GCSE

4370/06

MATHEMATICS – LINEAR
PAPER 2
HIGHER TIER

A.M. MONDAY, 12 November 2012

2 hours

ADDITIONAL MATERIALS

A calculator will be required for this paper.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

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

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **4**.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	3	
2	10	
3	4	
4	8	
5	7	
6	9	
7	10	
8	6	
9	3	
10	11	
11	3	
12	6	
13	2	
14	9	
15	7	
16	2	
TOTAL MARK		

Formula List

Area of trapezium $= \frac{1}{2}(a + b)h$
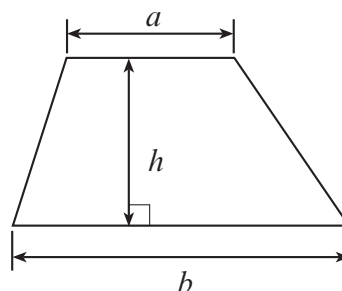
Volume of prism = area of cross-section × length
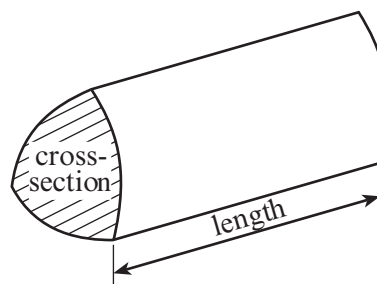
Volume of sphere $= \frac{4}{3}\pi r^3$

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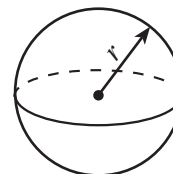
Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$
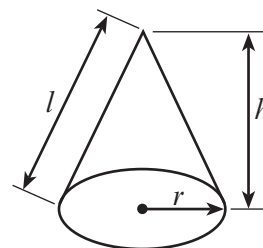
In any triangle ABC

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

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

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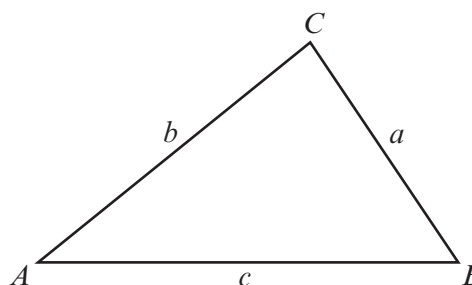
The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

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

(4370-06)

1.
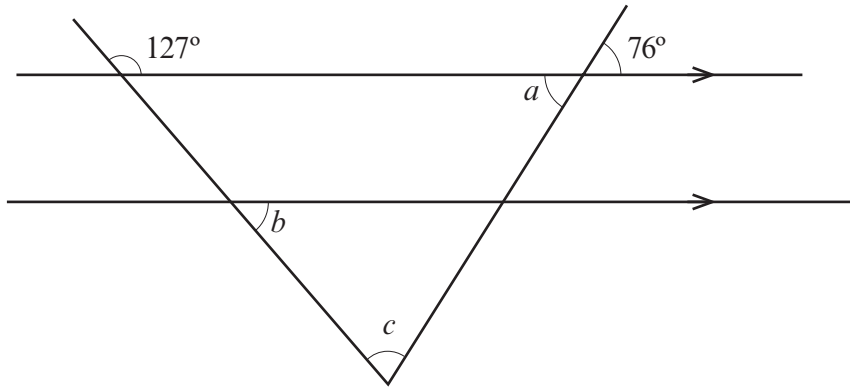
Diagram not drawn to scale

Find the sizes of the angles *a*, *b* and *c*.

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$a =$ .... ° $b =$ .... ° $c =$ .... °

[3]

2. The table below gives information from the Highway Code on stopping distances for cars.

Speed in mph	Stopping distance in metres = Thinking distance + Braking distance (Thinking distance is given first, followed by Braking distance)
20 mph	6 m 6 m
30 mph	9 m 14 m
40 mph	12 m 24 m
50 mph	15 m 38 m

Diagram not drawn to scale

(a) A warning sign for a crossroads is to be placed on a road, which has a speed limit of 30 mph.
Use the data given above to find the minimum distance that the warning sign should be placed from the crossroads.

