OCR
Oxford Cambridge and RSA

H

Friday 6 November 2015 – Morning

GCSE MATHEMATICS B

J567/04 Paper 4 (Higher Tier)

J56704

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.
* The quality of written communication is assessed in questions marked with an asterisk (*).
* The total number of marks for this paper is **100**.
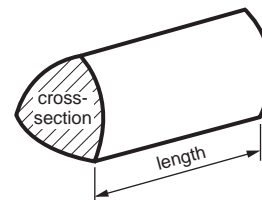* This document consists of **20** pages. Any blank pages are indicated.

[✓] **You are permitted to use a calculator for this paper**

Turn over

2

Formulae Sheet: Higher Tier

Area of trapezium $= \frac{1}{2}(a + b)h$
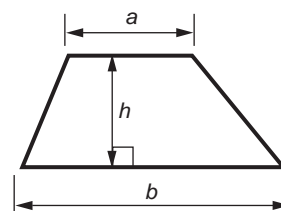
Volume of prism = (area of cross-section) × length
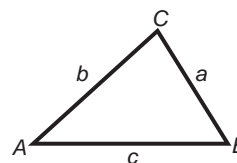

In any triangle *ABC*

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

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

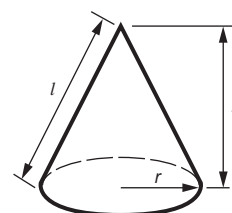**Area of triangle** $= \frac{1}{2}ab \sin C$

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

Surface area of sphere $= 4\pi r^2$
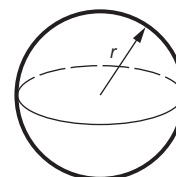
Volume of cone $= \frac{1}{3}\pi r^2 h$

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 **(a)** In the diagram, ABCD is parallel to EFG.
Angle BCF = 55° and angle ABF = 120°.

Not to scale
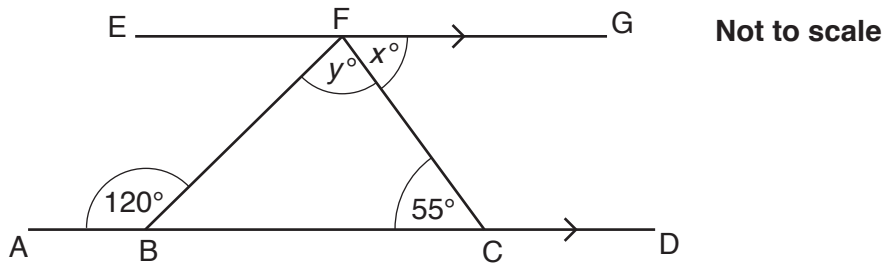
   (i) Complete the sentence with a reason.

   x = 55° because .... **[1]**

   (ii) Work out y.

   (a)(ii) ....° **[2]**

(b) Work out the exterior angle of a regular 18-sided polygon.

   (b) ....° **[2]**

(c) An angle is measured as 27° correct to the nearest degree.

   Write down the smallest possible size of the angle.

   (c) ....° **[1]**

Turn over

2   The dentists in a surgery keep a record of the waiting time for each patient.
    The waiting times for one Monday are summarised in the table.

Waiting time (t minutes)	Frequency		
$0 < t \leqslant 5$	12		
$5 < t \leqslant 10$	15		
$10 < t \leqslant 15$	16		
$15 < t \leqslant 20$	9		
$20 < t \leqslant 25$	5		
$25 < t \leqslant 30$	3		

(a)   Calculate an estimate of the mean waiting time.

(a) .... minutes **[4]**

(b)   Draw a frequency polygon to display the waiting times data.

Frequency

0   5   10   15   20   25   30
Waiting time (minutes)

