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	
18 – 19	
20 – 21	
22 – 23	
24 – 25	
TOTAL	

General Certificate of Secondary Education
Higher Tier
November 2012

Mathematics (Linear) 43652H

Paper 2

H

Monday 12 November 2012 9.00 am to 11.00 am

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

Time allowed
- 2 hours

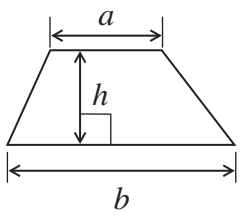
Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this 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.

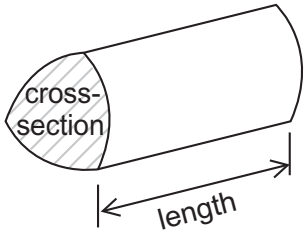
Advice
- In all calculations, show clearly how you work out your answer.

Formulae Sheet: Higher Tier

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

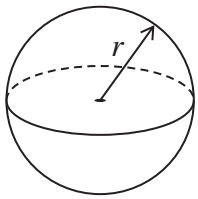


Volume of prism = area of cross-section × length



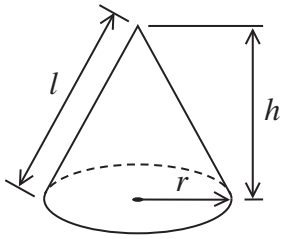
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

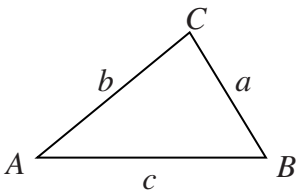
Curved surface area of cone = $\pi r l$



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 Work out the value of x.

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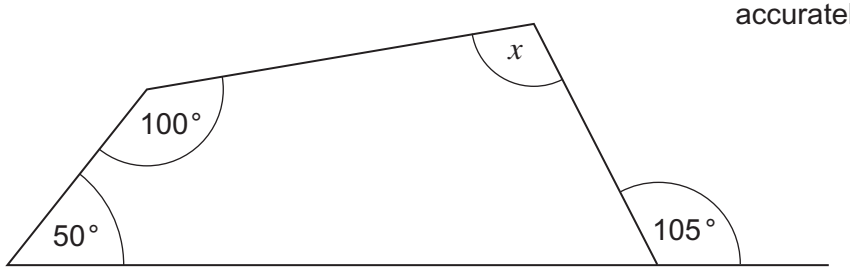

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Answer ..... degrees *(3 marks)*

Turn over for the next question

3

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

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

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

14

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.

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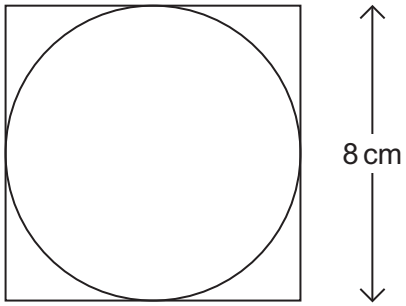

Work out the area of the circle.

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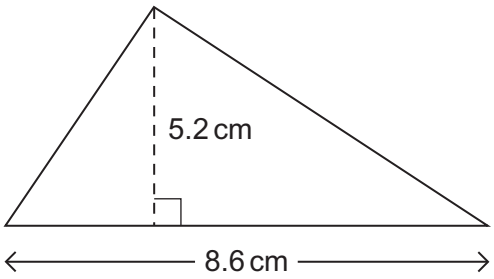
Answer ..... cm^2 *(3 marks)*

8 Work out the area of the triangle.



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Give your answer to 1 decimal place.

