Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Pages	Mark
2–3	
4–5	
6–7	
8–9	
10–11	
TOTAL	

In the style of

General Certificate of Secondary Education
Foundation Tier

Mathematics 43601H

Past Paper Questions by Topic

A* Questions

H

For this paper you must have: • mathematical instruments. You must **not** use a calculator.	

Time allowed
- 1 hour 15 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 spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book.

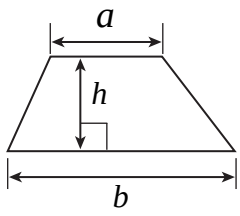
Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is.
- The quality of your written communication is specifically assessed in questions indicated with an asterisk (*)
- You may ask for more answer paper and graph paper. These must be tagged securely to this answer booklet.

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

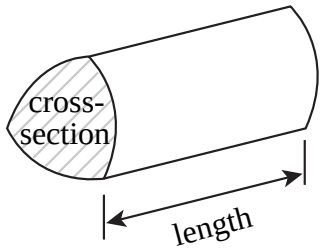
By Peter Bland

Formulae Sheet: Higher Tier

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

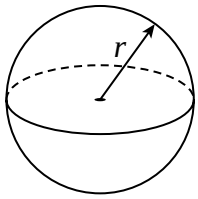


Volume of prism = area of cross-section × length



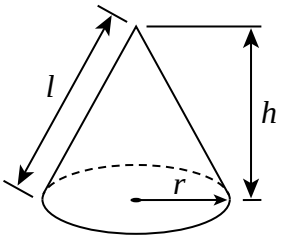
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

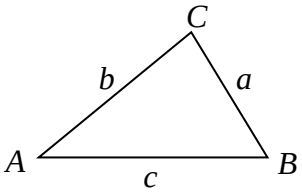


In any triangle ABC

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

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

1 The ticket office at an ice rink records the tickets that skaters buy. Here are Monday's sales, along with the charges.

Length of time (hours)	Number of skaters	Charge (£)
0 – 1	90	1.20
1 – 2	130	2.00
2 – 3	80	3.50
more than 3	60	5.00

Monday's results are equivalent to a 20% sample for the whole week, stratified by the four time intervals.

Work out the ice rink takings for the whole week.

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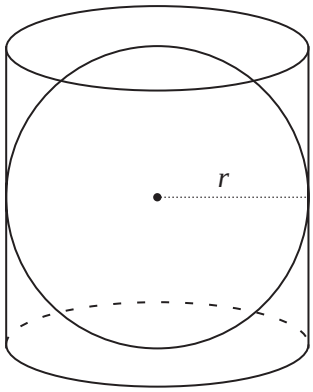
Answer £ ..... *(3 marks)*

2 A golf ball of radius r is packaged in a cylindrical box.
The ball touches the sides, top and base of the box.



What fraction of the volume of the box is empty space?
You **must** show all your working.

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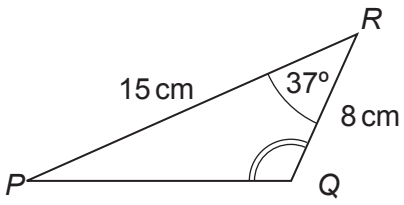
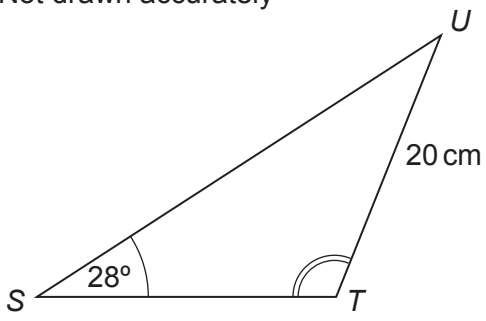
Answer ..... *(4 marks)*

3 Triangles *PQR* and *STU* are similar. Angle *PQR* = angle *STU*.

Not drawn accurately





3 (a) Work out the size of angle *STU*.

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

3 (b) Calculate the length of *SU*.

