Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

GCSE MATHEMATICS

H

Higher Tier Paper 3 Calculator

Monday 11 November 2019 Afternoon 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.
- 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.
- 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	

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Answer **all** questions in the spaces provided

1 Circle the relative frequency that represents 13 successes out of 50 trials.

[1 mark]

0.13 26 13 : 50 0.26

2 The equation of a straight line is $2y = 3x + 5$

Circle the gradient of the line.

[1 mark]

$\frac{2}{3}$ $\frac{3}{2}$ 3 5

3 $(2x - 4)(3x + 5)$ is expanded and simplified.

Circle the term which is part of the answer.

[1 mark]

$2x$ $-2x$ $22x$ $-22x$

Do not write outside the box

4 When rounded to 3 significant figures, $x = 6.37$

Circle the correct error interval.

[1 mark]

$6.365 \leqslant x < 6.375$ $6.36 \leqslant x < 6.38$

$6.369 \leqslant x < 6.379$ $6.365 \leqslant x < 6.3749$

5 Solve the simultaneous equations

$7x + 2y = 36$

$3x + 2y = 16$

[3 marks]

$x =$ _____ $y =$ _____

7

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6 (a) Tom is tiling a wall.

He needs to buy at least 100 tiles.

The tiles are sold in large packs and small packs.

Large pack	40 tiles	£18
Small pack	28 tiles	£14

Special offer

25% reduction when you buy 3 or more **large** packs

Work out the cheapest cost for Tom to buy the packs of tiles he needs.

[3 marks]

Answer £ _____

Do not write outside the box

6 (b) Tom is also tiling a floor.

The floor is a rectangle with length 600 cm and width 240 cm

Each tile is a square with side 40 cm

Tom uses this method to work out the number of tiles he needs.

Number of tiles that will fit along the length	=	600 ÷ 40
	=	15
Number of tiles that will fit along the width	=	240 ÷ 40
	=	6
Total number of tiles needed	=	15 + 6
	=	21

Give a reason why Tom's method is wrong.

[1 mark]

Turn over for the next question

4

Do not write outside the box

7 An equilateral triangle has side length 16 metres.

Using ruler and compasses only, construct a scale drawing of the triangle.

Use the scale 1 centimetre represents 2 metres.

[3 marks]

Scale: 1 cm represents 2 m

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8 In a choir there are 35 men and 48 women.

The probability that a man chosen at random wears glasses is $\frac{2}{5}$

The probability that a woman chosen at random wears glasses is $\frac{3}{8}$

8 (a) Work out the number of people in the choir who wear glasses.

[3 marks]

Answer _____

8 (b) A person is chosen at random from the choir.

Work out the probability that the person does **not** wear glasses.

[2 marks]

Answer _____

8

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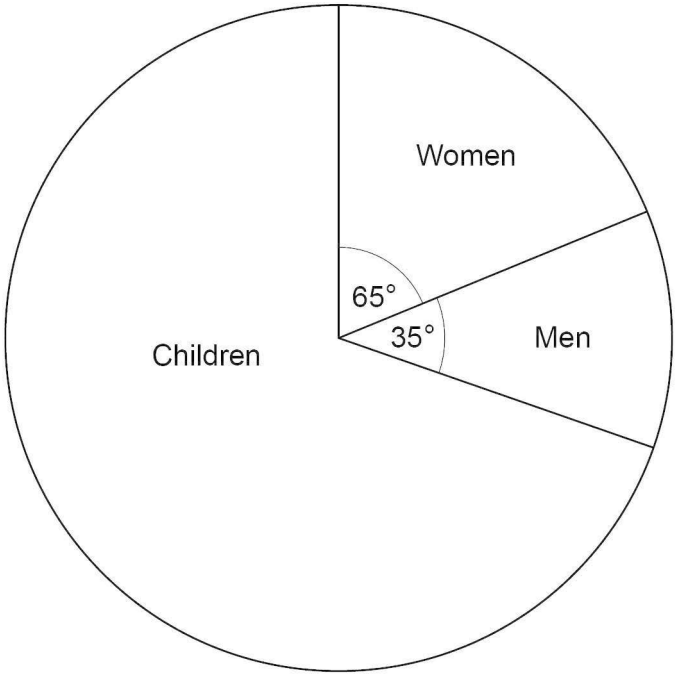
9 The pie chart shows information about people at a theme park.