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[1]

(b) An average car is approximately 4 metres in length. How many car lengths is the stopping distance for a car travelling at 40 mph?

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[2]

3. *(a)* Enlarge the rectangle shown by a scale factor of 2 using (2, 2) as the centre of the enlargement.

[2]
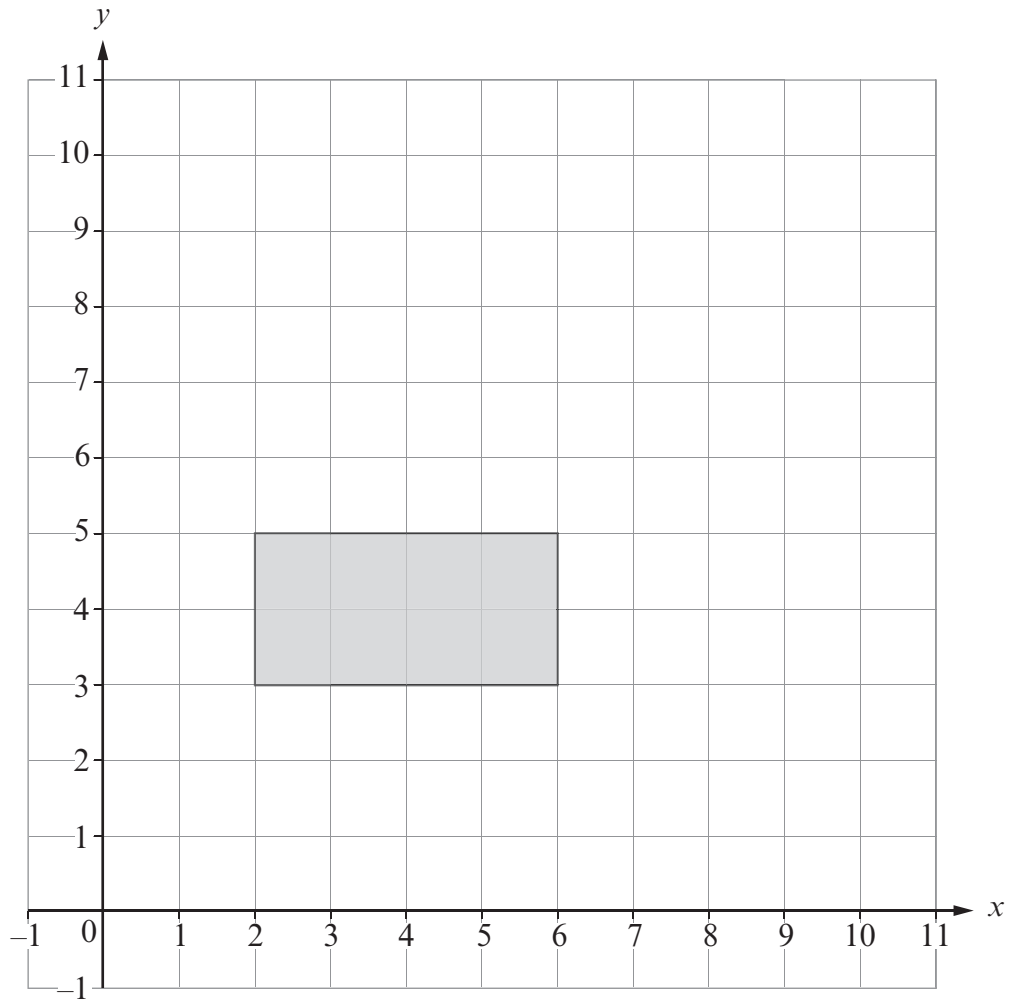
(b) Rotate the rectangle shown below through 180º about the point (2, 1).