[3]
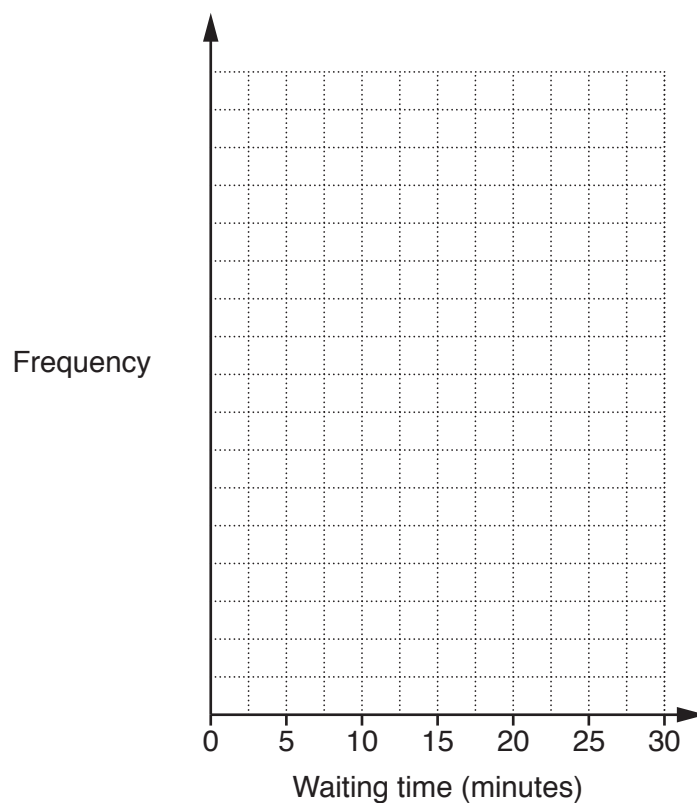
(c) Write down the modal class of the waiting times.

(c) .... minutes **[1]**

(d) The dentists have a target of fewer than 25% of patients waiting more than 15 minutes.

Did they meet their target on Monday? Show how you decide.

.... because ....

.... **[2]**

3 The diagram shows a parallelogram ABCD.

```
        A        8.4 cm        D
                                          Not to scale
  6.2 cm
                                  4.9 cm
        B                C
```
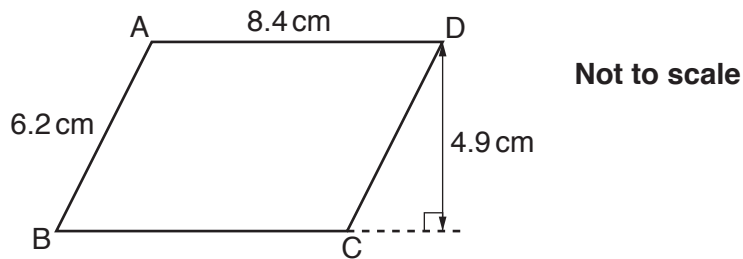
Work out the area of the parallelogram.

.... cm^2 **[2]**

Turn over

4 **(a)** Work out.

$$\sqrt{\frac{2.52 + 4.78}{1.29}}$$

Give your answer correct to three significant figures.

(a) .... **[2]**

(b) **(i)** Find the value of m.

$$2^m \times 2^3 = 4^4$$

(b)(i) .... **[2]**

(ii) In the calculation below p and q are integers and $p > q$.
One pair of values that make this calculation correct is $p = 3$ and $q = 2$.

Find another pair of values that make the calculation correct.

$$\frac{3}{5} \times \frac{5}{p} = \frac{q}{2}$$

(ii) $p =$ .... $q =$ .... **[2]**

7

5 **(a)** Pavel has a pack of cards.
Each card has a picture of either a square, a circle or a triangle.
Each picture is either black or white.
Pavel takes one of the cards from the pack at random.
Some probabilities for this are shown in the table.

	Square	**Circle**	**Triangle**
Black	0.24		0.04
White	0.12	0.20	0.08

(i) Complete the table. **[2]**

(ii) Find the probability that Pavel's card has a picture of a square.

(a)(ii) .... **[1]**

(b) A bag contains red balls, blue balls, yellow balls and green balls.

The probability that a ball taken at random from the bag is red is $\frac{2}{5}$.

The probability that a ball taken at random from the bag is blue is $\frac{1}{10}$.

The probability that a ball taken at random from the bag is yellow is $\frac{3}{8}$.

Find the **minimum** possible number of balls in the bag.

(b) .... **[2]**

6 **(a)** Factorise fully.

$$6xy - 9x^2$$

(a) .... **[2]**

(b) Solve.

$$8x = 3(x + 7)$$

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

(c) Solve this inequality.

$$2x - 7 > 5$$

(c) .... **[2]**

7* A water tank is in the shape of a cylinder.
It has diameter 0.44 m and height 1.2 m.
Water flows into the tank at a rate of 20 litres per minute.
1 litre = 1000 cm³.