There were 450 **more** women than men.

Work out the number of children.

[3 marks]

Answer _____

Do not write outside the box

10 Density $= \dfrac{\text{mass}}{\text{volume}}$

The mass is divided by 2 and the volume is multiplied by 4

What happens to the density?

Circle your answer.

[1 mark]

$\times 2$ $\div 2$ $\times 8$ $\div 8$

11 Work out

cube root of 512 : reciprocal of 0.4

Give your answer in the form $n : 1$

[3 marks]

Answer _____ : _____

Turn over for the next question

7

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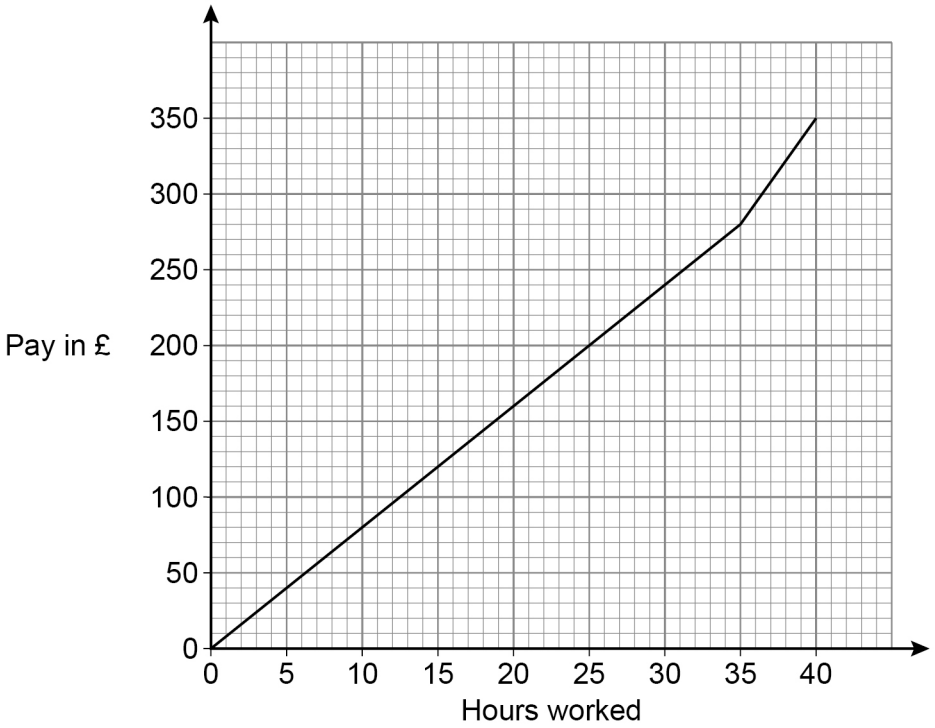
12 The graph shows how much Molly is paid for working for up to 40 hours.

She receives

a basic rate of pay for the first 35 hours worked

a higher rate of pay for the next 5 hours worked.



Work out the difference between the higher rate of pay and the basic rate of pay.

Give your answer in £ per hour.

[3 marks]

Answer £_____ per hour

Do not write outside the box

13 Naga states a hypothesis.

"Most people read more than 100 books a year."

She asks a sample of five people in a book club how many books they read last month.
The table shows the results.

	Lynn	**Ali**	**Paul**	**Chen**	**Ruth**
Number of books	10	11	8	10	13

13 (a) Show how Naga could use the data to support her hypothesis.

[2 marks]

13 (b) Give two reasons why this sample should **not** be used to support her hypothesis.

