

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Secondary Education
Higher Tier
November 2012

Mathematics (Linear)

43652H

Paper 2

Monday 12 November 2012 9.00 am to 11.00 am

H

For this paper you must have:

- a calculator
- mathematical instruments.



Time allowed

- 2 hours

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 105.
- The quality of your written communication is specifically assessed in Questions 11, 12, 27 and 28. These questions are indicated with an asterisk (*).
- You may ask for more answer paper, tracing paper and graph 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	
Examiner's Initials	
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	
TOTAL	



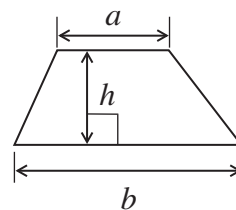
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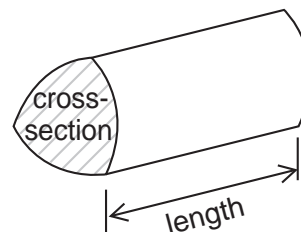
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Formulae Sheet: Higher Tier

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

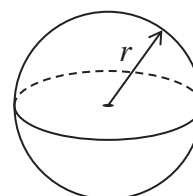


Volume of prism = area of cross-section \times length



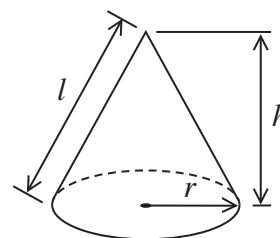
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

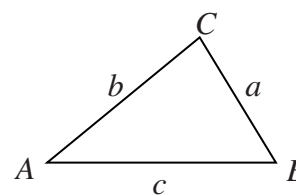


In any triangle ABC

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

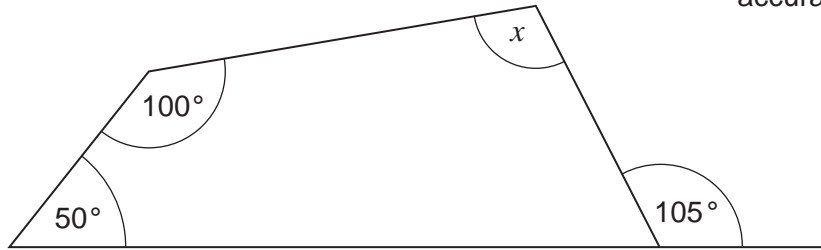
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$



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

1 Work out the value of x .

Not drawn
accurately



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Answer degrees (3 marks)

Turn over for the next question



2 Here are Jon's marks in two tests.

Test A 18 out of 25

Test B 30 out of 40

Which test gives the higher percentage mark?
You **must** show your working.

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Answer (3 marks)

3 Solve $3(2x + 4) + 8 = 50$

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$x =$ (4 marks)



4 (a) Put each of these numbers into the correct box.

27 2 8 11 64

	Square number	Odd number	Even number
Cube number			
Prime number			

(3 marks)

4 (b) Why is it **never** possible to put any number in the shaded box?

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(1 mark)

5 $A = \frac{4x + 3y}{x - y}$

Work out the value of A when $x = 6$ and $y = -1$

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Answer (3 marks)



6 Circle the **two** equations that are equivalent to $2y = 3x + 4$

A $2x = 3y + 4$

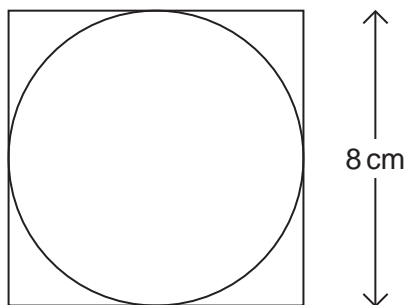
B $y - \frac{3}{2}x = 2$

C $y = \frac{3}{2}x + 4$

D $3x - 2y + 4 = 0$

(2 marks)

7 The diagram shows a circle inside a square.



Not drawn accurately

Work out the area of the circle.