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Answer ..... cm^2 *(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

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)*

10

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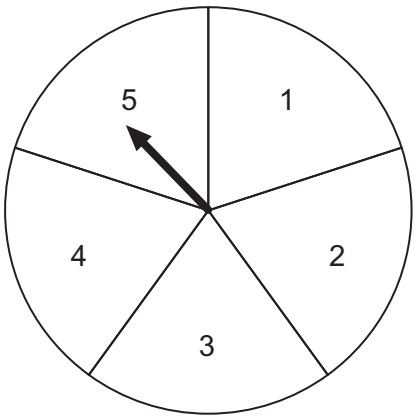
Answer ..... *(4 marks)*

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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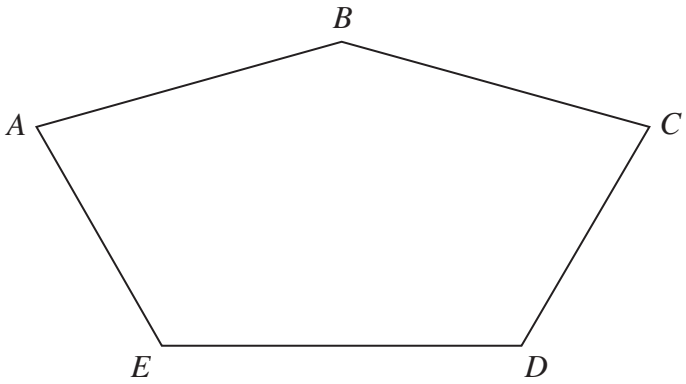
(2 marks)

10

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

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



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Work out the size of angle B.

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

15 Work out the height h.

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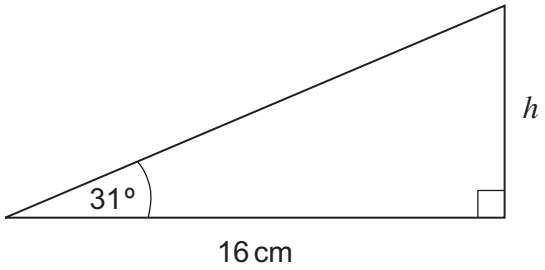

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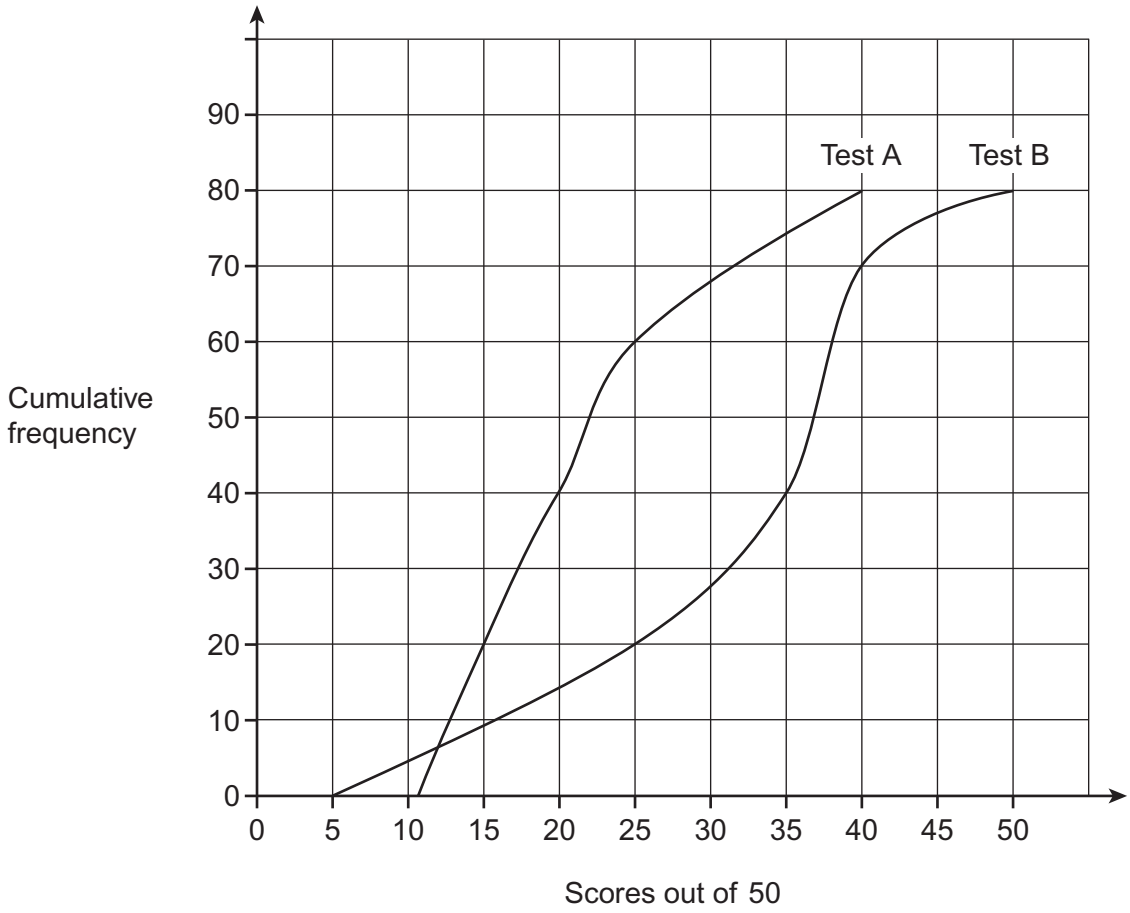
Answer ..... cm *(3 marks)*