[2 marks]

Reason 1

Reason 2

7

Turn over ►

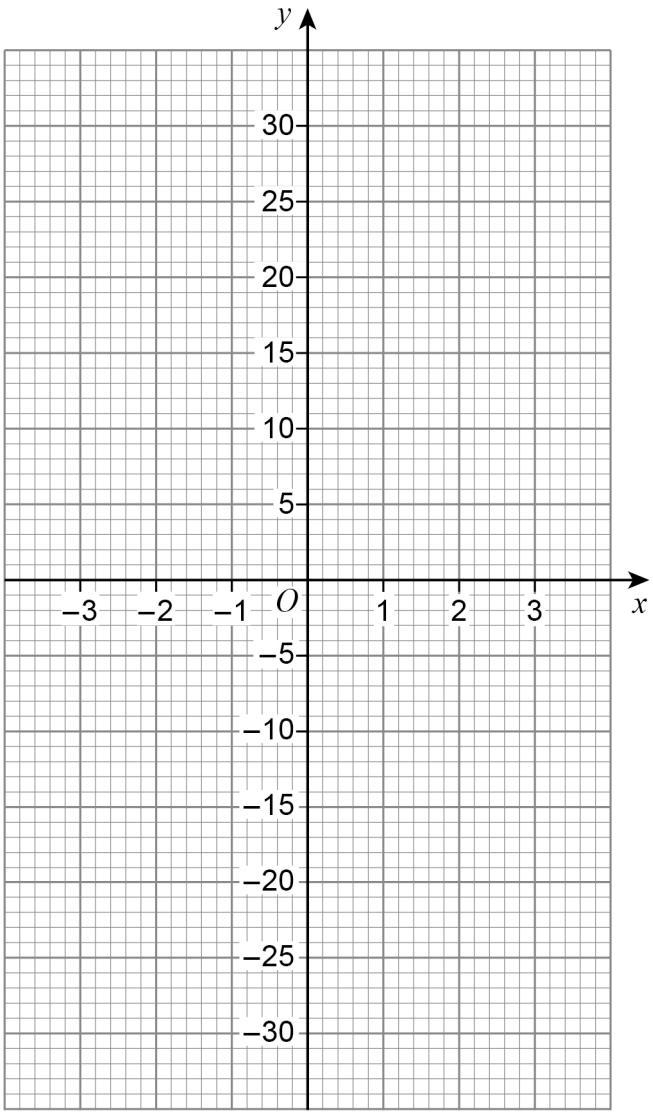
Do not write outside the box

14 A graph has equation $y = x^3 + a$ where a is an integer.

The graph passes through the point (3, 29)

Draw the graph for values of x from –3 to 3

[3 marks]



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15 When you earn money you pay income tax.

The amount you pay depends on how much you earn that year.

You pay

0%	on the first	£12 500 you earn
20%	on the next	£37 500 you earn
40%	on the next	£112 500 you earn.

One year, Kim paid £9260 income tax.

Work out how much she earned that year.

[4 marks]

Answer £_____

7

Turn over ►

Do not write outside the box

16 A building company employs

2 labourers

14 joiners

9 electricians

8 plumbers.

For a job, the company needs one of each type of worker.

16 (a) In how many ways can the company choose the four workers?

[2 marks]

Answer _____

16 (b) One labourer and two plumbers are on holiday.

In how many ways can the company now choose the four workers?

[2 marks]

Answer _____

Do not write outside the box

17 $f(x) = 3x^2 - 4x + 8$ for all values of x

Jenny says,

"f(10) must equal 2 × f(5), because 10 is 2 × 5"

Is Jenny correct?

Show working to support your answer.

[2 marks]

18 Work out the **two** roots of $(7x + 1)(2x - 3) = 0$

Circle **both** roots.

[1 mark]

$-\frac{1}{7}$ $\frac{1}{7}$ $-\frac{3}{2}$ $\frac{3}{2}$

7

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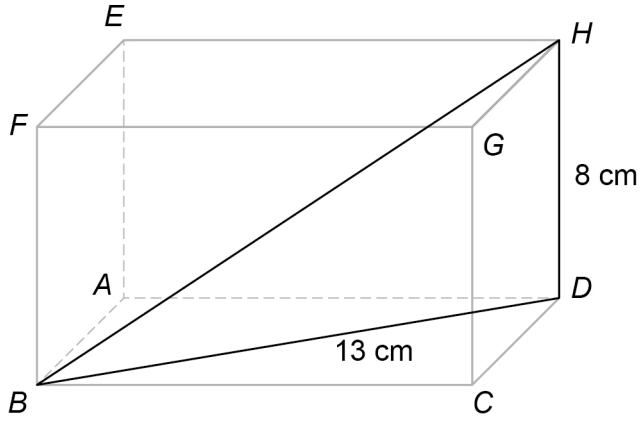
19 Here is a cuboid.