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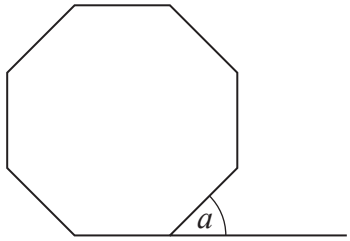
Answer ..... cm *(3 marks)*

4 The diagram shows a regular octagon.



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4 (a) Explain why the exterior angle of a regular octagon, marked a on the diagram, is 45°

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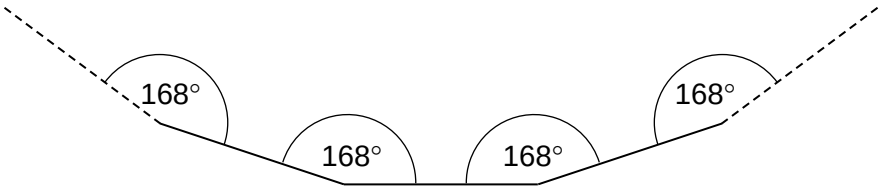
(1 mark)

4 (b) The diagram shows part of a regular polygon.
Each interior angle is 168°.



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Calculate the number of sides of this regular polygon.

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

5 The table shows the profits of a shop during each quarter from March 2010 to June 2011. The March 2011 entry is missing from the table.

Date	Mar 10	June 10	Sept 10	Dec 10	Mar 11	June 11
Profits	38 000	29 000	25 000	34 000		21 000

5 (a) Calculate the first four-point moving average.

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Answer £ ..... *(2 marks)*

5 (b) The second four-point moving average is £28 000

Calculate the missing entry for March 2011.

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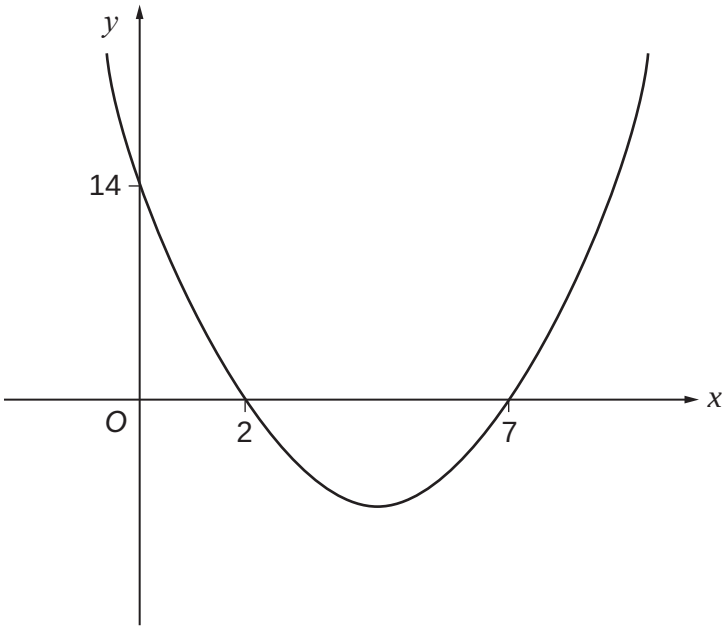
Answer £ ..... *(2 marks)*

6 This diagram shows the graph of $y = x^2 + px + q$

Not drawn accurately



Find the values of p and q. You **must** show all your working.

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Answer p = ... , q = ... *(3 marks)*

✳**7** A coffee machine dispenses 130 millilitres of black coffee into cups with a capacity of 175 millilitres.

These values are accurate to 3 significant figures.

Milk is supplied in small cartons which contain 21 millilitres, accurate to the nearest millilitre.

David likes milky coffee and always puts 2 cartons of milk in his coffee.

Will David's cup ever overflow?

You **must** show your working.

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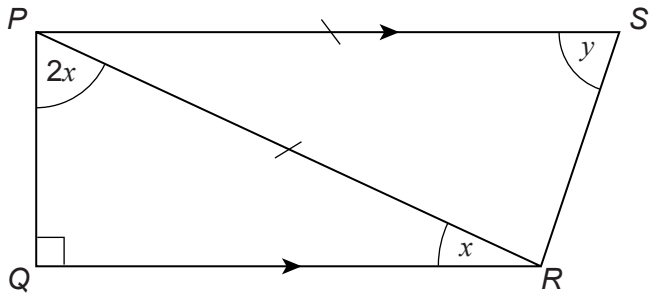
(5 marks)

8 *PQRS* is a trapezium with *PS* parallel to *QR*.
Triangle *PQR* is right-angled at *Q*.
Triangle *PSR* is isosceles with *PS* = *PR*
Angle *QPR* = $2x$
Angle *QRP* = x
Angle *PSR* = y

Not drawn accurately



8 (a) Work out the size of angle x.

