Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Pages	Mark
3	
4 – 5	
6 – 7	
8 – 9	
10 – 11	
12 – 13	
14 – 15	
16 – 17	
TOTAL	

AQA

General Certificate of Secondary Education
Higher Tier
June 2011

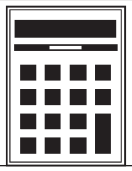
Methods in Mathematics (Linked Pair Pilot) 93652H

Unit 2 Geometry and Algebra

Tuesday 21 June 2011 1.30 pm to 3.00 pm

H

For this paper you must have:
- a calculator
- mathematical instruments.



Time allowed
- 1 hour 30 minutes

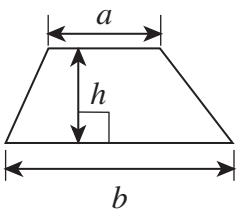
Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the space provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work that you do not want to be marked.
- If your calculator does not have a π button, take the value of π to be 3.14 unless another value is given in the question.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- The quality of your written communication is specifically assessed in Questions 1, 10 and 21.
  These questions are indicated with an asterisk (*).
- You may ask for more answer paper, graph paper and tracing paper.
  These must be tagged securely to this answer booklet.
- You are expected to use a calculator where appropriate.

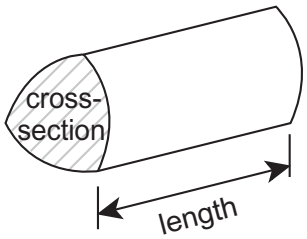
Advice
- In all calculations, show clearly how you work out your answer.

Formulae Sheet: Higher Tier

Area of trapezium = $\frac{1}{2}(a+b)h$

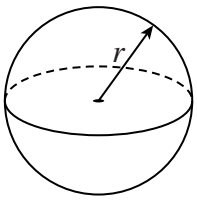


Volume of prism = area of cross-section × length



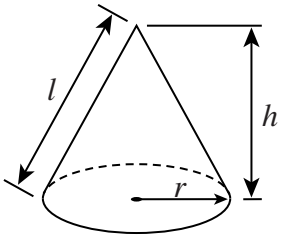
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

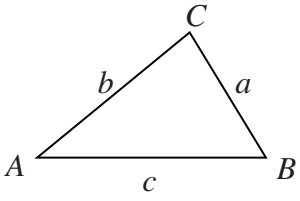
Curved surface area of cone = $\pi r l$



In any triangle ABC

Area of triangle = $\frac{1}{2}ab\sin C$

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$



Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

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

***1** Increase £480 by 3.5%.

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Answer £ ..... *(3 marks)*

2 In a class there are 32 students.

23 take History.

15 take French.

6 do **not** take either of these subjects.

2 (a) Use this information to fill in the Venn diagram below.

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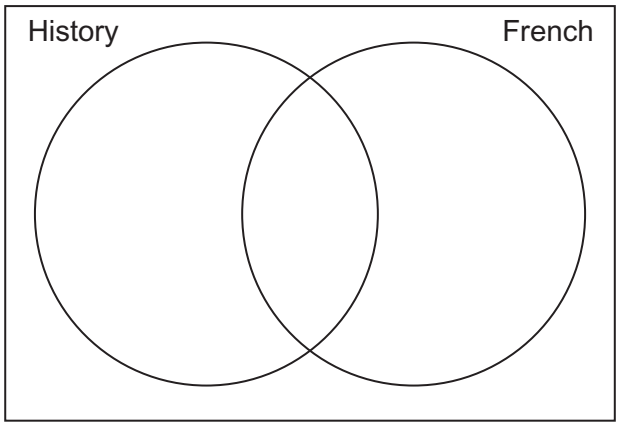

(3 marks)

2 (b) How many students take French but not History?