Turn over for the next question

8

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

17 These expressions represent three numbers.

x $\quad$ $x + 3$ $\quad$ $4x$

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

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

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

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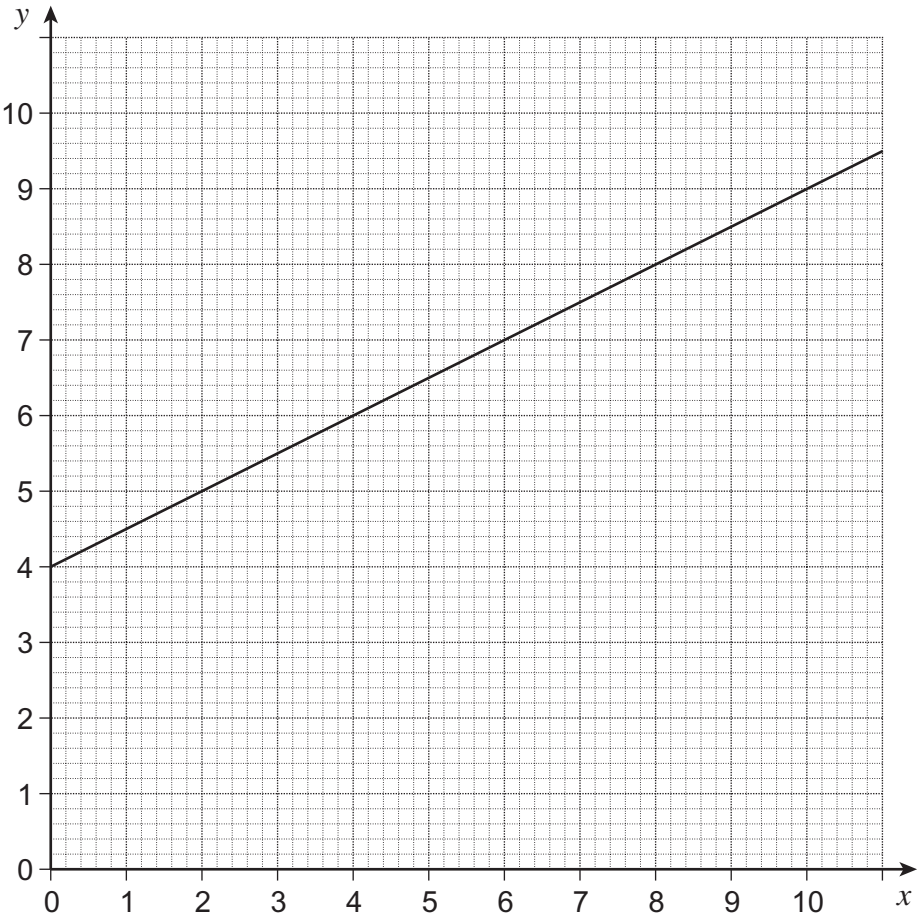
x = ... *(4 marks)*