[2]

4. *You will be assessed on the quality of your written communication in this question.*

Kate lives in the UK. She goes on holiday to Paris with two friends, Janie who lives in America and Ami who lives in Japan.
They meet in London for a few days and then fly to Paris together.
Janie exchanges 450 American dollars to pounds and Ami exchanges 30 000 Japanese yen to pounds.
In London, Janie and Ami each spend £100 and exchange their remaining money to euros.
Kate also exchanges £250 to euros.

£1 = 129.82 Japanese yen
£1 = 1.57 American dollars
£1 = 1.18 euros

Use the exchange rates shown above to calculate how many euros in total the three girls take to Paris.
You must explain each step of your calculations and show all your working.

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[8]

5. *(a)* In Kingstone, the mean daily snowfall for a week was 5·6 cm.
What would the mean daily snowfall have been if it had snowed 2 cm more on each day?

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[1]

(b) In Greyfield, the snowfall for each of 10 days was measured.
The results are summarised in the table below.

Daily snowfall, s, in cm	Number of days
$4·5 \leqslant s < 5·5$	4
$5·5 \leqslant s < 6·5$	2
$6·5 \leqslant s < 7·5$	1
$7·5 \leqslant s < 8·5$	1
$8·5 \leqslant s < 9·5$	2

(i) Calculate an estimate for the mean daily snowfall for the 10 days.

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[4]

(ii) State the modal class.

Modal class ....

[1]

(iii) Write down the class in which the median lies.

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[1]

6. *(a)* Calculate the volume of a cylinder with a diameter of 4·6 cm and a height of 8·4 cm.

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[3]

(b)
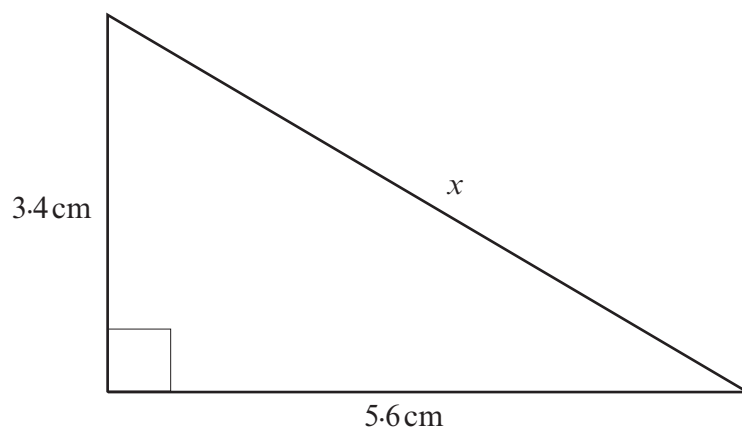
Diagram not drawn to scale

(i) Calculate the length of the side marked x in the diagram above.
Give your answer correct to 2 significant figures.

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[4]

(ii) Calculate the area of the triangle.

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[2]

7. The arm lengths of 100 women were measured in centimetres.
The table below shows a grouped frequency distribution of the results.

Arm length, l cm	$50 < l \leqslant 55$	$55 < l \leqslant 60$	$60 < l \leqslant 65$	$65 < l \leqslant 70$	$70 < l \leqslant 75$
Frequency	4	18	38	30	10

(a) On the graph paper below, draw a frequency polygon to show this data.

[2]