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

8 (b) Work out the size of angle y.

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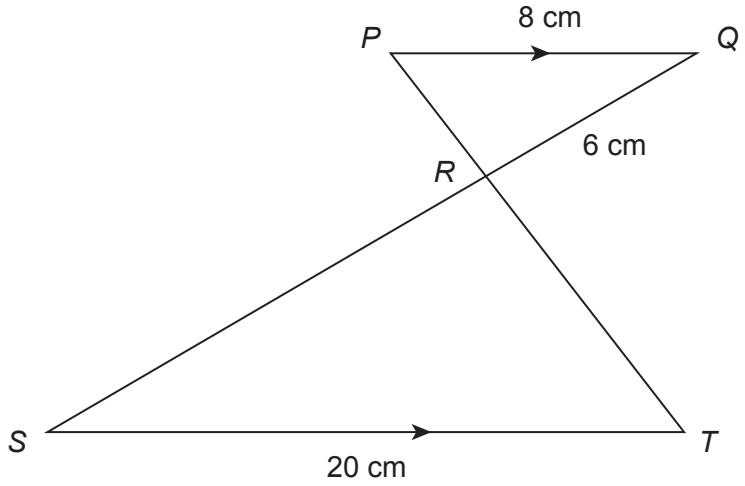
Answer ..... degrees *(3 marks)*

9 In the diagram, PQ is parallel to ST.
$PQ = 8$ cm, $QR = 6$ cm and $ST = 20$ cm



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9 (a) Explain why triangles PQR and TSR are similar.
You **must** give reasons for any statements you make.

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(3 marks)

9 (b) Work out the length of SR.

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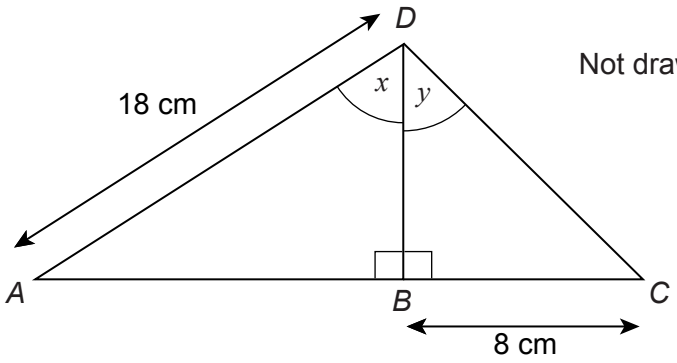
Answer ..... cm *(3 marks)*

10 The diagram shows two right-angled triangles *ABD* and *CBD*.
AD = 18 cm and *BC* = 8 cm
cos x = tan y



Not drawn accurately

Work out the length of *BD*.

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

11 Make x the subject of the formula $y = \dfrac{w+x}{x-2}$

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

12 Convert $\frac{7}{11}$ to a recurring decimal.

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

12 (b) Prove that the recurring decimal 0.3939... can be written as $\frac{13}{33}$

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(3 marks)

13 y is inversely proportional to x.
z is directly proportional to the square root of y.
When $x = 8$, $y = 9$
When $y = 16$, $z = 20$

