OCR
RECOGNISING ACHIEVEMENT

H

Monday 4 March 2013 – Morning

GCSE MATHEMATICS B

J567/04 Paper 4 (Higher Tier)

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- Geometrical instruments
- Tracing paper (optional)
- Scientific or graphical calculator

Duration: 1 hour 45 minutes

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (*).
- The total number of marks for this paper is **100**.
- This document consists of **24** pages. Any blank pages are indicated.

You are permitted to use a calculator for this paper

This paper has been pre modified for carrier language

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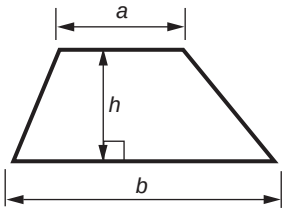
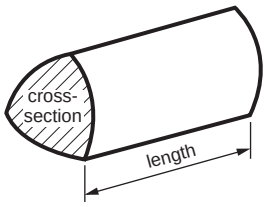
Formulae Sheet: Higher Tier

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



Volume of prism = (area of cross-section) × length

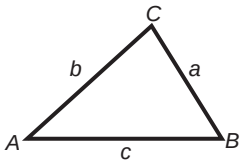


In any triangle *ABC*

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

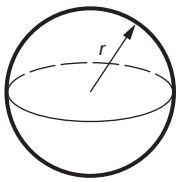
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

