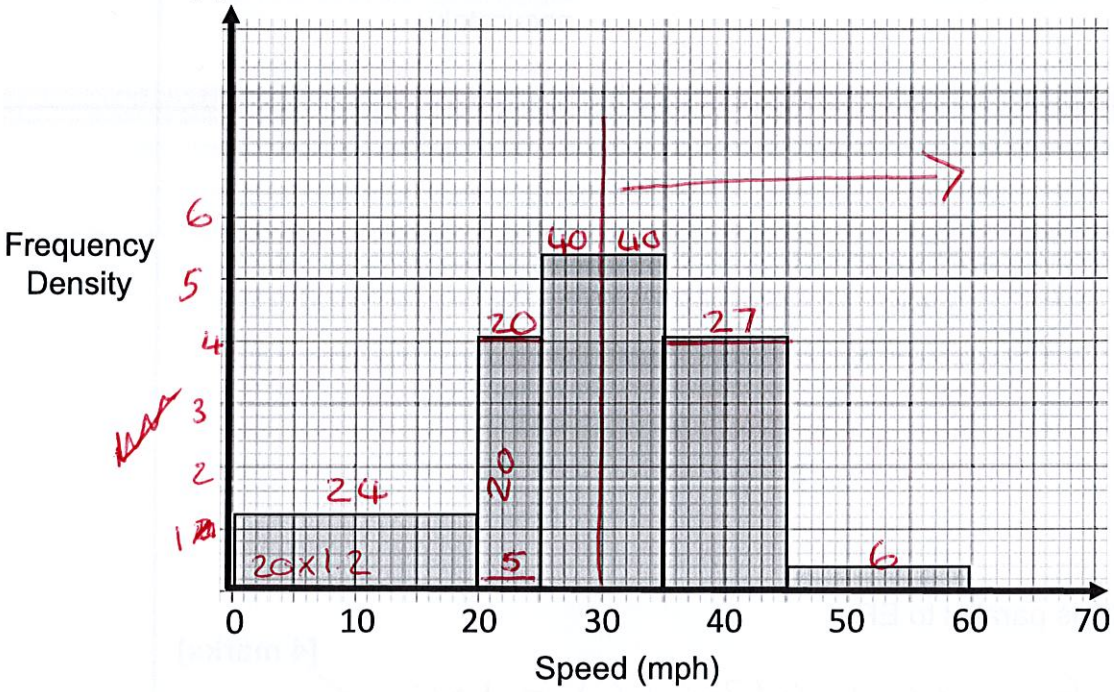
$5(14) - 26 = 44°$

$14 + 30 = 44°$

4

Do not write outside the box

18 The incomplete histogram gives some information about the speed of cars travelling past a school.



On a Monday morning a speed camera van measured the speed of the cars which passed the van.

There were 20 cars measured as travelling in the range $20 \leq speed < 30$.

The speed limit is 30 miles per hour.

Work out the proportion of cars that were caught speeding.

[4 marks]

$5 \times ? = 20$ ✓

$? = \frac{20}{5} = 4$

Total cars = 157

Speeding

30 to 35 → 5 x 5.4 = 27 cars

35 to 45 → 10 x 4 = 40 cars ✓ anyone seen.

45 to 60 → 15 x 0.4 = 6 cars

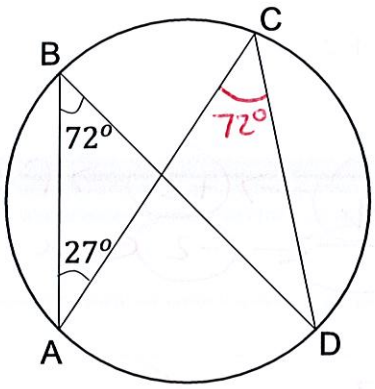
73 cars ✓

Answer 73/157 ✓ or 46.5%

4

Do not write outside the box

19



Not drawn accurately

Circle the size of angle ACD.

[1 mark]

27^o 72^o 81^o 99^o 108^o

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

20 A circle has equation $x^2 + y^2 = 36$

Circle the length of its diameter.

$r^2=36$

$r=\sqrt{36}=6$

$d=6\times 2=12$

[1 mark]

4 6 12 18 36

2

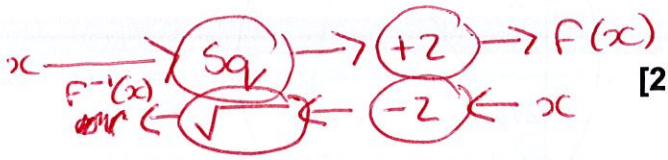
Do not write outside the box

21 For all values of x,

$$f(x) = x^2 + 2$$

$$g(x) = 3 - x$$

21 (a) Find $f^{-1}(x)$ **[2 marks]**



or $x^2 + 2 = y$

$x^2 = y - 2$ ✓

$x = \sqrt{y-2}$.