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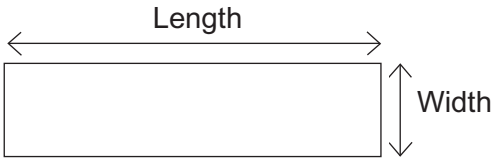
Answer ..... *(1 mark)*

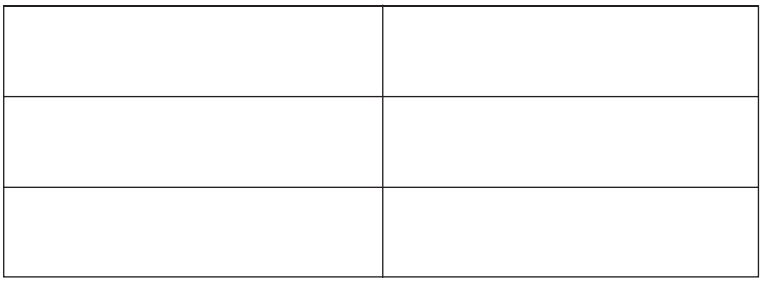
7

Turn over ▶

3 Here is a tile.
The length of the tile is 4 times its width.



Six tiles are put together as shown.



Not drawn accurately

The perimeter of the whole shape is 55 cm.

Work out the width of a tile.

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Answer ..... cm *(3 marks)*

4 (a) Calculate the circumference of a circle with diameter 13 cm.

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Answer ..... cm *(2 marks)*

4 (b) Calculate the area of a circle with radius 9 cm.

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Answer ..... cm^2 *(2 marks)*

5 Expand and simplify $(x - 4)(x + 1)$

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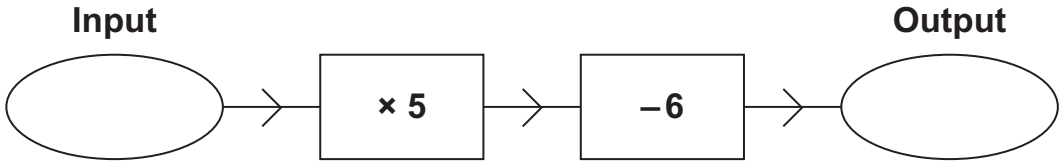
Answer ..... *(2 marks)*

Turn over for the next question

9

6 Here is a number machine.



6 (a) What is the output when the input is –3?

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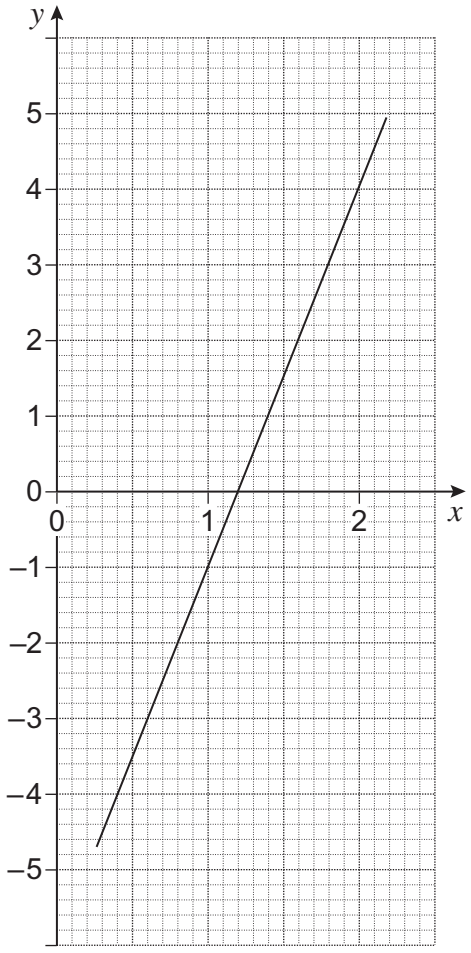
Answer ..... *(1 mark)*

6 (b) Here is a graph of $y = 5x - 6$



Find the input value for the number machine that gives the same output value.
You **must** show clearly how you obtain your answer.