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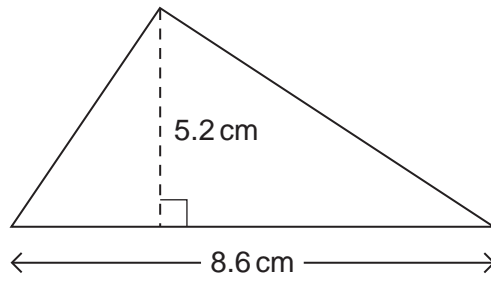
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Answer cm^2 (3 marks)



8 Work out the area of the triangle.



Not drawn accurately

Give your answer to 1 decimal place.

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Answer cm² (3 marks)

9 Show that the equation $x^3 + 8x = 30$ has a solution between $x = 2.2$ and $x = 2.3$

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(2 marks)



10 (a) A drink is made from 1.5 litres of orange juice and 7.5 litres of lemonade.

What fraction of the drink is orange juice?
Give your answer in its simplest form.

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Answer (3 marks)

10 (b) A different drink is made from 2 litres of blackcurrant juice and 12 litres of water.

How much more blackcurrant juice should be added so that 25% of the drink is blackcurrant juice?

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Answer litres (3 marks)



11 Mark went fishing on four Saturdays.

	Week 1	Week 2	Week 3	Week 4
Number of fish caught	4	1	6	3
Time fishing	2.5 hours	1.5 hours	5 hours	2.5 hours
Mean weight of fish caught	1.2 kg	2.3 kg	0.8 kg	1.9 kg

11 (a) Work out the **mean** number of fish caught **per hour** in **Week 1**.

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Answer (2 marks)

*11 (b) Mark says,
"One of the fish I caught weighed 5 kg."

In which week did this happen?
Give a reason for your answer.

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Answer (2 marks)



12 (a) Expand and simplify $(x + 6)^2$

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Answer (2 marks)

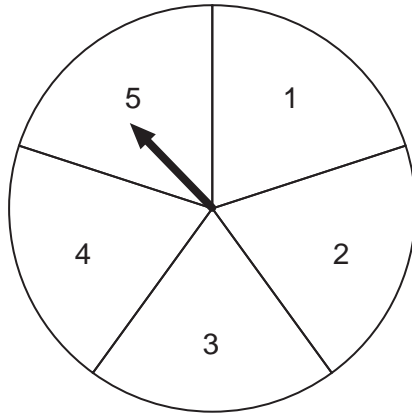
***12 (b)** Expand and simplify $9w(3x - 4y) - 5w(x + y)$

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Answer (4 marks)



13 Matt made this spinner. He spins the arrow 200 times.



13 (a) How many times would you expect the arrow to stop on the number 5 if the spinner is fair?

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Answer (2 marks)

13 (b) The table shows the number of times the arrow stops on each number.

Stops on	1	2	3	4	5
Number of times	32	41	65	27	35

Do you think the spinner is fair? Give a reason for your answer.

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(2 marks)

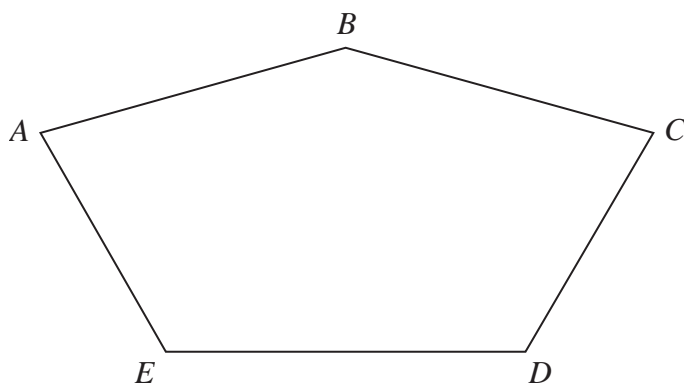
10

Turn over ►



14 This pentagon has a **vertical** line of symmetry.

The ratio of angles $B : C : D = 6 : 3 : 4$



Not drawn
accurately

Work out the size of angle B .