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



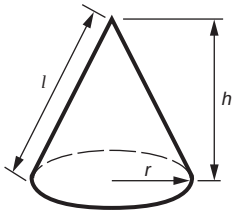
Volume of sphere $= \frac{4}{3}\pi r^3$

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



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

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



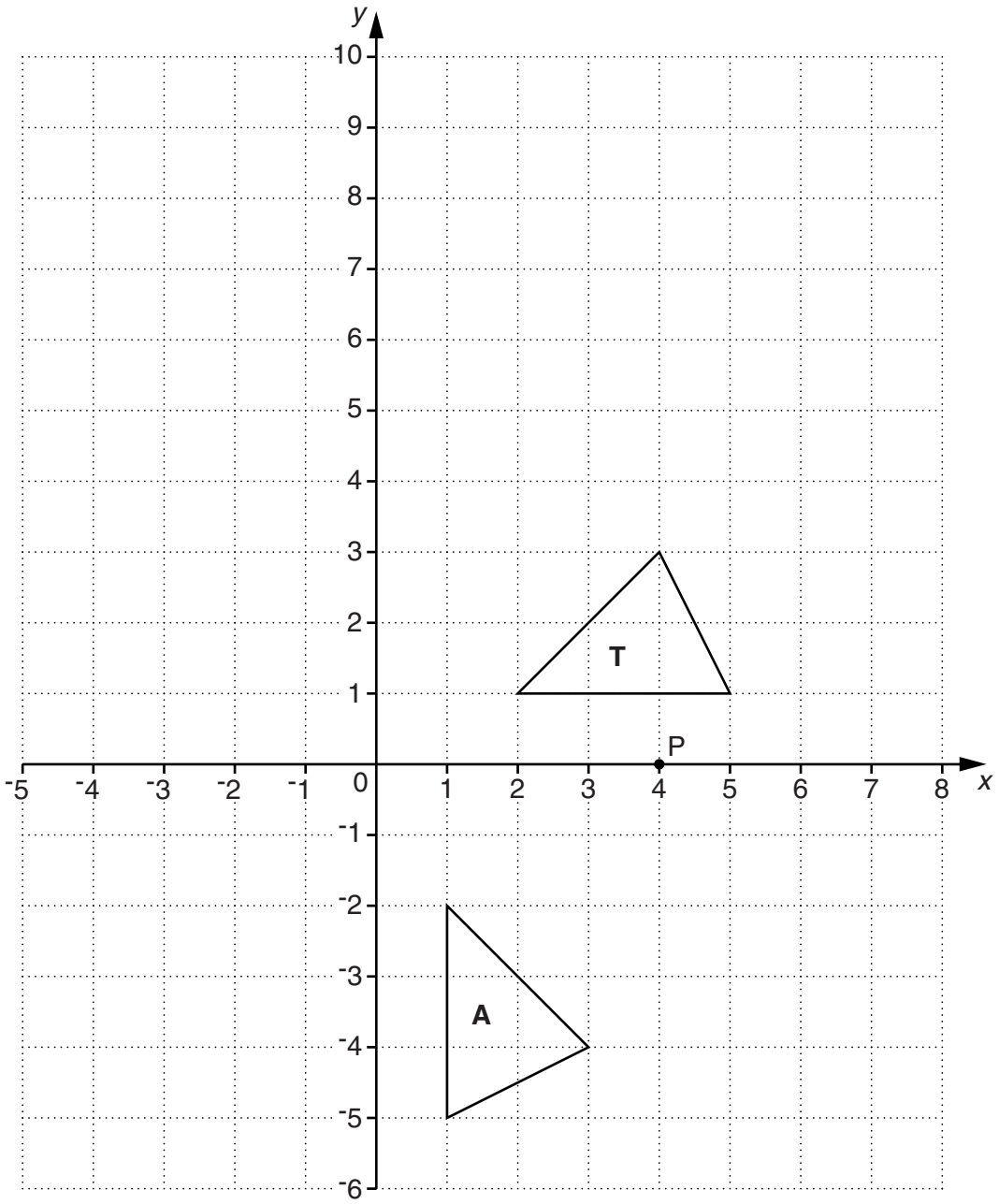
The Quadratic Equation

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

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

PLEASE DO NOT WRITE ON THIS PAGE

1 Here is a grid with two triangles, **T** and **A**.