Answer $y = \sqrt{x-2}$ ✓

21 (b) Solve the equation

sub in here.

$$fg(x) = 18$$

[4 marks]

$f(x) = x^2 + 2$

$fg(x) = f(3-x) = (3-x)^2 + 2$ ✓

$= x^2 - 6x + 9 + 2$

$= x^2 - 6x + 11$

So $x^2 - 6x + 11 = 18$ ✓

$x^2 - 6x - 7 = 0$

$(x+1)(x-7) = 0$ ✓

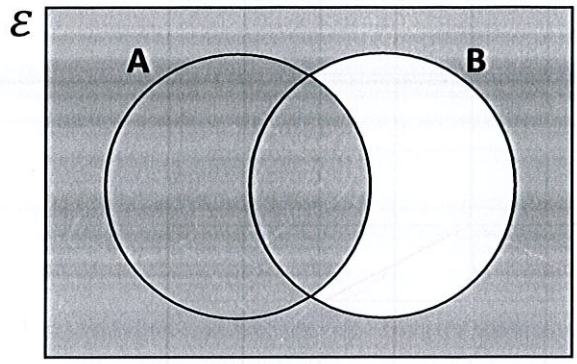
$x = -1 \quad x = 7$ ✓

Answer _____

6

Do not write outside the box

22 Here is a Venn diagram representing the universal set, which includes set A and set B.



Circle the notation which represent the shaded region. **[1 mark]**

$(A \cap B)' \cap A$ $(A \cap B) \cup A$ $A \cap B'$ $A \cup B'$

(AnB)' AnB B' B' A

(AnB)'nA (AnB)UA AnB'

23 Here is a quadratic sequence. $n^2 = 1, 4, 9, 16$

7 20 39 64

The expression for the nth term of this sequence is $pn^2 + qn$.

Find the value of p and the value of q. **[3 marks]**

7 20 39 64

1st diff +13 +19 +25

2nd diff +6 +6

$6n^2 = 3n^2$

2

$3n^2$ 3 12 27 48

7, 20, 39, 64

4 8 12 16

+4 +4 +4

4n

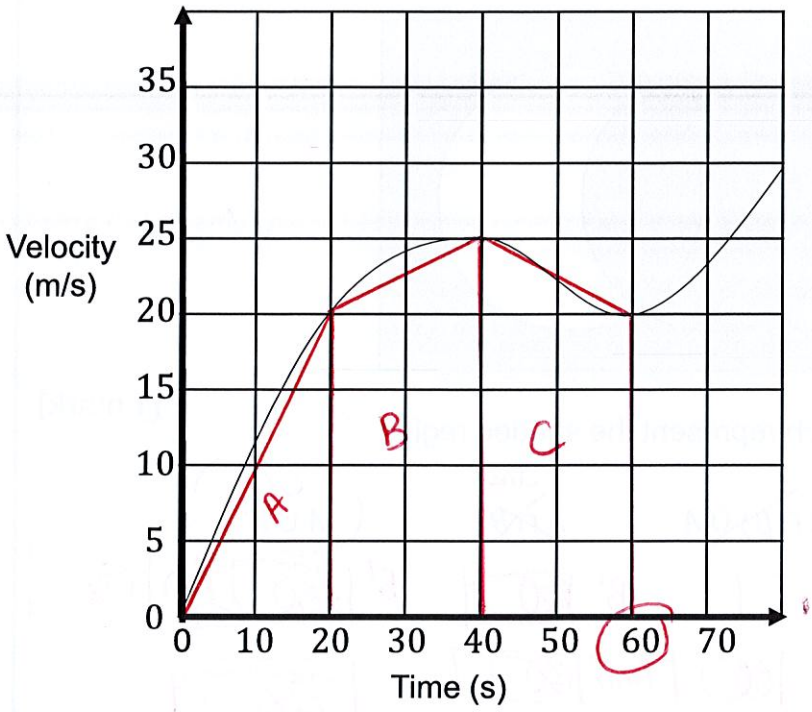
$3n^2 + 4n$

$p =$ 3 $q =$ 4

4

Do not write outside the box

24 Here is a velocity-time graph for a bike journey.



24 (a) Work out an estimate for the total distance travelled in the first 60 seconds. **[3 marks]**

$A = \frac{20 \times 20}{2} = 200m$ ✓ $C = \frac{25 + 20}{2} \times 10$

$B = \frac{20 + 25}{2} \times 10 = 225m$ ✓ $= 225m$

Total $= 200 + 225 + 225$

Answer $= 650\,m$ ✓

24 (b) Is your answer to (a) an underestimate or an overestimate of the actual distance?