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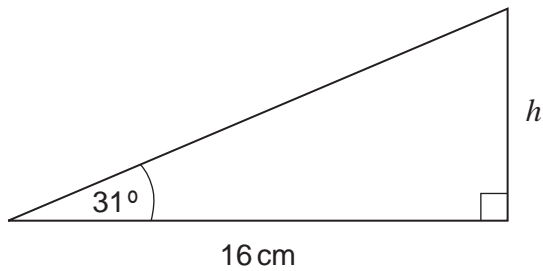
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Answer degrees (5 marks)



15 Work out the height h .



Not drawn
accurately

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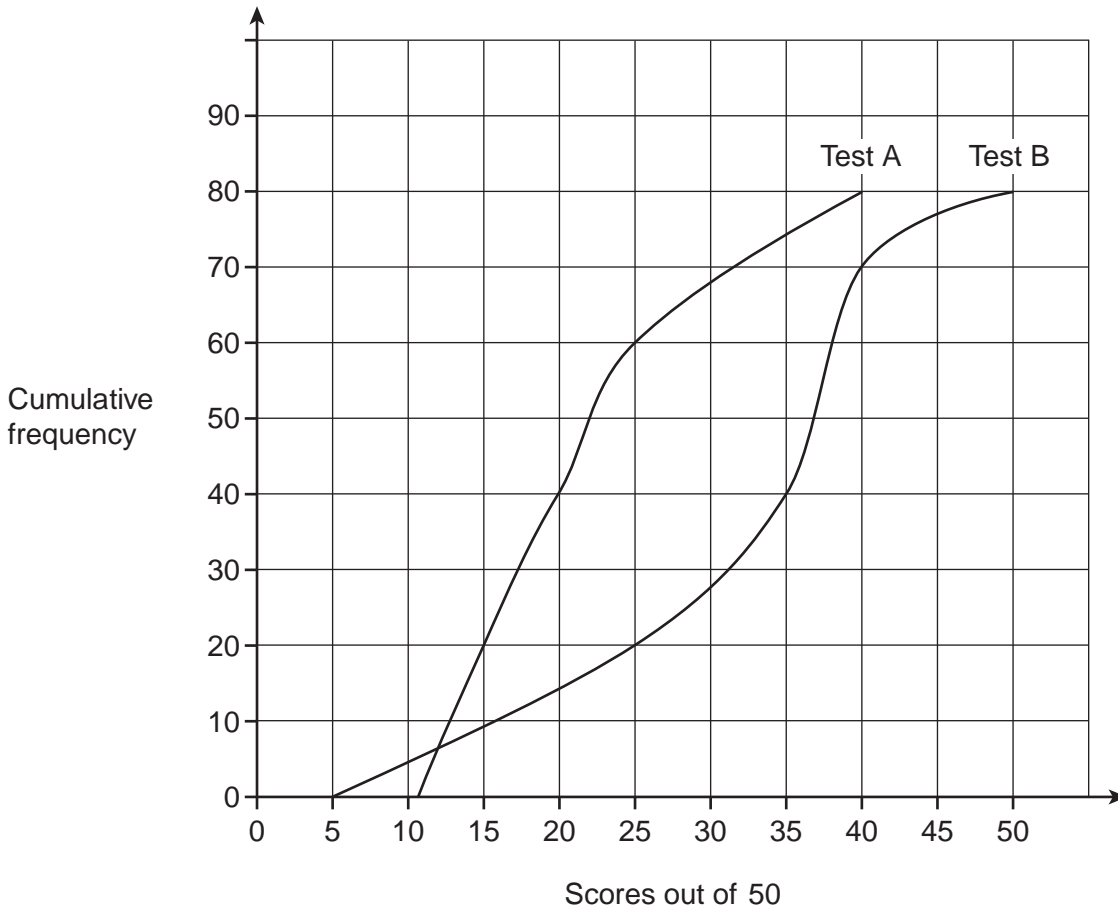
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Answer cm (3 marks)

Turn over for the next question



16 The same students take two tests. The scores out of 50 are represented on the cumulative frequency graphs.



16 (a) How many students took each test?