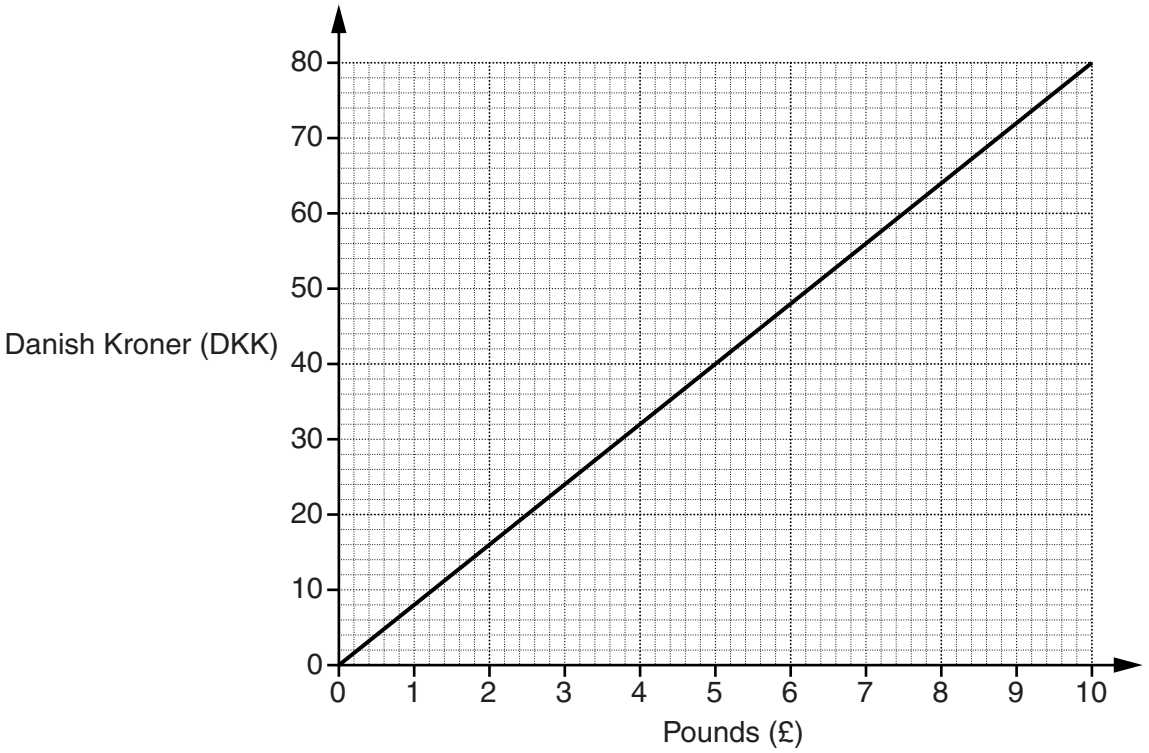
(a) Describe fully the **single** transformation that maps triangle **T** onto triangle **A**.

_____

_____ **[3]**

(b) Enlarge triangle **T** with scale factor 3 and centre P (4, 0). **[2]**

2 This is a graph for converting Pounds (£) to Danish Kroner (DKK).



(a) Use the graph to convert £6 to Danish Kroner (DKK).

(a) _____ DKK **[1]**

(b) Work out the gradient of the line.

(b) _____ **[2]**

(c) Explain what this gradient represents.

_____ **[1]**

(d) Convert 152 DKK to Pounds.

(d) £ _____ **[2]**

3 **(a)** Here is a list of numbers.