Give a reason for your answer.

☑ Underestimate ☐ Overestimate

[1 mark]

Most shapes fall underneath the line of the curve.

4

Do not write outside the box

25 (a) Show that the equation $x^3 + 5x = 10$ has a solution between $x = 1$ and $x = 2$. **[2 marks]**

$f(1) = 1^3 + 5(1) = 6$ too small (4 away from 10)

$f(2) = 2^3 + 5(2) = 18$ too big (8 away from 10)

So solution between 1 & 2.

25 (b) Show that the equation $x^3 + 5x = 10$ can be arranged to give

$$x = \frac{10}{x^2 + 5}$$

[1 mark]

$x(x^2 + 5) = 10$

$x = \frac{10}{x^2 + 5}$

25 (c) Starting with $x_0 = 1$, use the iteration formula $x_n = \frac{10}{x_n^2 + 5}$, to find an estimate for the solution of $x^3 + 5x = 10$ **[3 marks]**

1 = ans $\quad \frac{10}{ans^2 + 5}$

$x_0 = 1$

$x_1 = 1.66666\ldots$

$x_2 = 1.2857\ldots$

$x_3 = 1.50306\ldots$

$x_4 = 1.37756\ldots$

$x_5 = 1.4497\ldots$

$x_6 = 1.4080\ldots$

$x_7 = 1.4321\ldots$

$x_8 = 1.4182\ldots$

$x_9 = 1.4262\ldots$

$x_{10} = 1.4216\ldots$

$x_{11} = 1.42429\ldots$

$x_{12} = 1.42275$

$x_{13} = 1.4236$

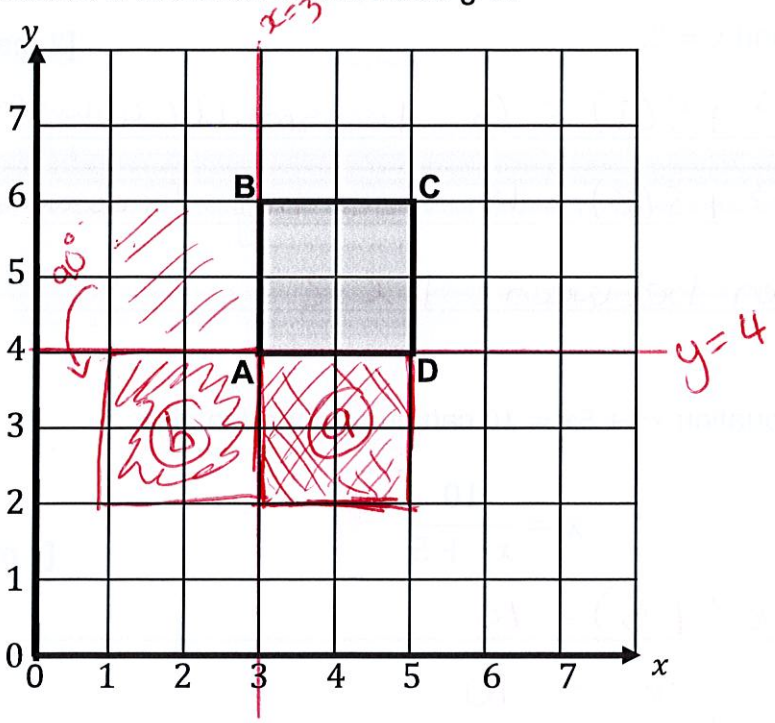
$x_{14} = 1.4231\ldots$

Answer $x = 1.42$

6

Do not write outside the box

26 A square ABCD is drawn on a centimetre grid.



26 (a) ABCD is reflected in the line $y = 4$ and

Circle the number of invariant points.

[1 mark]

0 1 2 3 4

26 (b) ABCD is reflected in the line $x = 3$ and

then rotated 90^o anti-clockwise from the centre $(3,4)$.

Circle the number of invariant points.