Answer (1 mark)

16 (b) Work out the median score for each test.

Median for test A

Median for test B (2 marks)



16 (c) The interquartile range for test B is 13.

Work out the interquartile range for test A.

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Interquartile range for test A (2 marks)

16 (d) Which test is more difficult?

Give **one** reason to support your answer.

Test

Reason

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(1 mark)

Turn over for the next question

6

Turn over ►



17 These expressions represent three numbers.

x

$x + 3$

$4x$

Work out the mean in terms of x .
Give your answer in its simplest form.

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Answer (3 marks)

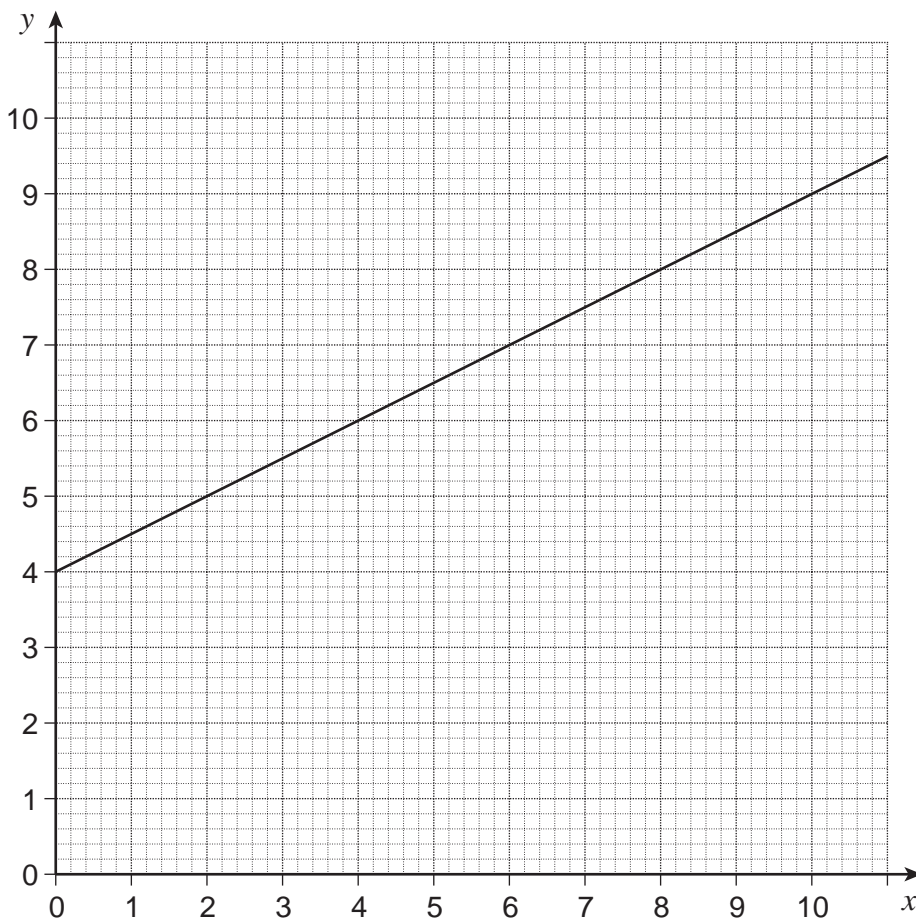
18 Solve $\frac{18 + 5x}{3} = 10 - x$

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$x =$ (4 marks)



