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	
TOTAL	

General Certificate of Secondary Education
Higher Tier
January 2012

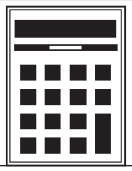
Methods in Mathematics (Linked Pair Pilot) 93652H

Unit 2 Geometry and Algebra

Thursday 19 January 2012 1.30 pm to 3.00 pm

H

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



Time allowed
- 1 hour 30 minutes

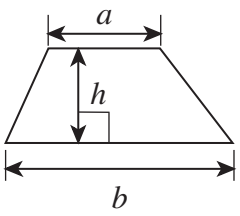
Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the space provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work that you do not want to be marked.
- If your calculator does not have a π button, take the value of π to be 3.14 unless another value is given in the question.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- The quality of your written communication is specifically assessed in Questions 1, 5 and 16.
  These questions are indicated with an asterisk (*).
- You may ask for more answer paper, graph paper and tracing paper.
  These must be tagged securely to this answer booklet.
- You are expected to use a calculator where appropriate.

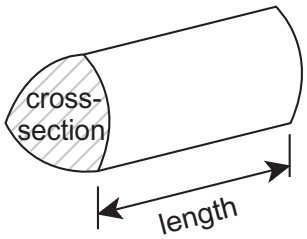
Advice
- In all calculations, show clearly how you work out your answer.

Formulae Sheet: Higher Tier

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

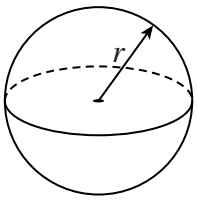


Volume of prism = area of cross-section × length



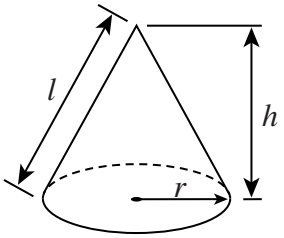
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

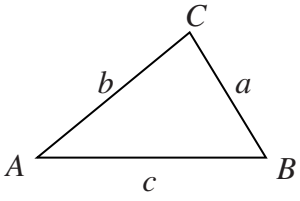


In any triangle ABC

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** Decrease £632 by 7.5%.

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Answer £ ..... *(3 marks)*

2 (a) Expand $5(x + 7)$

.....

Answer ..... *(1 mark)*

2 (b) Factorise $3x - 12$

.....

Answer ..... *(1 mark)*

2 (c) Expand and simplify $3(5x + 2) - 4(2x - 1)$

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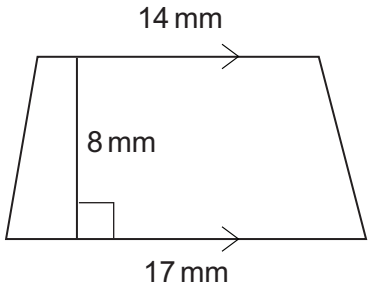
Answer ..... *(3 marks)*

3 Work out the area of the shape shown.



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Answer ..... mm^2 *(2 marks)*

10

Turn over ▶

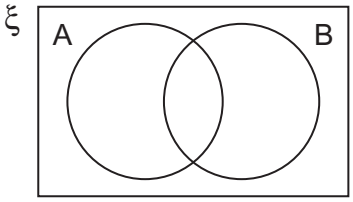
4 Match the appropriate Venn diagram with the following pairs of sets.

Pair X: Set A is the multiples of 4.
Set B is the multiples of 8.

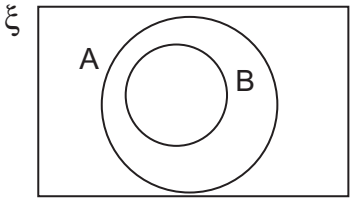
Pair Y: Set A is the even numbers.
Set B is the odd numbers.

Pair Z: Set A is the multiples of 3.
Set B is the multiples of 5.