$DH = 8$ cm

$DB = 13$ cm



19 (a) Work out the size of angle *DBH*.

[2 marks]

Answer _____ degrees

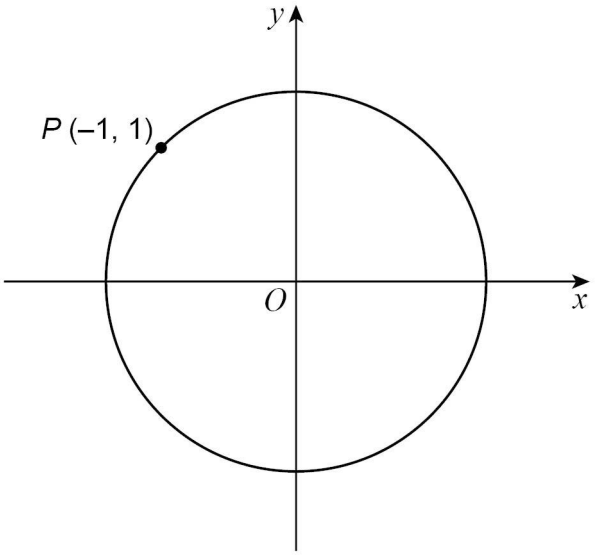
19 (b) Using your answer to part (a), work out the size of angle *ECG*.

[1 mark]

Answer _____ degrees

Do not write outside the box

20 P (–1, 1) is a point on the circle, centre O, radius r.



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Work out the value of r.

Circle your answer.

[1 mark]

1 2 $\sqrt{2}$ $2\sqrt{2}$

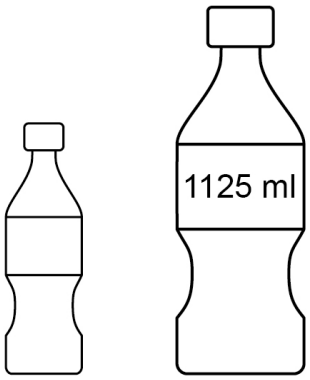
4

Turn over ►

Do not write outside the box

21 Juice is sold in small bottles and large bottles.

The volume of the large bottle is 1125 ml.



volume of small bottle : volume of large bottle = 2 : 5

A café has small glasses and large glasses.

volume of small glass : volume of large glass = 4 : 7

A small bottle fills 6 small glasses with no juice left over.

How many large glasses can be filled by a large bottle?

You **must** show your working.

[4 marks]

Answer _____

Do not write outside the box

22 The **only** solution to $x^2 + bx + c = 0$ is $x = 5$

Work out the values of b and c.

[2 marks]

$b =$ _____ $c =$ _____

23 $x : y = \frac{1}{4} : \frac{2}{3}$

What is x as a fraction of y?

Circle your answer.

[1 mark]