John says that it will take about 10 minutes to completely fill the empty tank.
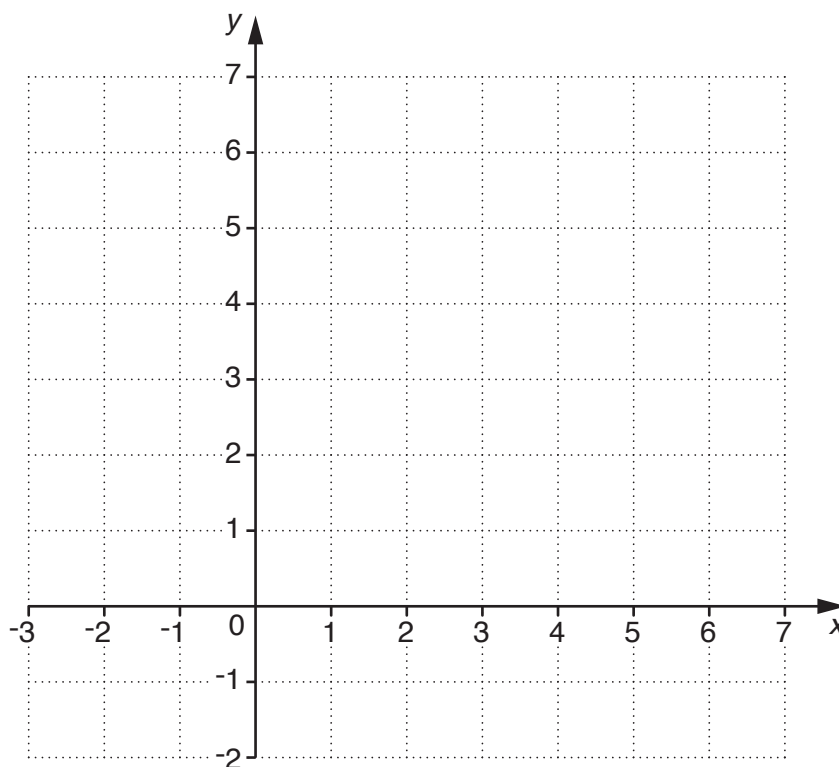Is he correct? Show calculations to justify your answer. **[5]**

10

8 **(a)** Complete the table for $y = 3 - \dfrac{1}{3}x$.

x	-3	0	6
y		3	

[1]

(b) Draw the graph of $y = 3 - \dfrac{1}{3}x$ on the grid below.

[2]

(c) On the same grid, draw the graph of $x + y = 5$. [2]

(d) Use your graphs to solve the simultaneous equations $y = 3 - \dfrac{1}{3}x$ and $x + y = 5$.

(d) $x =$ .... $y =$ .... [2]

9 **(a)** A website has a 24-hour sale offering 12% off all purchases.

   (i) Dina buys a skirt in the sale.
   The original price of the skirt was £36.

   Calculate the price of the skirt in the sale.

   (a)(i) £ .... **[2]**

   (ii) Dina also buys a sweatshirt in the sale.
   She pays £24.20 for the sweatshirt.

   Calculate the original price of the sweatshirt.