39 43 57 79 91 111

Write down all the numbers in this list which are prime numbers.

(a) _____ **[1]**

(b) Write 42 as a product of its prime factors.

(b) _____ **[2]**

(c) Find the lowest common multiple of 24 and 42.

(c) _____ **[2]**

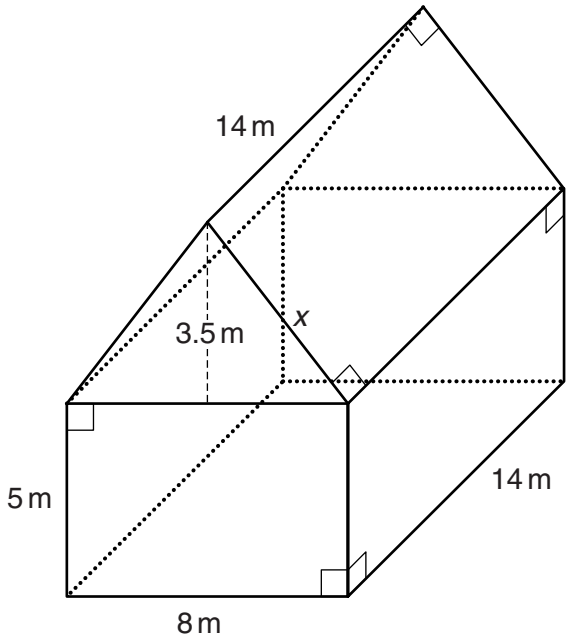
(d) A travel firm has to take 95 pupils on a visit.
It has taxis which take 7 passengers and minibuses which take 15 passengers.
They do not want to have any empty seats.

Work out how many taxis and minibuses they need to use.

(d) taxis = _____

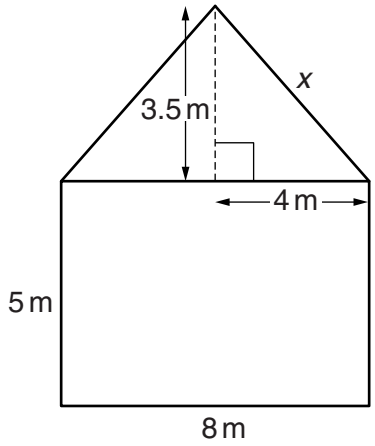
minibuses = _____ **[2]**

4 Here is a diagram of a barn.



(a) The front elevation of the barn is sketched below.

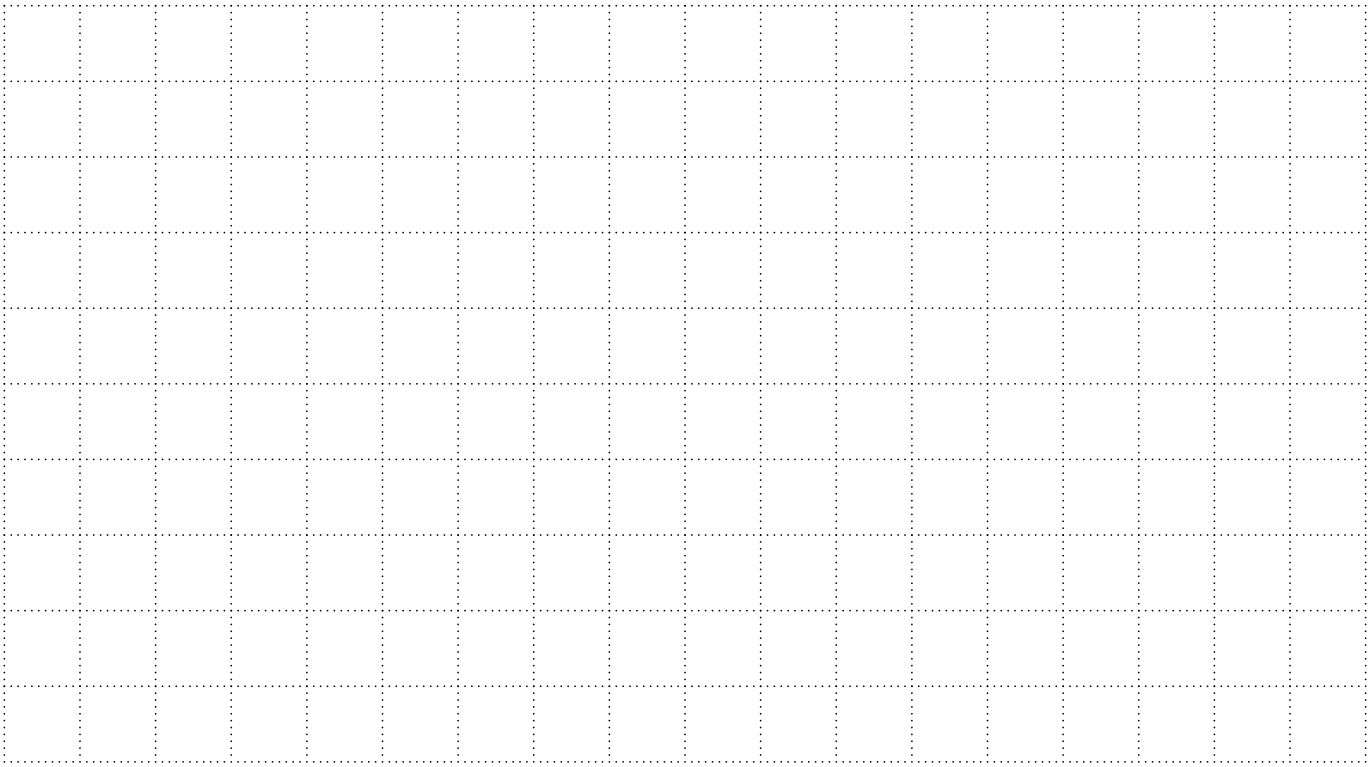
Calculate the length *x*.