Frequency
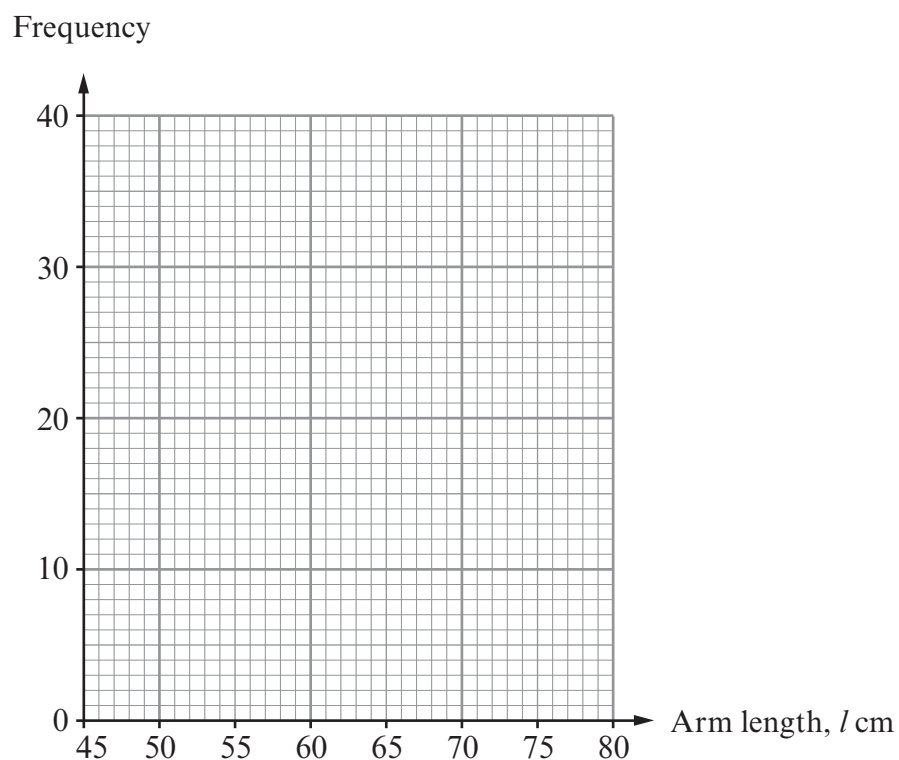
Arm length, l cm

(b) Complete the following cumulative frequency table.

Arm length, l cm	$l \leqslant 50$	$l \leqslant 55$	$l \leqslant 60$	$l \leqslant 65$	$l \leqslant 70$	$l \leqslant 75$
Cumulative frequency	0	4				

[1]

(c) Use the graph paper below to draw a cumulative frequency diagram for the arm lengths of the 100 women.

[4]

Cumulative frequency

Arm length, *l* cm
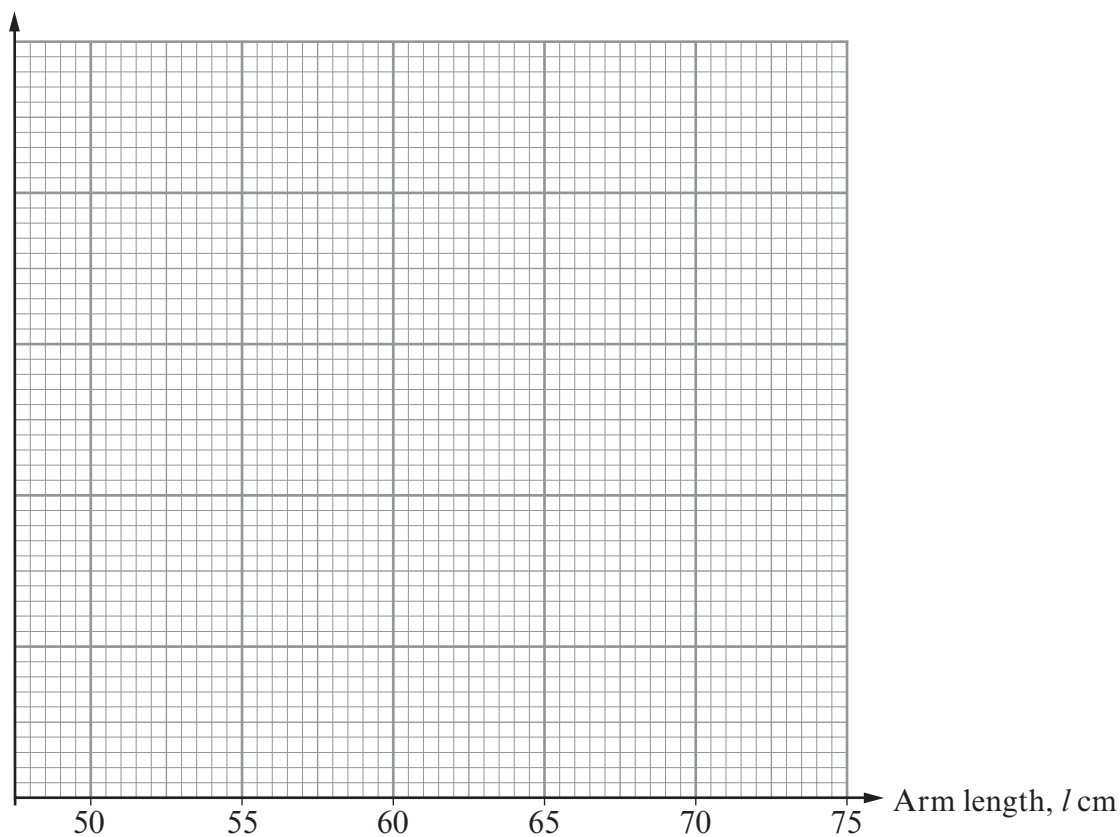
(d) Use your cumulative frequency diagram to find estimates for