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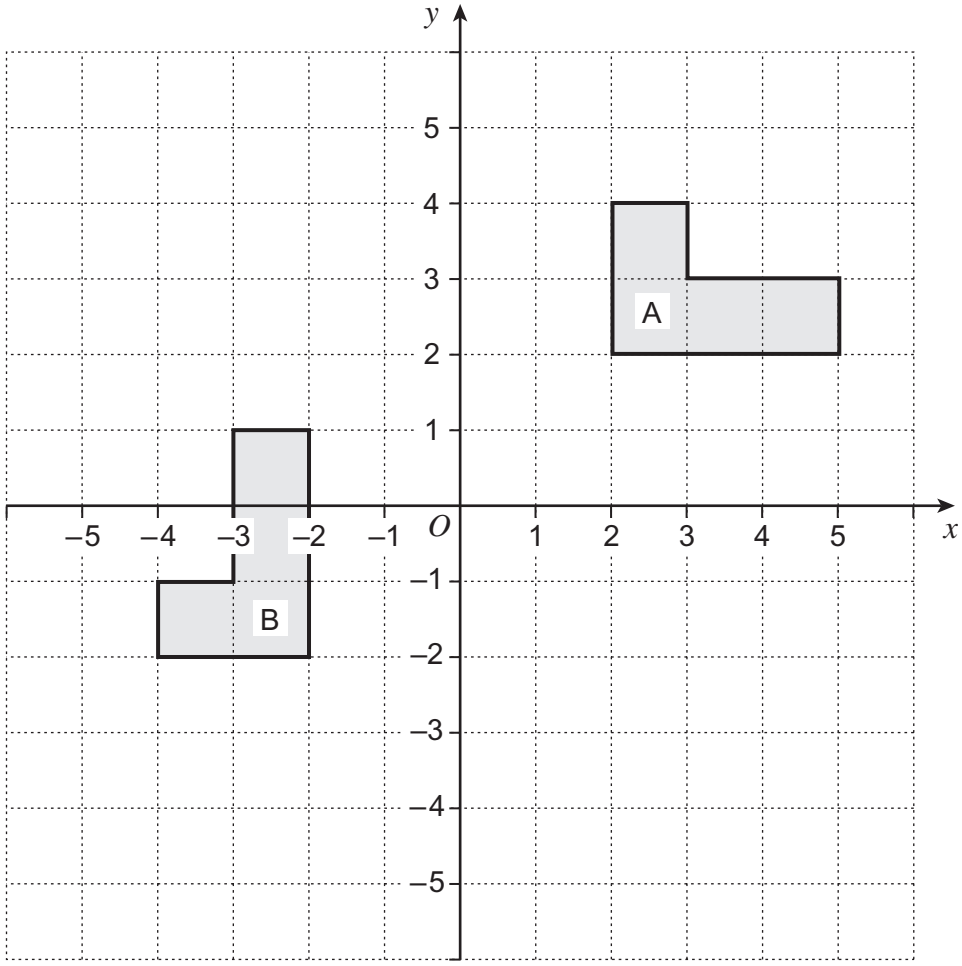
Answer ..... *(2 marks)*

7 Shapes A and B are shown on the grid.



7 (a) Reflect shape A in the line $y = 1$

(2 marks)

7 (b) Describe fully the **single** transformation that maps shape A to shape B.