Not to scale

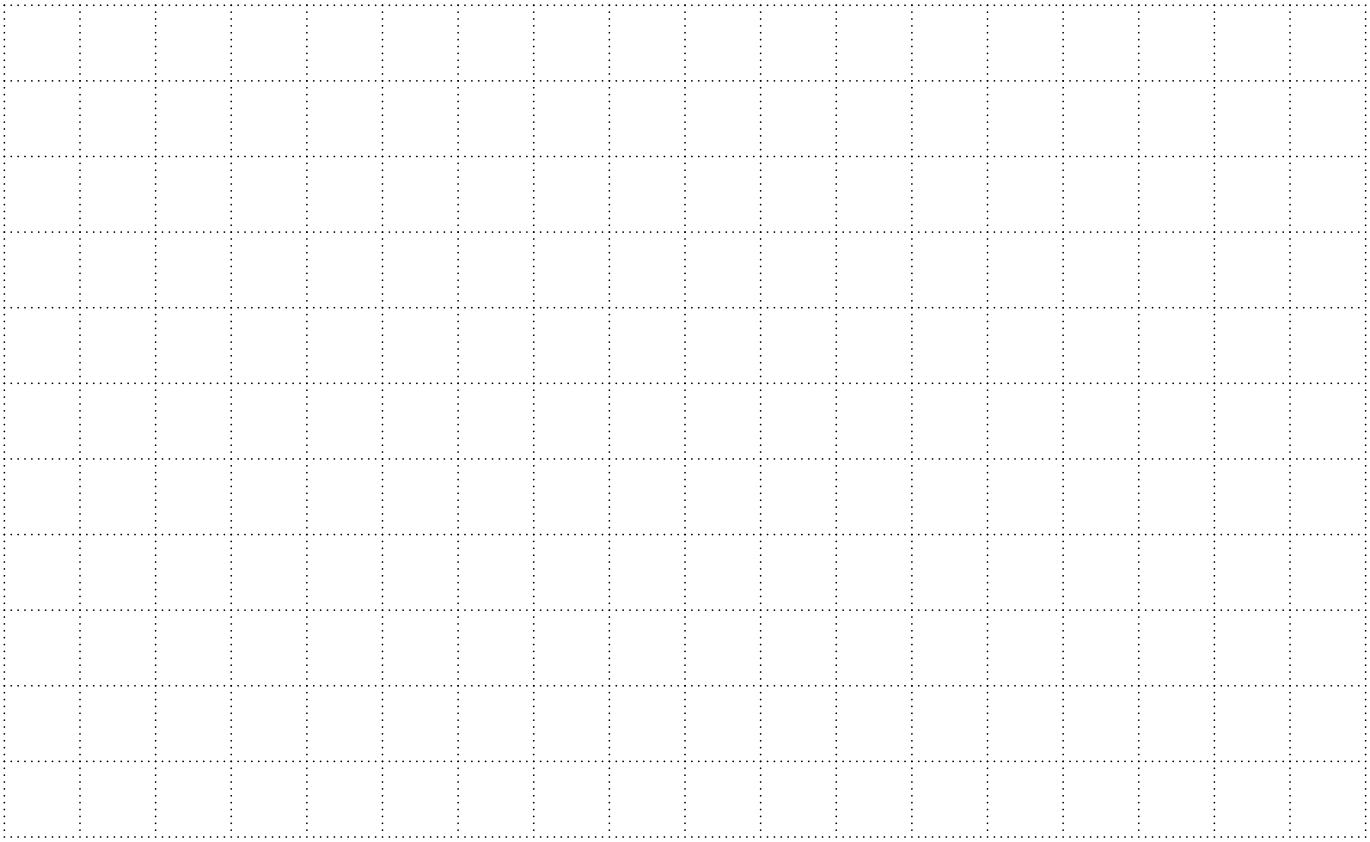
(a) _____ m **[3]**

(b) (i) Draw the **plan view** of the barn on the grid below using a scale of 1 cm to 1 m.



[1]

(ii) Draw the **side elevation** of the barn on the grid below using a scale of 1 cm to 1 m.



[1]

5 Here are the first four terms of a sequence.

17 23 29 35

Write an expression for the nth term.

_____ **[2]**

6 **(a)** Multiply out the brackets and simplify.

$5(x - 3) + 2(x + 5)$

(a) _____ **[2]**

(b) Solve.

$12x - 11 = 4x + 9$

(b) $x =$ _____ **[3]**

7 Golf scores are recorded on cards.
The table summarises the scores for one day.

Score	Frequency
60 – 66	10
67 – 73	15
74 – 80	14
81 – 87	4

(a) Calculate an estimate of the mean score.

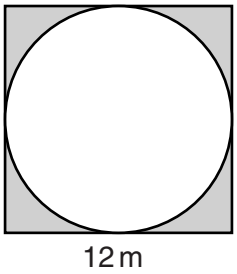
(a) _____ **[4]**

(b) A card is picked at random.

Work out the probability that the score on the card is 73 or below.

(b) _____ **[2]**

8 The diagram shows a circular pond with paving stones around the edge making up a square. The length of each side of the square is 12 m.



Not to scale

Calculate the shaded area.

_____ m^2 **[4]**

9 **(a)** Calculate.

$$\sqrt{18.5^2 - 11.1^2}$$

(a) _____ **[1]**

(b) Here are three cards.

A

$$\frac{1}{2.5^2 - 1.5^2}$$

B

$$\left(\frac{35}{54}\right)^2$$

C

$$\sqrt[3]{0.06}$$

Work out the values written on each card.
Put the values in order, smallest first.

(b) _____ _____ _____ **[2]**

smallest

10 **(a)** The equation $x^3 - x^2 - 40 = 0$ has a solution between $x = 3$ and $x = 4$.

Find this value of x correct to 1 decimal place.
Show clearly your trials and the values of their outcomes.

x			

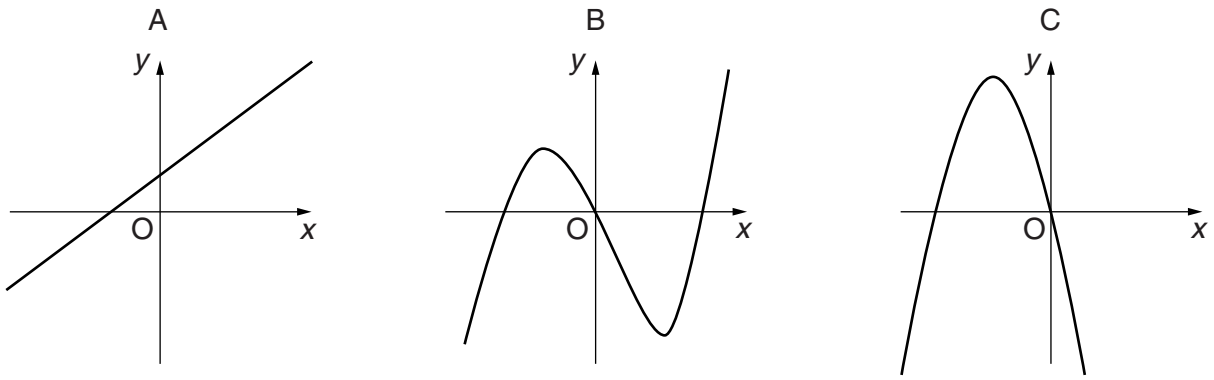
(a) $x =$ _____ **[3]**

(b) Solve.

$$\frac{(x - 5)}{3} + \frac{(3x + 4)}{2} = 15$$

(b) $x =$ _____ **[4]**

11 Here are three sketch graphs.



Write the equation of each graph in the spaces on the answer line.
Choose your answers from this list.