19 Work out the equation of the line shown.



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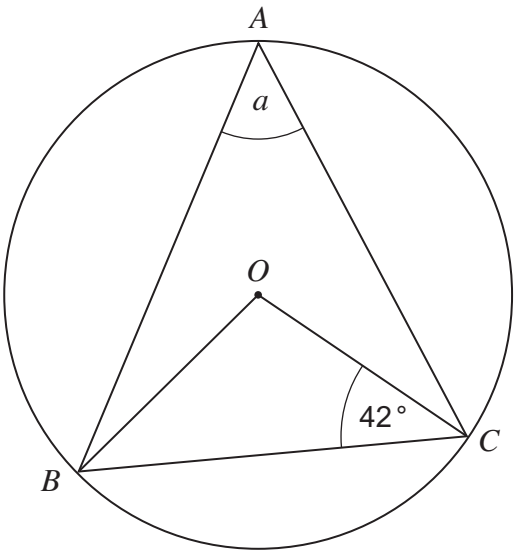
Answer ..... *(3 marks)*

10

20 The diagram shows a circle, centre O.



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Work out the value of a.

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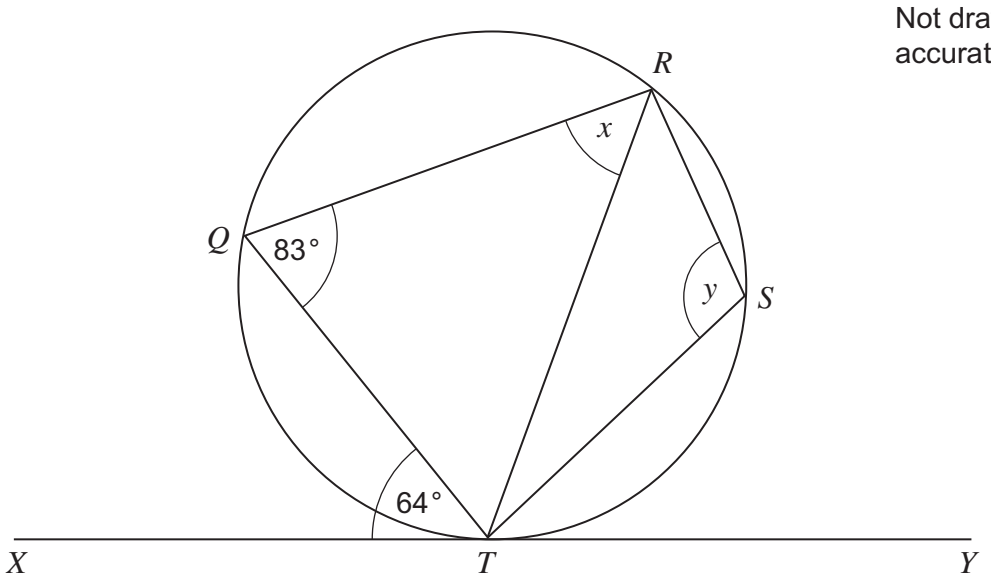
Answer ..... degrees *(3 marks)*

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)*

6

Turn over ▶

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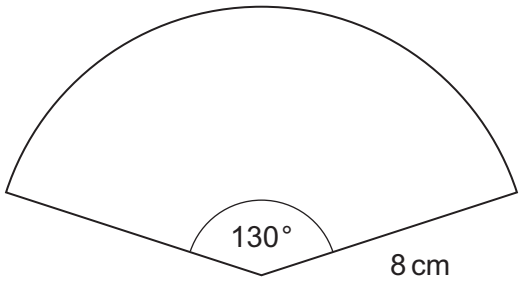
Answer ..... *(5 marks)*