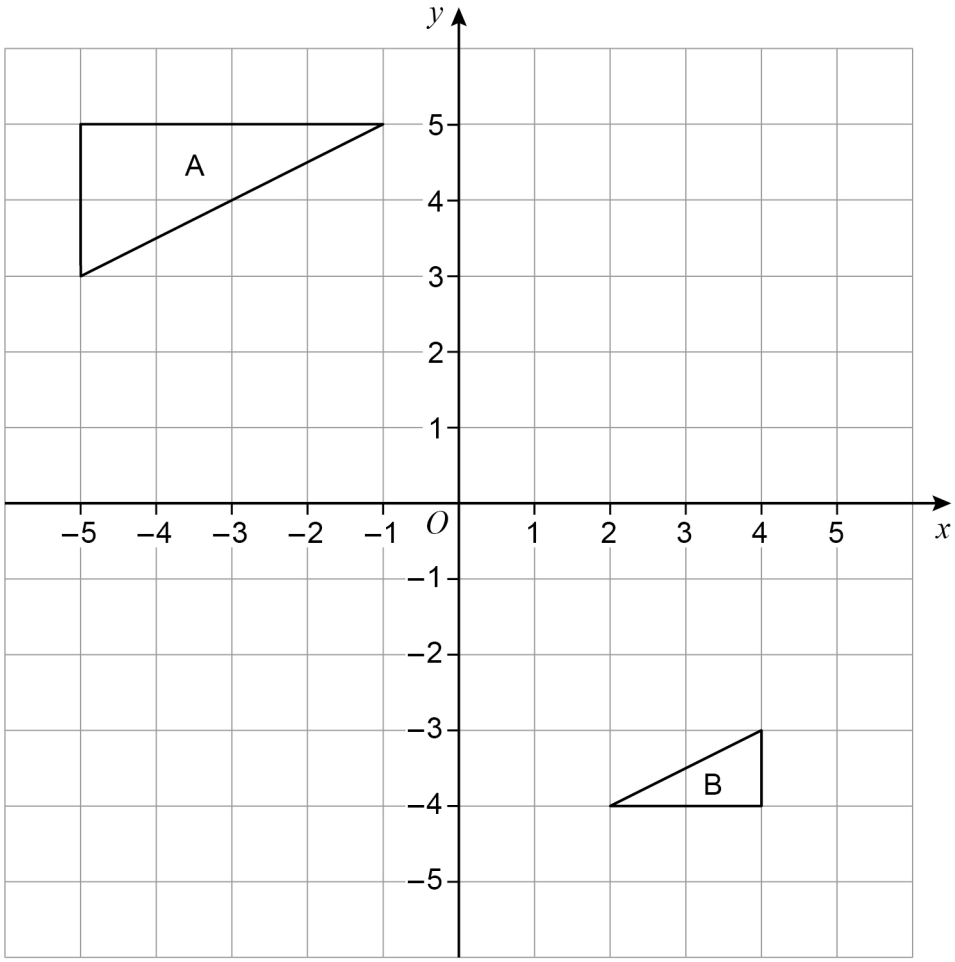
$\frac{8}{3}$ $\frac{1}{6}$ $\frac{3}{7}$ $\frac{3}{8}$

7

Turn over ►

Do not write outside the box

24 Shape A and shape B are shown on the grid.



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

[3 marks]

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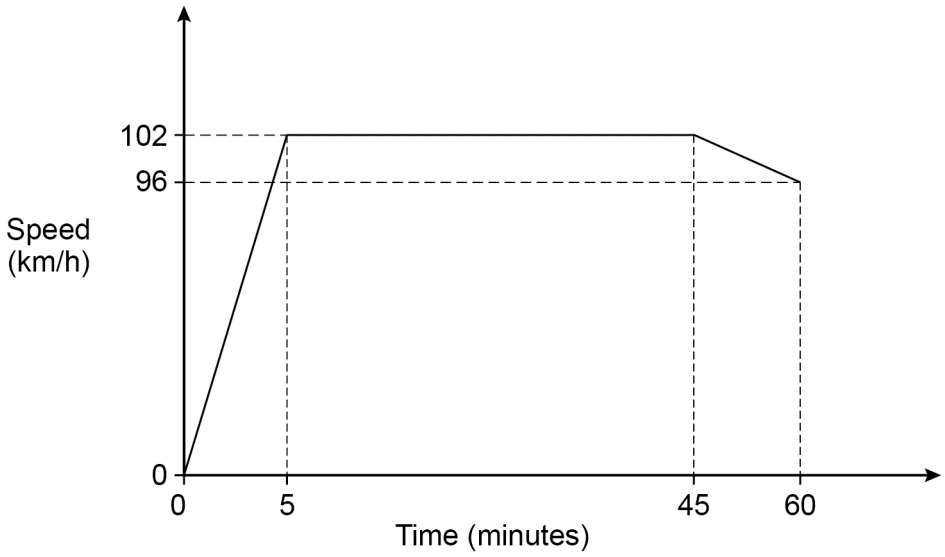
25 Here is a sketch of a speed-time graph for the first part of a journey.