$y = -4x - 4x^2$	$y = 4x$	$y = x^3 - 4x + 4$	$y = 4x^2 - 4x$
$y = -4x + 4$	$y = x^3 - 4x$	$y = 4x - 4x^2$	$y = x + 4$

Graph A is $y =$ _____

Graph B is $y =$ _____

Graph C is $y =$ _____ **[3]**

12 **(a)** Write 16 000 in standard form.

(a) _____ **[1]**

(b) Here are some facts about four planets.

	Mercury	Venus	Earth	Mars
Mass (kg)	3.30×10^{23}	4.87×10^{24}	5.97×10^{24}	6.42×10^{23}
Volume (m^3)	6.08×10^{19}	9.28×10^{20}	1.08×10^{21}	1.63×10^{20}

(i) Complete this sentence, giving your answer correct to 3 significant figures.

The volume of Venus is _____ times the volume of Mercury. **[2]**

(ii) Show that the Earth has the greatest density.
Make all your working clear. **[3]**

13 Make c the subject of this formula.

$$E = mc^2$$

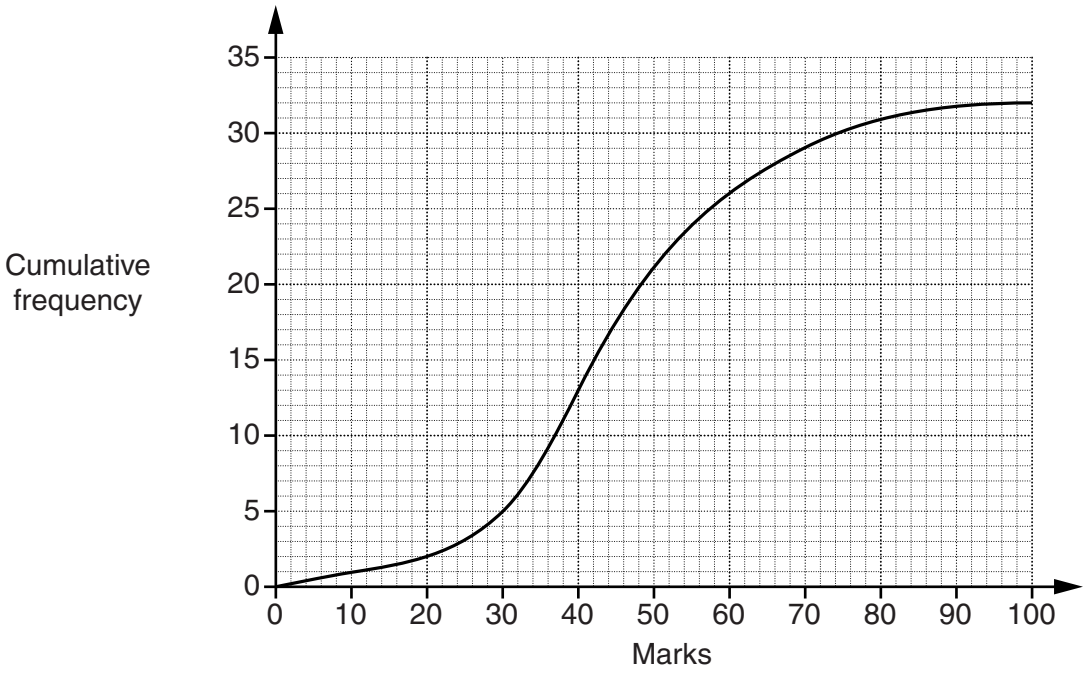
$c =$ _____ **[2]**

14 y is directly proportional to x^2 and $y = 80$ when $x = 4$.

Write a formula for y in terms of x.

_____ **[3]**

15 Mr Chalmers gave a GCSE paper to all the 32 pupils in his class.
The results are summarised in this cumulative frequency graph.



(a) Use the graph to find

(i) the number of pupils who scored 30 marks or fewer,

(a)(i) _____ **[1]**

(ii) the median,

(ii) _____ **[1]**

(iii) the interquartile range.

(iii) _____ **[2]**

(b)* The marks for each grade for the GCSE paper are given in the table below.

Mark	Grade
0 to 9	U
10 to 24	E
25 to 40	D
41 to 54	C
55 to 69	B
70 to 84	A
85 to 100	A*

The percentage of students nationally achieving a grade C, or better, for the paper was 55%. Mr Chalmers says that his pupils' results are better than this.

Is he correct?
Show your working clearly.

[5]

(c) Explain why this may not be a sensible comparison.