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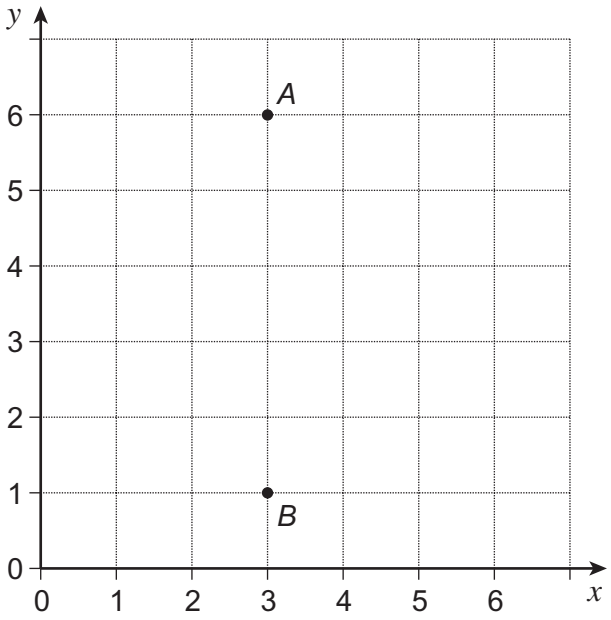
Answer ..... *(3 marks)*

8

Turn over ▶

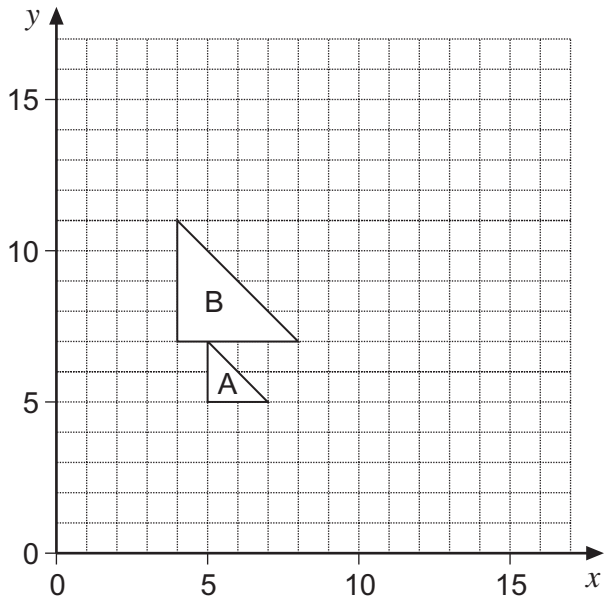
8 On this centimetre square grid, A and B are two vertices of a kite.
The diagonals of the kite meet at (3, 4).
The area of the kite is 10 cm^2.

Draw the kite on the grid.



(3 marks)

9 On the grid are two triangles A and B.



Triangle C, not shown on the diagram, is an enlargement of triangle B with scale factor 2, centre of enlargement (0, 9).

What is the scale factor and centre of enlargement that maps triangle A to triangle C?

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Answer Scale factor.....

Centre (....., ...) *(4 marks)*

Turn over for the next question

7

10 (a) Solve the equation $\frac{10}{x} = 2$

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Answer x = ... *(1 mark)*

10 (b) Solve the equation $7y - 8 = 4 - 2y$

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Answer y = ... *(3 marks)*

***10(c)** Solve the equation $\frac{w + 2}{3} - \frac{w - 4}{7} = 1$

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Answer w = ... *(5 marks)*

11 Use your calculator to work out $\sin(\cos^{-1} 0.6372)$

11 (a) Write down your full calculator display.

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Answer ..... *(1 mark)*

11 (b) Give your answer to part (a) to 3 significant figures.

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Answer ..... *(1 mark)*

12 (a) The nth term of a sequence is given by $n^2 - n + 4$

Work out the first 5 terms of the sequence.

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Answer ..... , ... , ... , ... , ... *(2 marks)*

12 (b) Work out the 25th term of the sequence 2, 3, 5, 8, 12, ...

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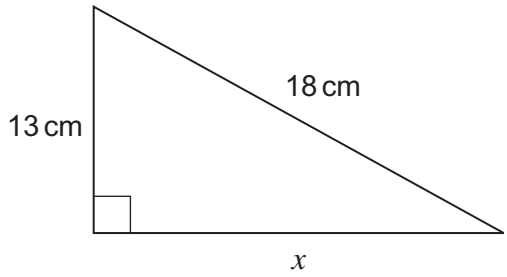
Answer ..... *(2 marks)*

Turn over for the next question

15

13 (a) Calculate the length x in the triangle.