   (ii) £ .... **[3]**

(b) Ross has a season ticket.
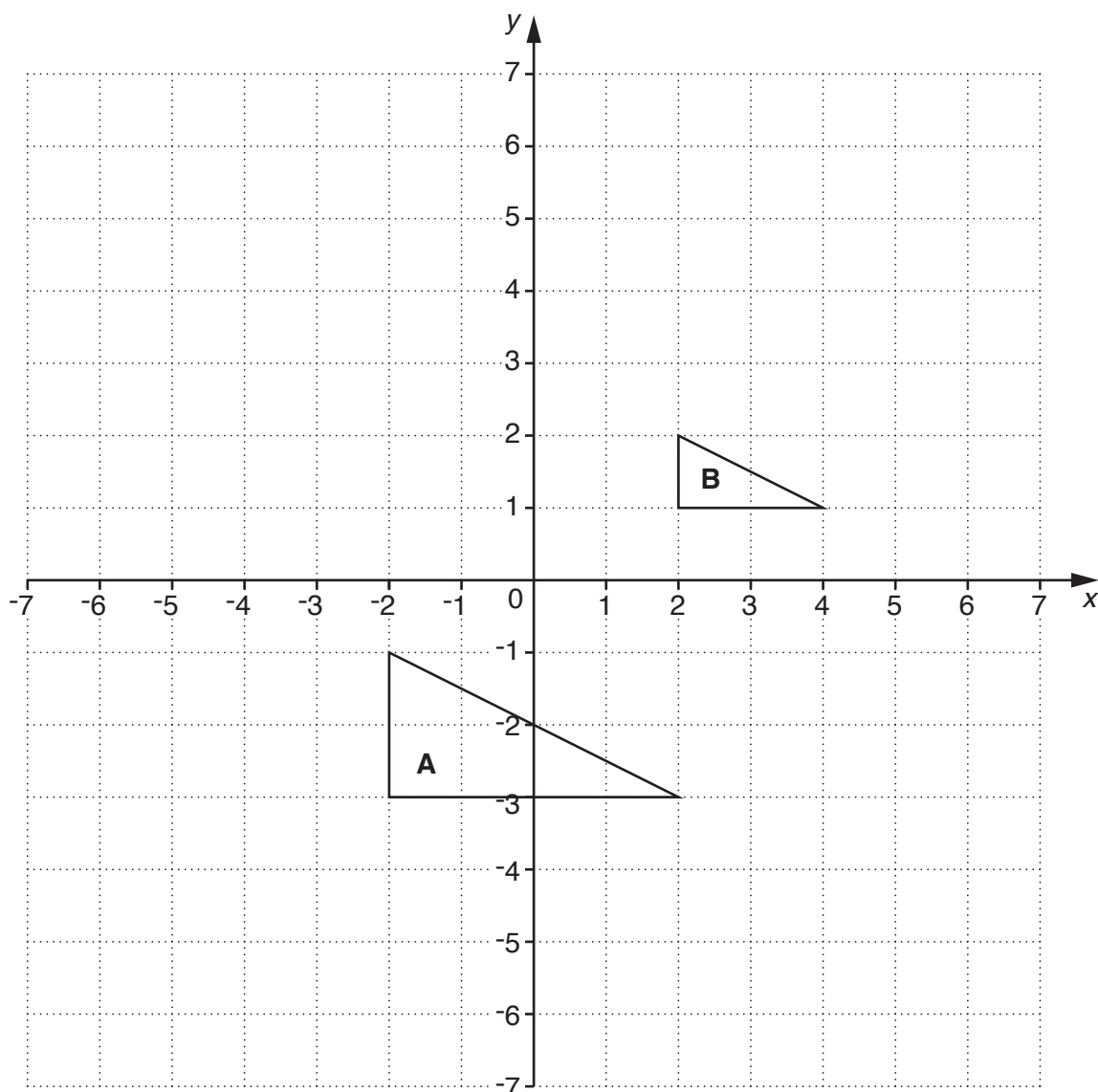   In 2013 the season ticket cost £65.
   In 2014 the cost of the ticket was increased by 8%.
   In 2015 the cost of the ticket was increased by a further 5%.

   Calculate the cost of the season ticket after the two price increases.

   (b) £ .... **[3]**

Turn over

12

10   Triangles **A** and **B** are drawn on the grid below.

Triangle **B** is an enlargement of triangle **A**.

(a)   Write down the coordinates of the centre of the enlargement.

(a) (.......................... , ...) **[1]**

(b)   Write down the scale factor of the enlargement.

(b) .... **[1]**

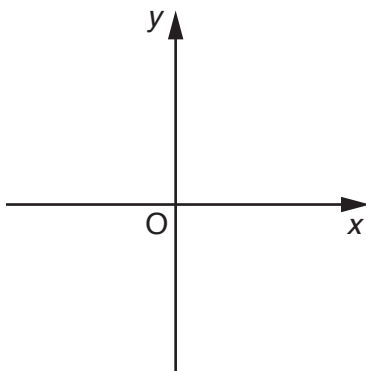**(c)**   Write down the ratio of the area of triangle **A** to the area of triangle **B**.
Give your answer in its simplest form.

(c) .... : .... **[2]**

11 (a) Liam describes a graph.

> It is a linear graph.
> It has a negative gradient.
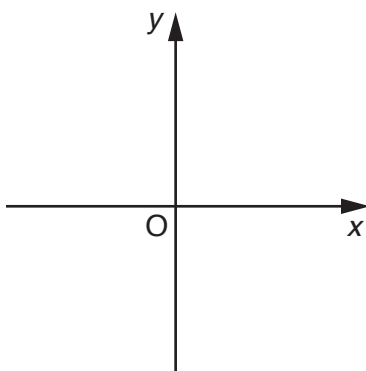> It passes through the origin.