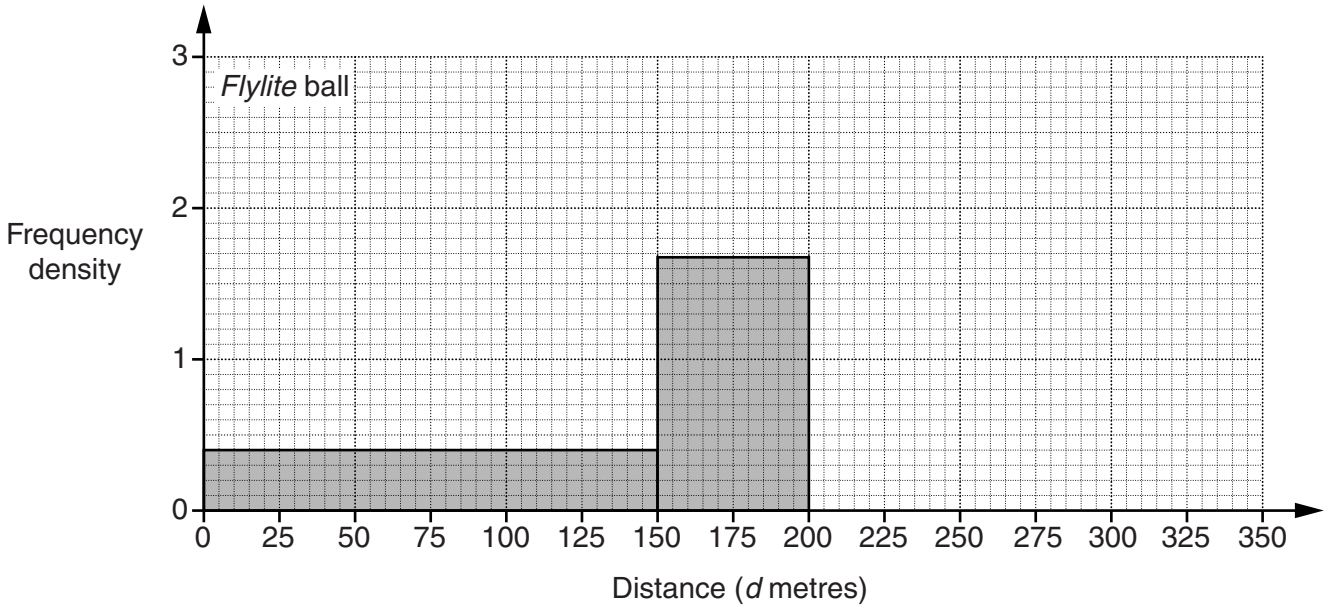
[1]

16 A golfer records the distances he hits golf balls.

(a) The table shows the distances with *Flylite* balls.

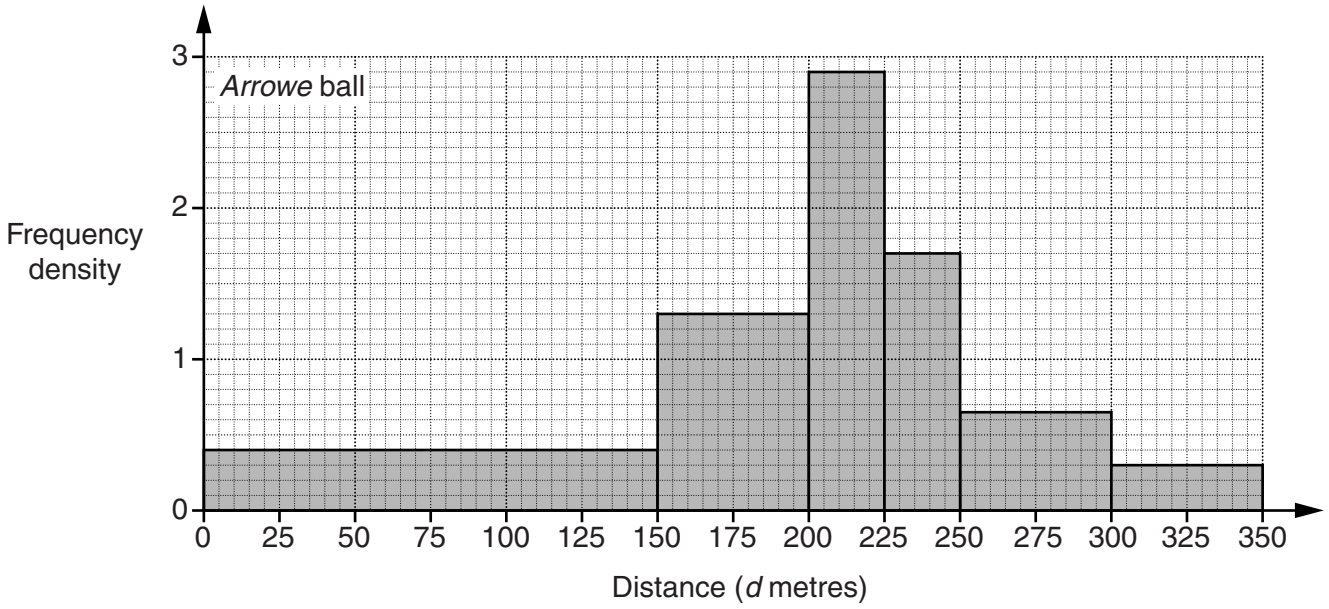
Distance (d metres)	$0 \leqslant d < 150$	$150 \leqslant d < 200$	$200 \leqslant d < 225$	$225 \leqslant d < 250$	$250 \leqslant d < 300$
Frequency	60	84	58	20	15