[1 mark]

0 1 2 3 4

2

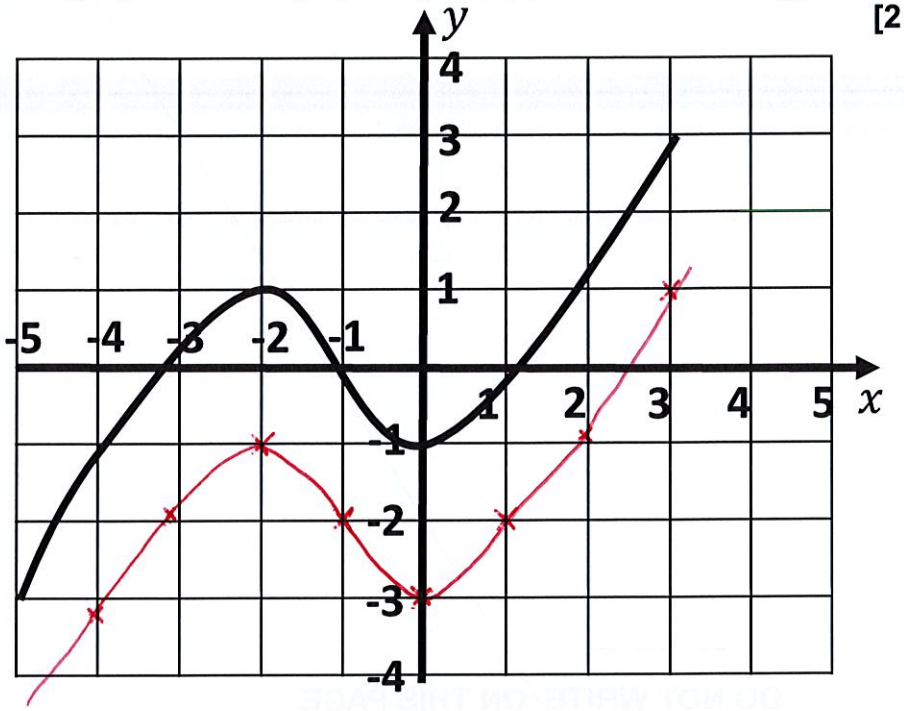
Do not write outside the box

27 (a) The graph of $y = f(x)$ is shown on the grids.

On this grid, sketch the graph of $y = f(x) - 2$

y ↓ 2

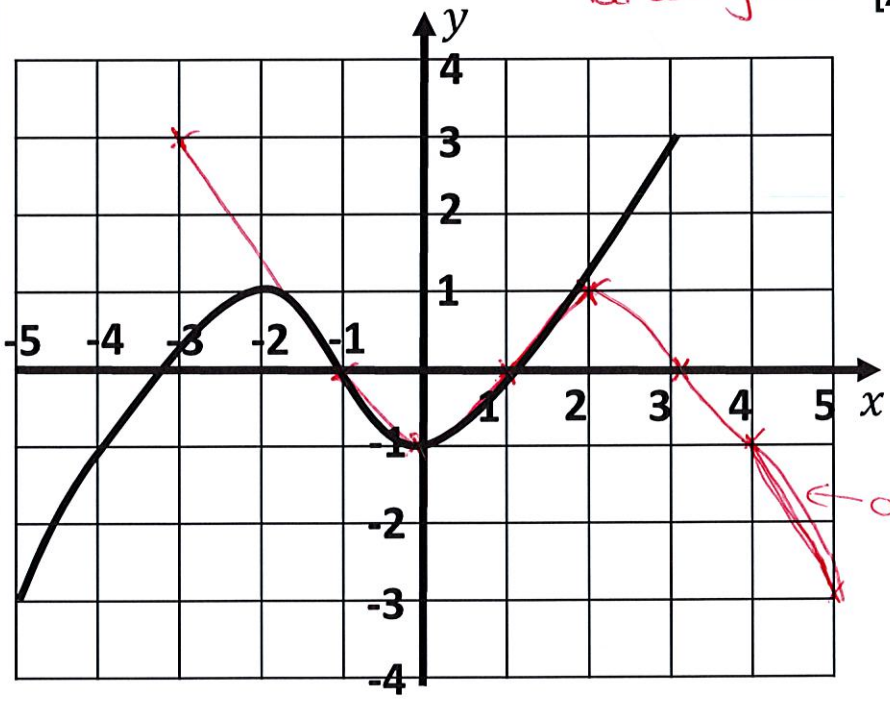
[2 marks]



27 (b) On this grid, sketch the graph of $y = f(-x)$

all x-coordinates change sign.
Reflect y axis

[2 marks]



← don't do a sketchy line.

End of Questions

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4

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ANSWER IN THE SPACES PROVIDED