19 Work out the equation of the line shown.



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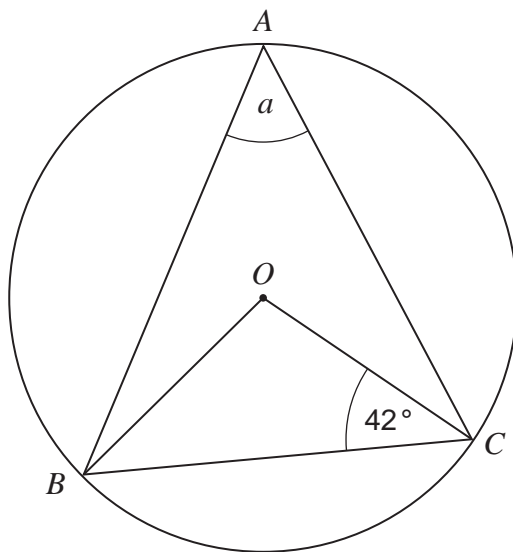
Answer (3 marks)

10

Turn over ►



20 The diagram shows a circle, centre O .



Not drawn
accurately

Work out the value of a .

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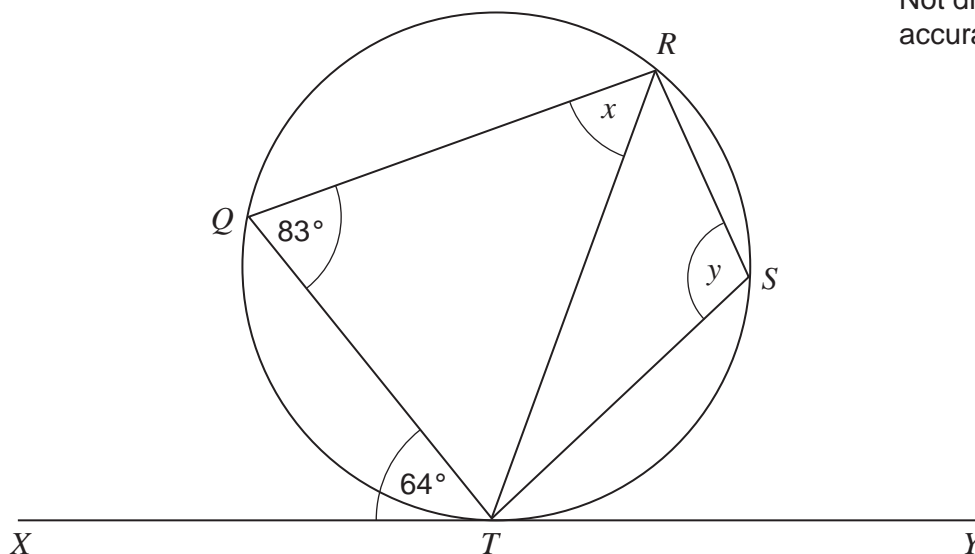
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Answer degrees (3 marks)



21 *XTY* is a tangent to the circle.

Not drawn accurately



21 (a) Write down the value of x .
Give a reason for your answer.

Answer degrees

Reason (2 marks)

21 (b) Work out the value of y .

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Answer degrees (1 mark)



- 22** The table shows the probabilities that I am on time or late for work each day.
It also shows the amount of pay deducted for being late each day.

	On time	Up to 30 minutes late	30 minutes to 1 hour late
Probability	0.6	0.3	0.1
Amount deducted	—————	£8	£16

Work out the probability that I have exactly £16 deducted **over two days**.

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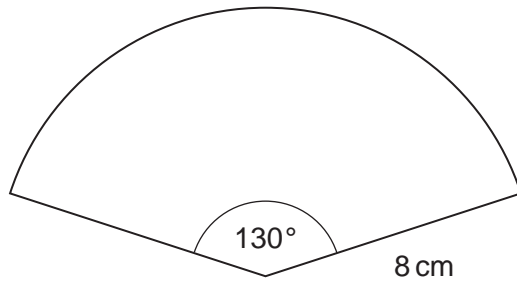
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Answer (5 marks)



23 The diagram shows a sector of a circle.



Not drawn
accurately

Work out the area of the sector.
Give your answer to a suitable degree of accuracy.