On the axes below, sketch this graph.

[1]

(b) Katy describes a graph.

> It is a cubic graph.
> When x is positive, y is positive.
> The graph only crosses the x-axis once.

On the axes below, sketch this graph.

[2]

Turn over

14

12 (a) Nathan keeps a record of the amount of money that he spends in the supermarket each week.
The table shows this information for an 8-week period and some 4-weekly moving averages.

Week	Amount spent	Moving average
1	£32.80	
2	£23.20	
		£27.40
3	£29.50	
		£26.50
4	£24.10	
5	£29.20	
6	£21.60	
7	£30.50	
8	£22.70	

   (i) Complete the table to show the next three moving averages. **[3]**

   (ii) Describe how the amount Nathan spends on food changes from week to week.

   ....

   .... **[1]**

   (iii) Describe the **trend** in the amount Nathan spends on food.

   ....

   .... **[1]**

(b) The chart below shows the average amount of money spent per week by households in the UK on different items over a number of years.


Key

- Food & non-alcoholic drinks
- Alcoholic drinks, tobacco & narcotics
- Clothing & footwear
- Housing, fuel & power
- Household goods & services
- Health
- Transport
- Communication
- Recreation & culture
- Education
- Restaurants & hotels
- Miscellaneous goods & services
- Other expenditure items
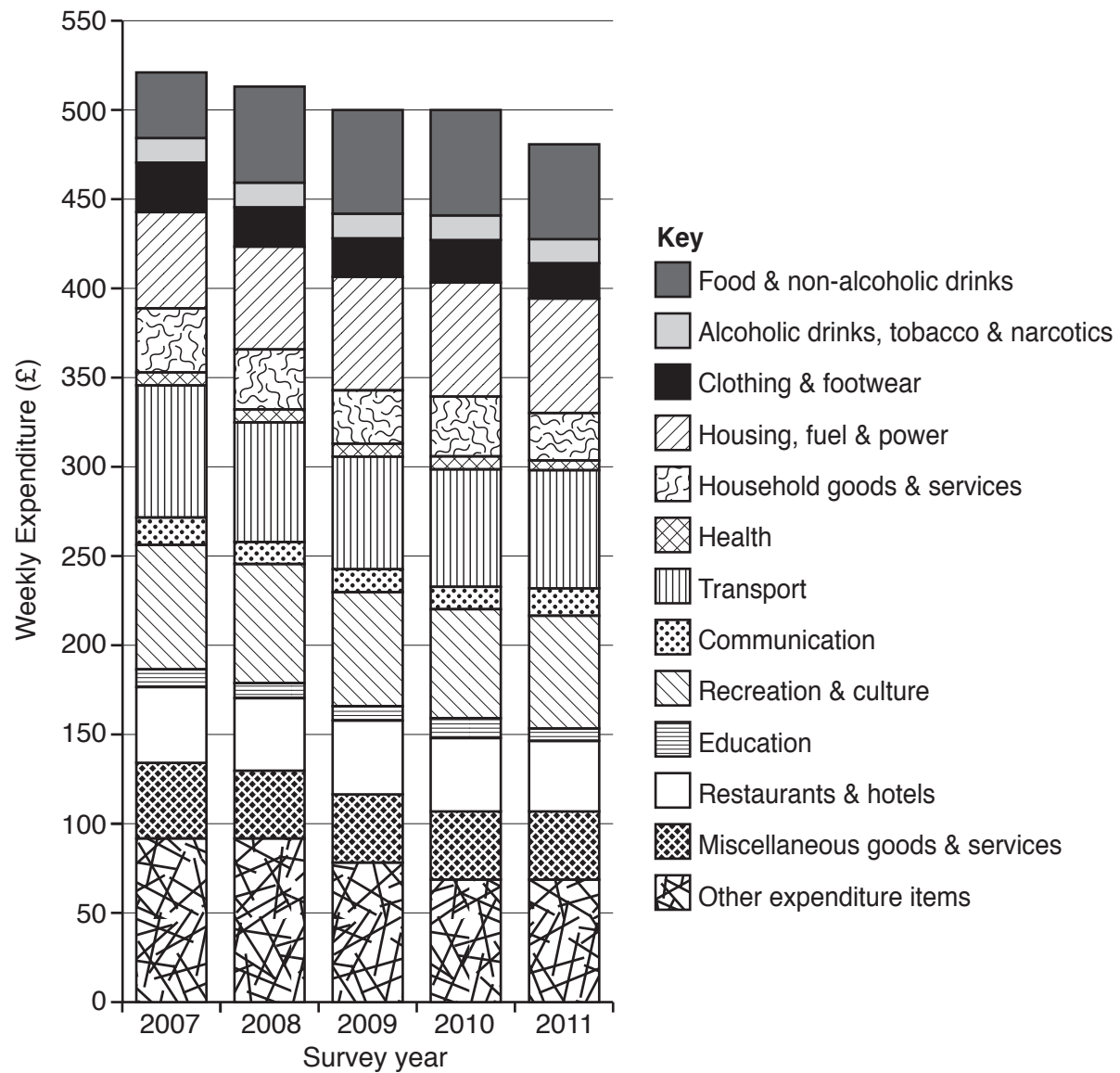
(i) Estimate the average amount of money spent per week by households in the UK in 2007 on housing, fuel and power.