The total distance for the journey is 130 kilometres.

How far is left to travel?

[4 marks]

Answer _____ km

7

Turn over ►

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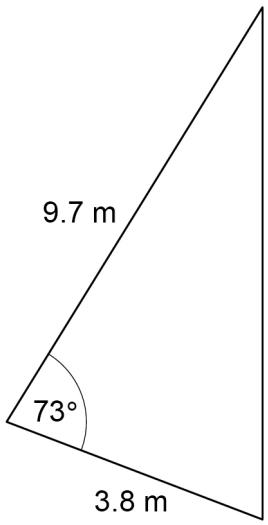
26 Here is a triangular sail.



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26 (a) Vicky needs to buy waterproofing liquid for the sail.

She will put **3 coats** of liquid on **each** side of the sail.

A litre of liquid covers 8.5 square metres of sail.

How many 1-litre bottles of liquid does Vicky need?

[3 marks]

Answer _____

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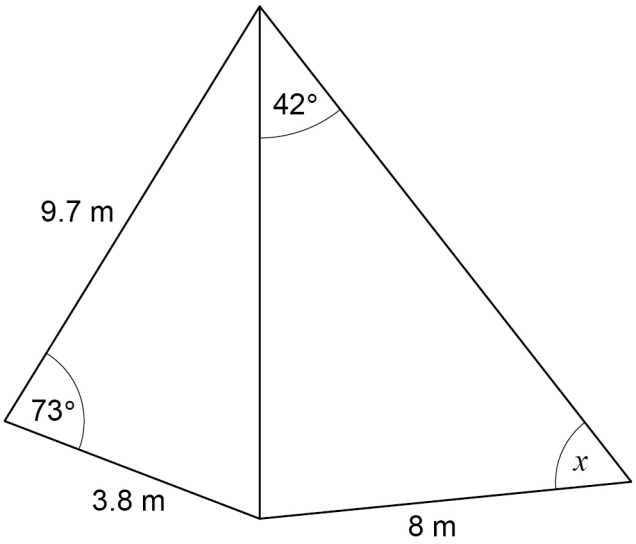
26 (b) Another sail is joined to the first sail as shown.



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x is an acute angle.

Work out the size of angle x.

[5 marks]

Answer _____ degrees

8

Turn over ►

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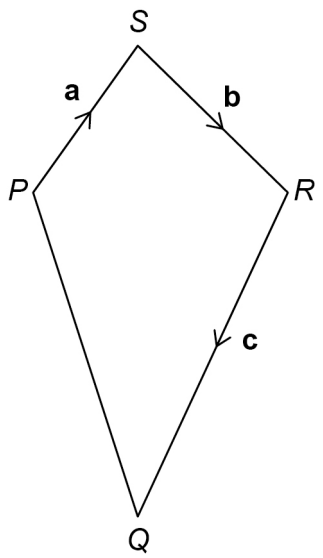
27 Here is quadrilateral *PQRS*.

$\overrightarrow{PS} = \mathbf{a}$ $\overrightarrow{SR} = \mathbf{b}$ $\overrightarrow{RQ} = \mathbf{c}$



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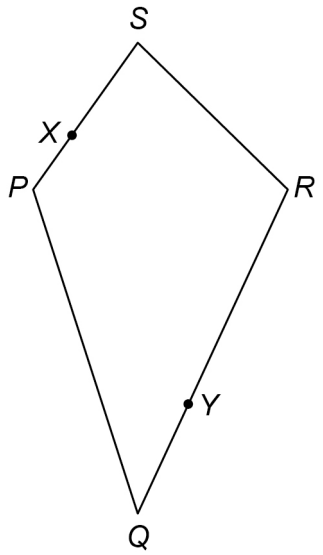
X is a point on *PS* where $PX : XS = 1 : 2$

Y is a point on *RQ* where $RY : YQ = 2 : 1$



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Is *XY* parallel to *PQ*?

Show working to support your answer.

[3 marks]

Turn over for the next question

3

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28 $f(x) = 2x - 3$ and $g(x) = x^2$

Show that $f^{-1}(55) = fg(4)$

[4 marks]

END OF QUESTIONS

4

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