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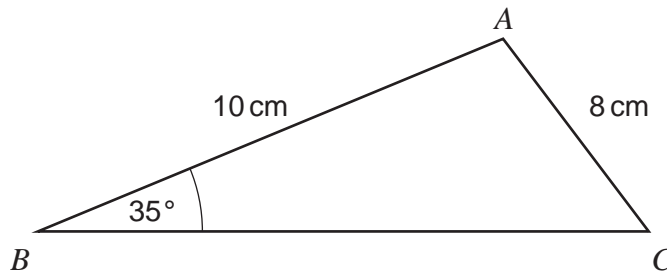
Answer cm^2 (4 marks)

9

Turn over ►



24 In the diagram, angle A is obtuse.



Not drawn accurately

Work out the size of angle A.

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Answer degrees (4 marks)

25 n is a positive integer.

Prove that $n^2 + 3n + 2$ must be a multiple of 2.

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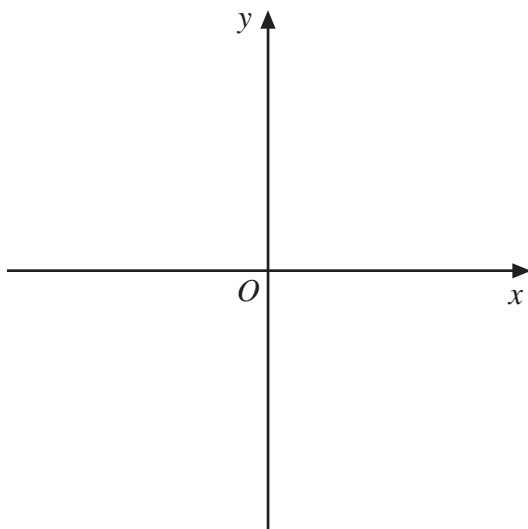
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(4 marks)

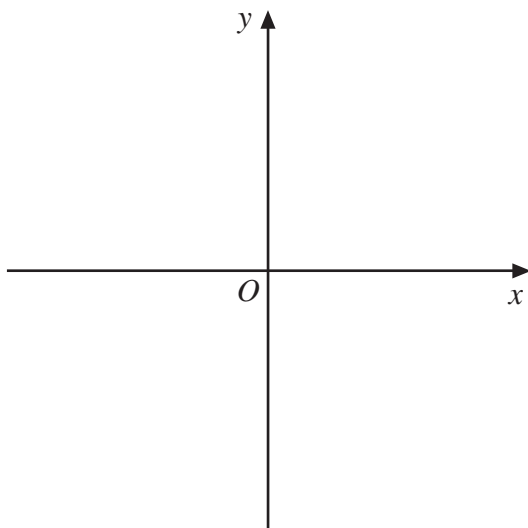


26 (a) On the axes, make a sketch of $y = x^3$



(1 mark)

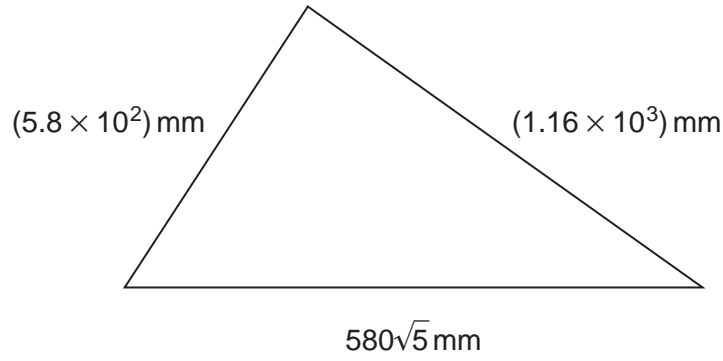
26 (b) On the axes, make a sketch of $y = \frac{1}{x}$



(1 mark)



*27 Is this a right-angled triangle?



Not drawn
accurately

You **must** justify your answer.

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(4 marks)



***28** Solve the simultaneous equations

$$y = 10 - x$$

$$y = 2x^2 + 4$$

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$$x = \dots\dots\dots, y = \dots\dots\dots$$

$$x = \dots\dots\dots, y = \dots\dots\dots$$

(5 marks)

END OF QUESTIONS



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