(i) the median,

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[1]

(ii) the interquartile range.

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[2]

8. A warehouse stores electrical goods in boxes.
The boxes are all cuboids.

(a) One of the boxes has a depth of 46 cm, a width of 55 cm and a length of 62 cm, where all the measurements are correct to the nearest centimetre.

(i) Write down the greatest and least possible values for each of these measurements in the table below.

Dimension	Least value	Greatest value
Depth 46 cm	.... cm	.... cm
Width 55 cm	.... cm	.... cm
Length 62 cm	.... cm	.... cm

[2]

(ii) Hence, calculate the **greatest** possible volume of the box.

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[2]

(b) Another box has dimensions x cm by y cm by z cm.
Each of these measurements is correct to the nearest cm.
Find an expression for the **least** possible volume of this box in terms of x, y and z.
You do not need to simplify your expression.

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[2]

9.
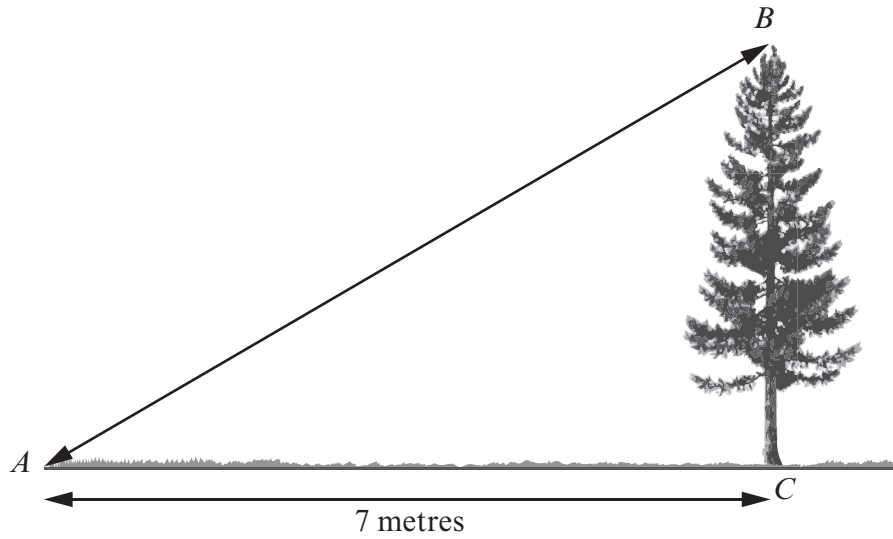
The height of a vertical tree is 3·2 metres.
The horizontal distance of a point *A* from the base of the tree is 7 metres.
Calculate the angle of elevation of the top of the tree from the point *A*.

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[3]

10. *(a)* Solve the following simultaneous equations using an algebraic method.

$$3x + 2y = 27$$
$$2x - 5y = 37$$

[4]

(b) Solve $\dfrac{3 + x}{2} + \dfrac{2x - 1}{11} = 13$.