(b)(i) £ .... **[1]**

(ii) Comment on how the total amount of money spent has changed over time.

.... **[1]**

Turn over

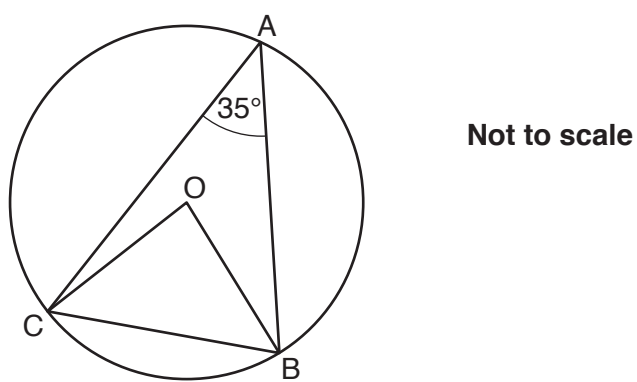**13** The angle of elevation of the top of a building from a point P is 32°.
Point P is 25 m horizontally from the base of the building.

Not to scale
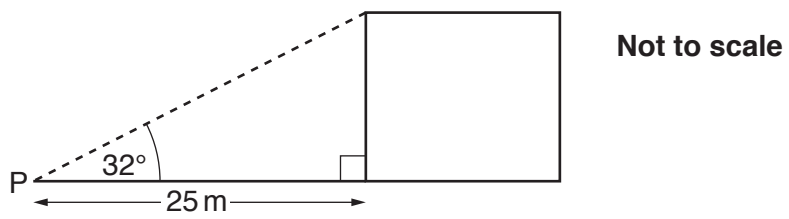
Calculate the height of the building.

.... m **[3]**

14 A, B and C are points on the circle, centre O.
Angle BAC = 35°.

Not to scale

Find angle OBC.
Give a reason for each step of your working.

....

....

....

....

.... **[4]**

15 (a) A candle is in the shape of a cone.
The radius of the base of the cone is 3.5 cm and its height is 10 cm.

Calculate the volume of the candle.

(a) .... cm^3 **[2]**

(b) The mass of a candle is 180 g, correct to the nearest 10 g.
Four of these candles are packed in a box.
The mass of the box is 50 g, correct to the nearest 5 g.

Calculate the upper bound of the total mass of the box of candles.

(b) .... g **[3]**

16 The population of a town is now 84 100.
The population of the town is predicted to rise by 2% each year.

(a) Write down an expression for the population of the town after t years.

(a) .... **[2]**

(b) Find the predicted population of the town after 6 years.

(b) .... **[1]**

Turn over

17 (a) Simplify fully.

$$\frac{x+4}{x^2+2x-8}$$

(a) .... **[3]**

(b) Complete the missing numbers in this identity.

$$x^2 + \ldots\ldots x + 14 = (x + 3)^2 + \ldots\ldots$$ **[3]**

18   A lighthouse, L, is due north of a coastguard station, C.
A boat, B, is 17 km from the coastguard station on a bearing of 059°.
The boat is 35 km from the lighthouse.

North

L

Not to scale

35 km

B

59°

17 km

C

Calculate the bearing of the boat from the lighthouse.

....° **[4]**

19 Solve algebraically these simultaneous equations.

$$y = x^2 + 5x - 4$$

$$y = 8 - 3x$$

Give your answers correct to 2 decimal places.

x =............................ *y* =............................

x =............................ *y* =............................ **[5]**

END OF QUESTION PAPER