Use this information to find the value of z when $x = 2$

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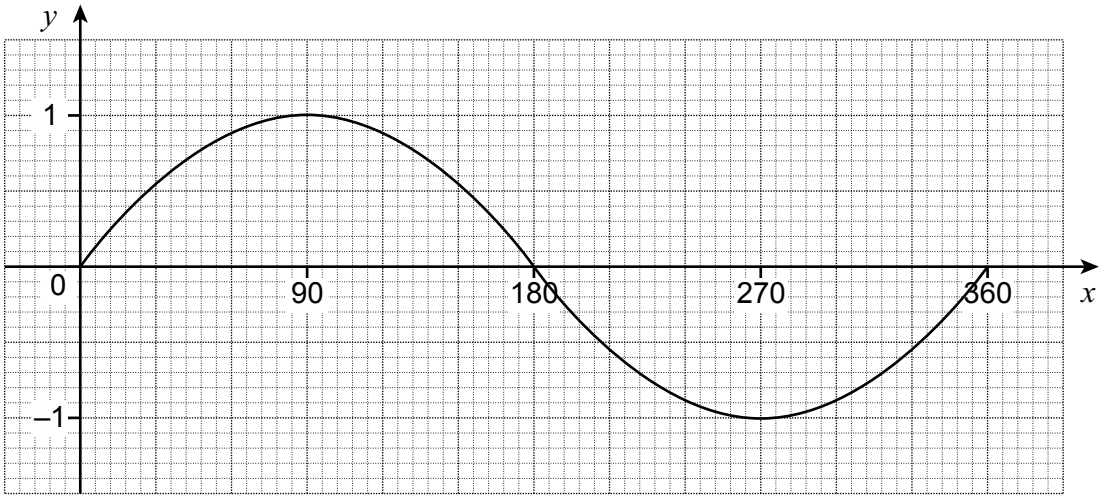
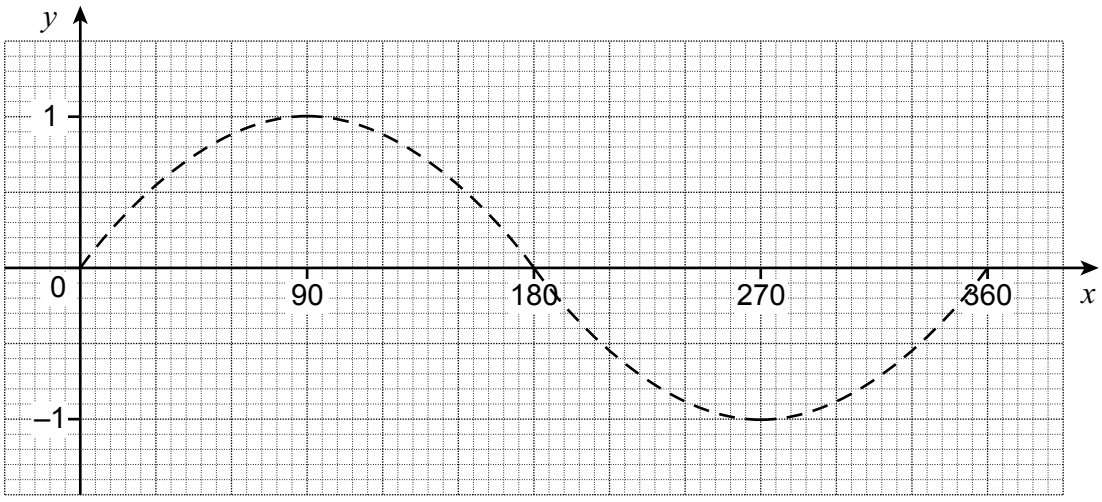
Answer ..... *(6 marks)*

14 This is the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$



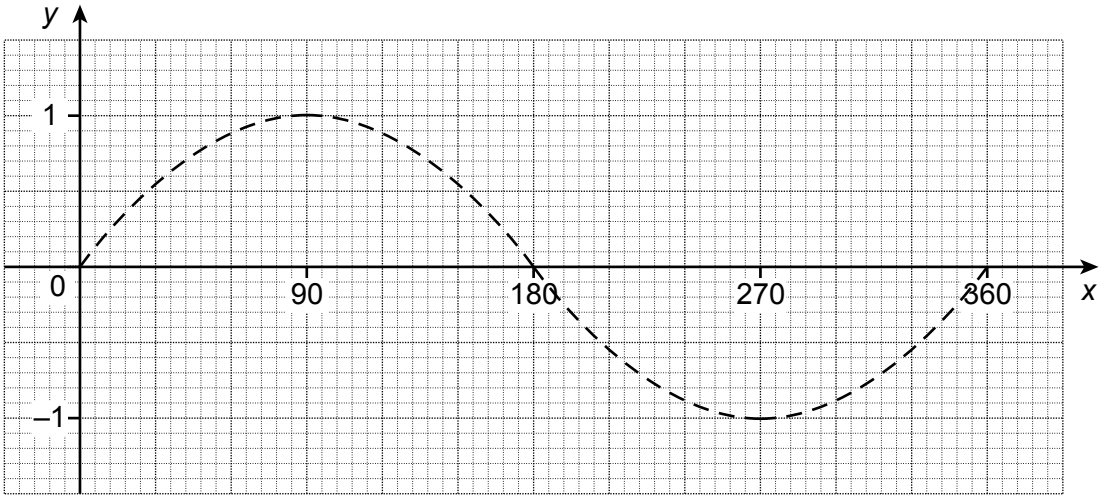
On the axes draw the following graphs for $0° \leqslant x \leqslant 360°$
The graph of $y = \sin x$ is shown dotted to help you.