Complete the histogram for this information.
The shaded values have been drawn for you.



[2]

(b) The histogram below summarises the distances with the *Arrowe* balls.



Make two different comments comparing the distances he hits these two types of ball.
Calculations are not necessary.

Comment 1

Comment 2

[2]

17 Here are the equations of two graphs.

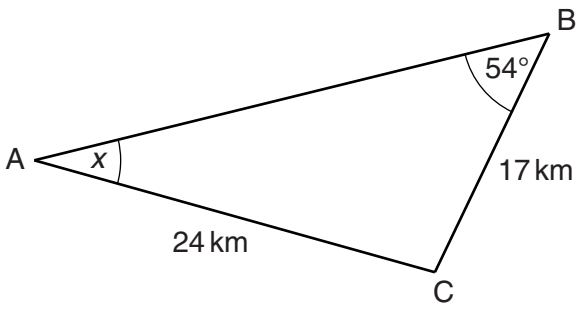
$y^2 = x^2 - 2x + 10$
$y = 3x + 2$

(a) Show that the point of intersection of these graphs satisfies the equation $4x^2 + 7x - 3 = 0$. **[3]**

(b) Solve the equation $4x^2 + 7x - 3 = 0$, giving your answers correct to 2 decimal places.

(b) $x =$ _____ and $x =$ _____ **[3]**

18 ABC is a triangle.



Not to scale

Calculate angle x.

_____ ° **[3]**

19 A building project is expected to cost £4 500 000.
The agreed completion date is 1 January 2014.
After this date, for every month it is delayed, the cost increases by 2% of the cost for the previous month.

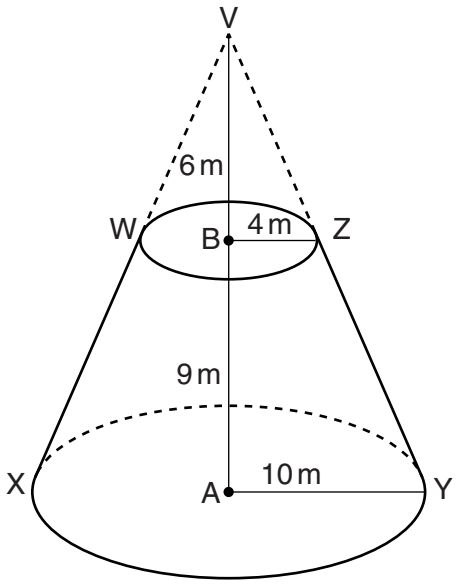
(a) Calculate the cost on 1 April 2014.

(a) £ _____ **[1]**

(b) When the cost first exceeds £5 500 000, for how many months has the project been delayed?

(b) _____ **[3]**

20 WXYZ is a frustum of a cone.



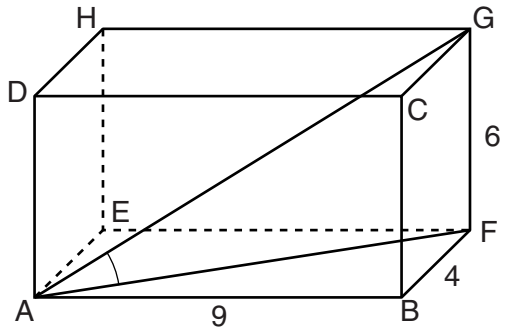
The base radius, AY, of the frustum is 10 m and the top radius, BZ, is 4 m.
VB = 6 m and BA = 9 m.

Calculate the volume of the frustum.

_____ m^3 **[4]**

TURN OVER FOR QUESTION 21

21 ABCDEFGH is a cuboid.



Calculate the angle GAF.

_____ ° **[5]**

END OF QUESTION PAPER