[4]

(c) Rearrange the following formula to make *r* the subject.

$$7r - b = ar - c$$

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[3]

11. A unit of measure used with textiles is the denier.
Silk is said to measure 1 denier when 9000 m of a single strand of the silk weights 1 g.

1 denier is the same as 1 g per 9000 m

(a) Complete the statement.

1 denier is the same as .... g per 450 m

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[1]

(b) Complete the following statement, giving your answer in standard form correct to two significant figures.

1 denier is the same as .... g per metre

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[2]

12. *(a)* The diagram shows a circle with centre *O*.
The points *A*, *B*, *C* and *D* all lie on the circumference of the circle.
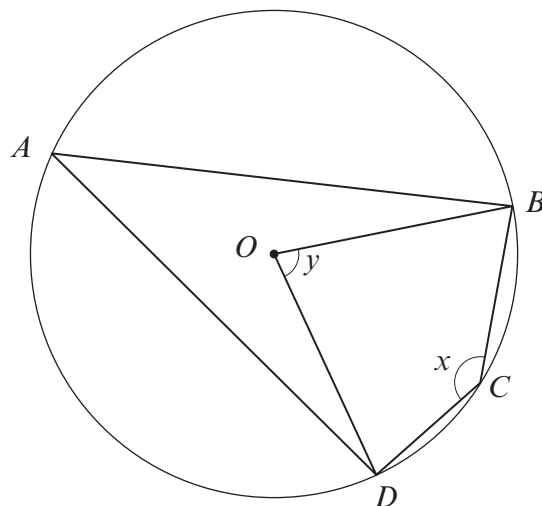
Diagram not drawn to scale

Find an expression for *y* in terms of *x*.

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[2]

(b) A circle has a diameter *FH*.

The point *G* is a point on the circumference of the circle.

Given that the length of the straight line *GH* = 6·8 cm and $G\hat{F}H$ = 32°, calculate the length of *FH*.

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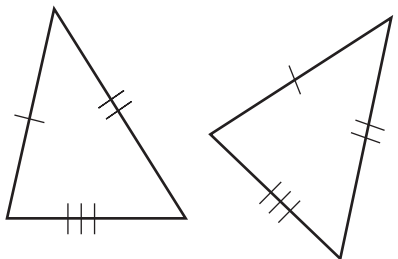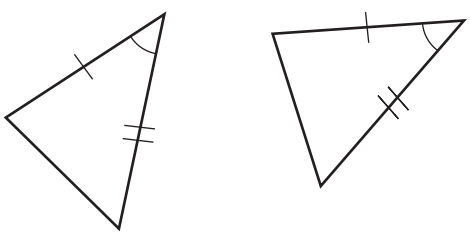
[4]

13. State why each of the pairs of triangles below are congruent.

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[2]

14. The point B is at the centre of the circle.
The points P and Q are on the circumference of the circle.

Diagram not drawn to scale

Calculate the area of the shaded sector.

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[9]
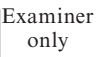
15. It is suggested that the three letters **a**, **e** and **r** are the most frequently used letters in the English language.
Six sentences were chosen at random from a newspaper article.
The total number of the letters **a**, **e** and **r** in each sentence was recorded.

Sentence number	1	2	3	4	5	6
Total number of letters a, e and r	8	6	8	3	4	5
Total number of letters in the sentence	36	22	42	8	10	14

    (a) Using all of this information, calculate the best estimate of the probability that a letter chosen at random from this article is one of the letters **a**, **e** or **r**.

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    (b) All of the letters from the 6 sentences are placed in a bag.
Two letters are selected at random from the bag and not replaced.
Calculate the probability that at least one of the letters is a letter **a**, **e** or **r**.
Give your answer correct to two decimal places.
You must show your working.

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16. Using the axes below, **sketch** the graph of $y = \cos x + 1$ for values of x from 0° to 360°.

[2]