Not drawn accurately



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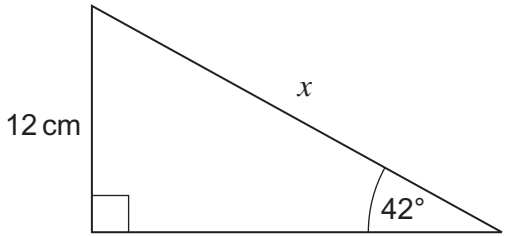
Answer ..... cm *(3 marks)*

13 (b) Calculate the length x in the triangle.

Not drawn accurately



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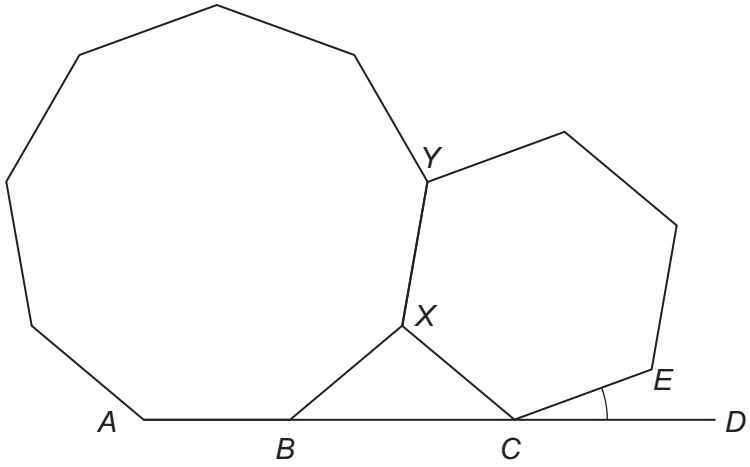
Answer ..... cm *(3 marks)*

14 The diagram shows a regular nonagon and a regular hexagon joined at side *XY*.
The straight line *ABD* passes through the vertex *C* of the hexagon.



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Calculate the size of angle *ECD*.

You **must** show your working.

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Answer ..... degrees *(5 marks)*

11

Turn over ▶

15 Write the quadratic expression $x^2 + 6x - 5$ in the form $(x + a)^2 - b$

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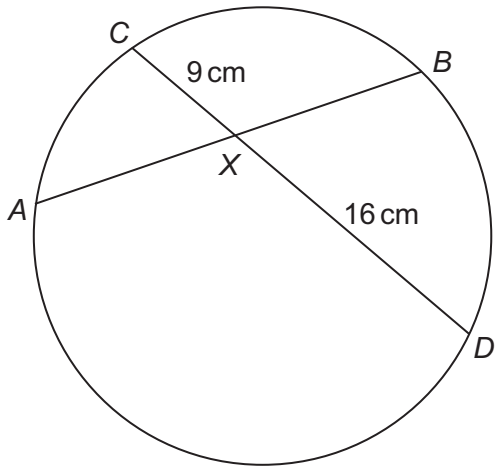
Answer ..... *(2 marks)*

16 *AB* and *CD* are two chords of a circle that intersect at *X*.

CX = 9 cm, *DX* = 16 cm.

AX = *BX*



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Work out the length of *AX*.