14 (a) $y = \sin (x + 90)$



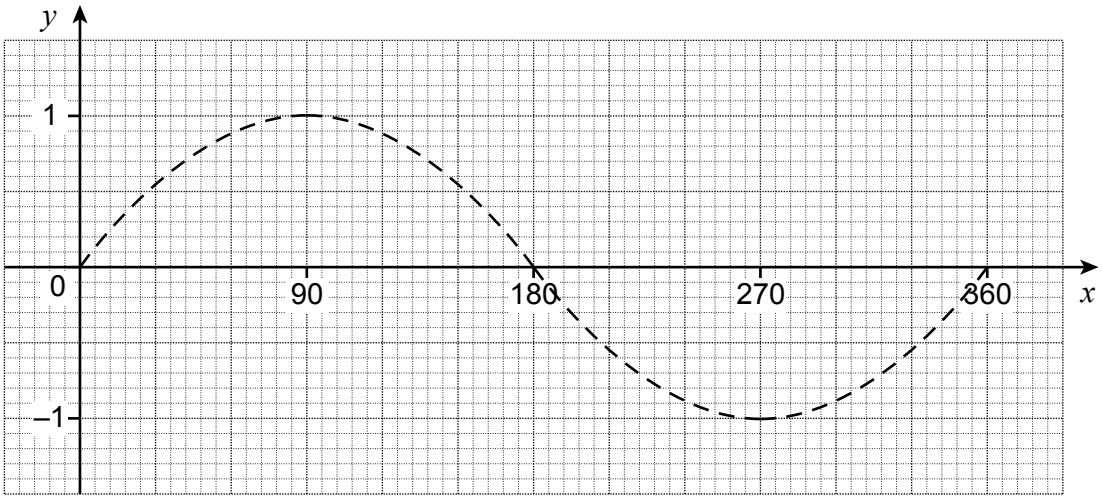
(1 mark)

14 (b) $y = \frac{1}{2} \sin x$



(1 mark)

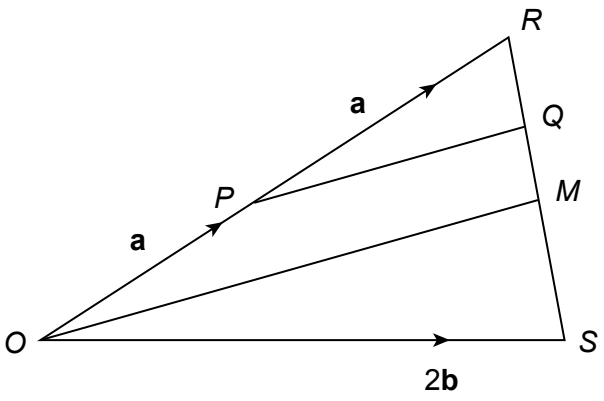
14 (c) $y = \sin \frac{x}{2}$



(1 mark)

15 *ORS* is a triangle with *P* the mid-point of *OR* and *M* the mid-point of *RS*.

$\overrightarrow{OP} = \mathbf{a}$, $\overrightarrow{PR} = \mathbf{a}$ and $\overrightarrow{OS} = 2\mathbf{b}$



Not drawn accurately

15 (a) Write down an expression for *RS* in terms of **a** and **b**.

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

15 (b) *Q* lies on *RS* such that $\overrightarrow{RQ} = \frac{1}{4}\ \overrightarrow{RS}$

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

Explain your answer.

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

15 (c) Write down, and simplify, an expression for $\overrightarrow{OM}$ in terms of **a** and **b**.

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

(d) Explain why the answers for part (b) and part (c) show that *OPQM* is a trapezium.

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(1 mark)