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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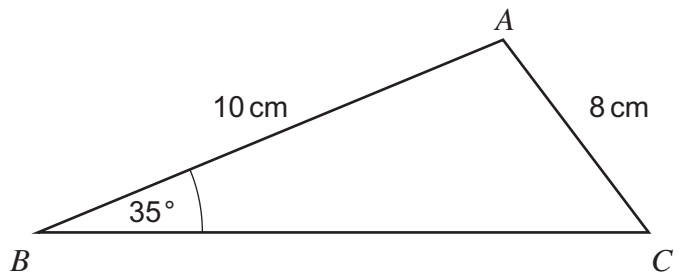
Answer ..... cm^2 *(4 marks)*

9

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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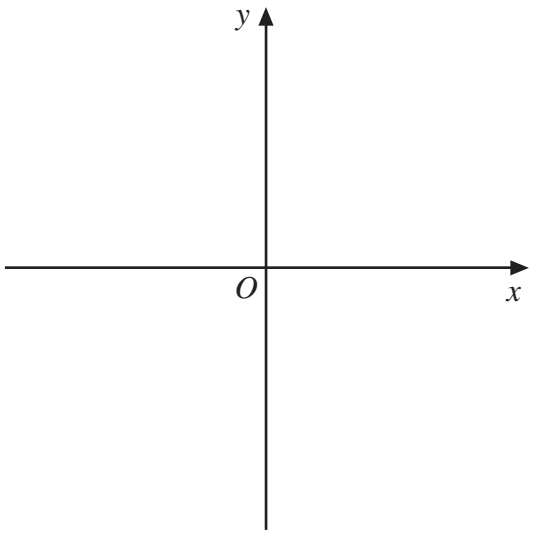
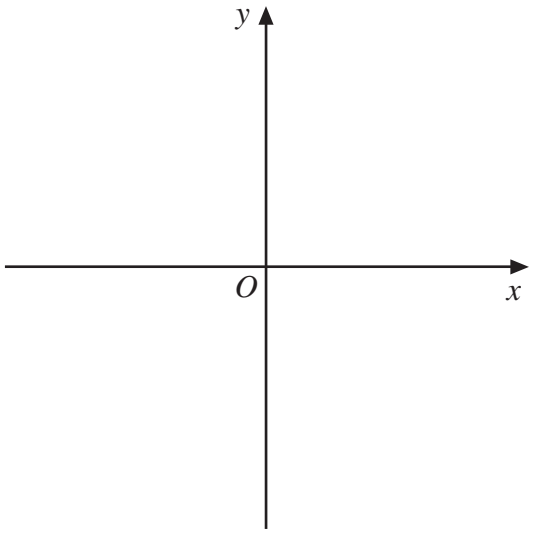
(4 marks)

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



(1 mark)

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

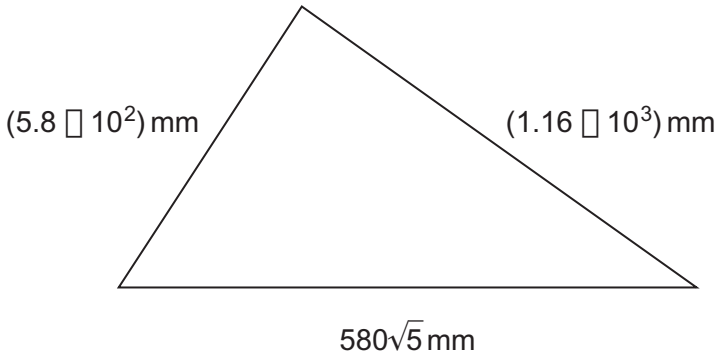


(1 mark)

10

***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 = ... , y = ...

x = ... , y = ...

(5 marks)

END OF QUESTIONS

9

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