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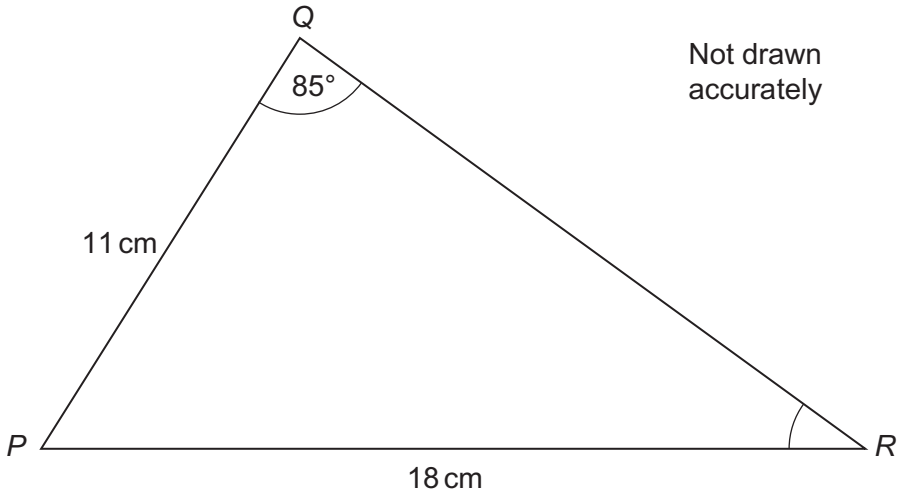
Answer ..... cm *(2 marks)*

17 Work out the size of angle *QRP*.



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Answer ..... degrees *(3 marks)*

18 Simplify fully $\dfrac{4x^2 - 9}{2x^2 - 7x - 15}$

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Answer ..... *(4 marks)*

11

Turn over ▶

19 The ratio of men to women in a running club is 5 : 3

After a group of 6 women join the club the percentage of women in the club goes up to 40%.

How many people were in the club before the women joined?

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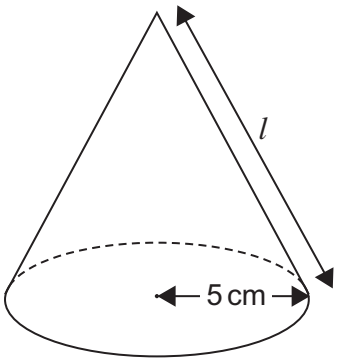
Answer ..... *(4 marks)*

20 A cone has a base radius of 5 cm and a slant height l.

The **total** surface area is 220 cm^2.



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Calculate the value of l.

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Answer ..... cm *(3 marks)*

***21** The diagram shows the points O, P, Q, R, M and N.

$\overrightarrow{OP} = \mathbf{a}$, $\overrightarrow{OQ} = \mathbf{b}$ and $\overrightarrow{QR} = 3\mathbf{b}$

$PM : MQ = 2 : 1$

$PN : NR = 1 : 2$

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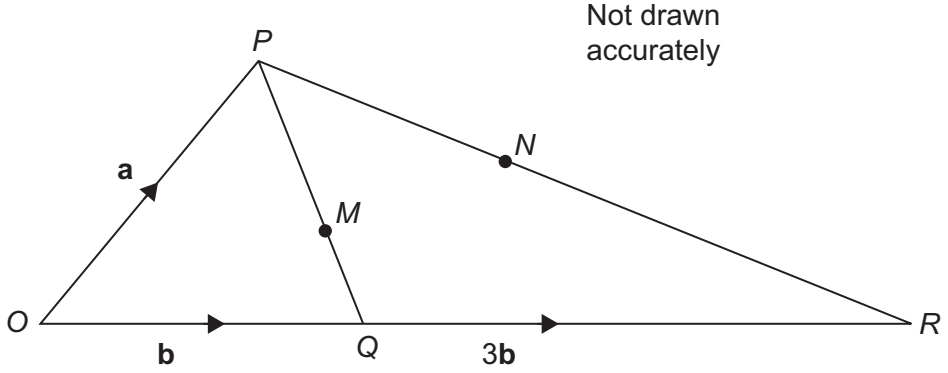

21 (a) $\overrightarrow{PQ} = \mathbf{b} - \mathbf{a}$

Show that $\overrightarrow{OM} = \frac{1}{3}\ \mathbf{a} + \frac{2}{3}\ \mathbf{b}$

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(1 mark)

21 (b) Show that OMN is a straight line.

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(4 marks)

END OF QUESTIONS

12

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