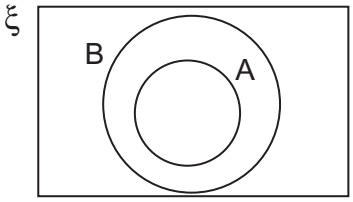
Venn diagram 1



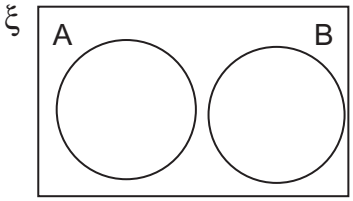
Venn diagram 2



Venn diagram 3



Venn diagram 4

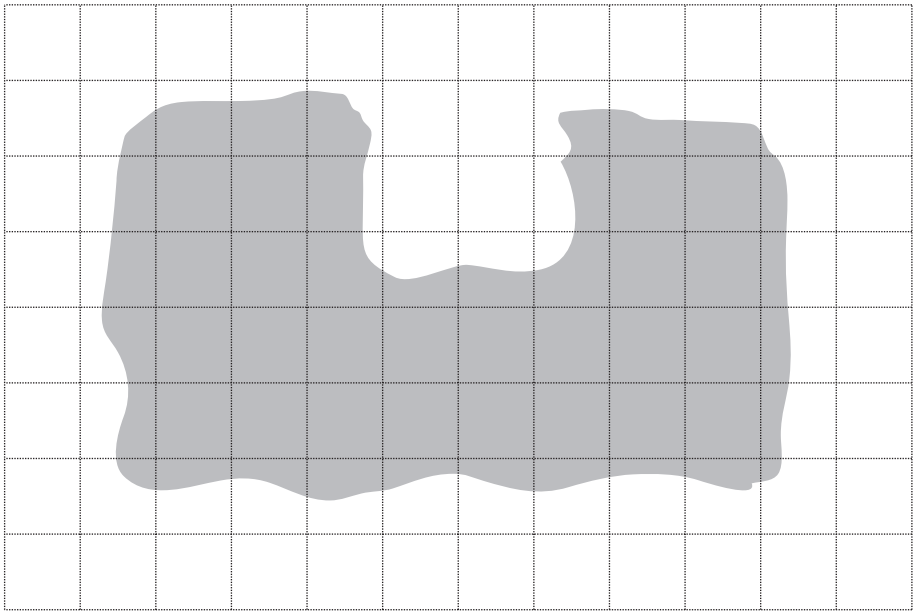


Answer Pair X matches Venn diagram .....

Pair Y matches Venn diagram .....

Pair Z matches Venn diagram ..... *(3 marks)*

***5** A shape is shaded on a centimetre grid.



Simon says that the area of the shaded shape is between 24 cm^2 and 56 cm^2.

Explain why Simon is correct.
You may mark the diagram to help you with your answer.

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(3 marks)

6

6 Use your calculator to work out $\dfrac{3.17 + 8.42}{16.3 - 7.84}$

6 (a) Write down your full calculator display.
Give your answer as a decimal.

.....

Answer ..... *(1 mark)*

6 (b) Write your answer to part **(a)** to 3 significant figures.

.....

Answer ..... *(1 mark)*

7 Airmail stamps are 73p.
First class stamps are 42p.
Jack buys some of each.
He spends £40.97.

7 (a) How can you tell from the amount he spends that he buys an odd number of airmail stamps?

.....

.....
(1 mark)

7 (b) Jack buys four times as many first class stamps as airmail stamps.

How many of each stamp does he buy?

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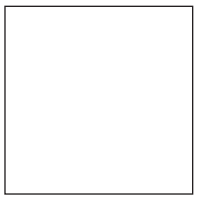
Answer Airmail stamps .....

First class stamps ..... *(3 marks)*

8 (a) How many lines of symmetry does a square have?



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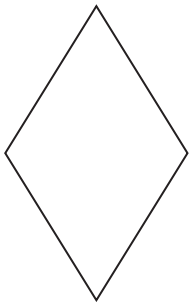
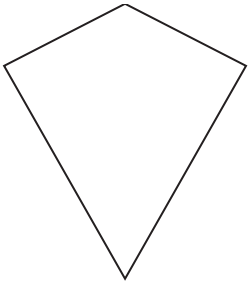
Answer ..... *(1 mark)*

8 (b) Here are three quadrilaterals.



rhombus

parallelogram



kite

Give a reason why each of the quadrilaterals could be the odd one out.

8 (b) (i) The rhombus could be the odd one out because .....

.....

(1 mark)

8 (b) (ii) The parallelogram could be the odd one out because .....

.....

(1 mark)

8 (b) (iii) The kite could be the odd one out because .....

.....

(1 mark)

10

9 (a) Solve the equation $9x - 3 = 5x + 2$

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Answer x = ... *(3 marks)*

9 (b) Solve the equation $\frac{4}{y} + 3 = 11$

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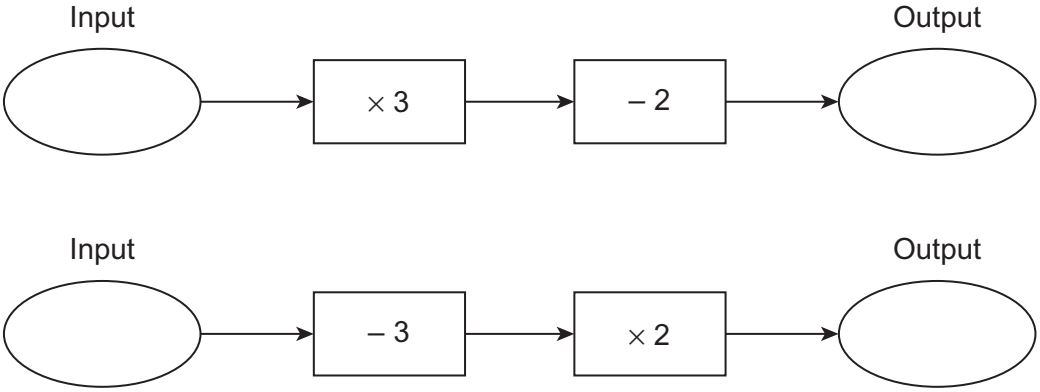
Answer y = ... *(3 marks)*

10 Here are two number machines.



The same number is put into each machine.
The two outputs are equal.

What number is put in?

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

Turn over for the next question

10

11 (a) Work out the nth term of the sequence.

6 11 16 21 26 .....

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Answer ..... *(2 marks)*

11 (b) Work out the nth term of the sequence.

9 15 23 33 45 .....

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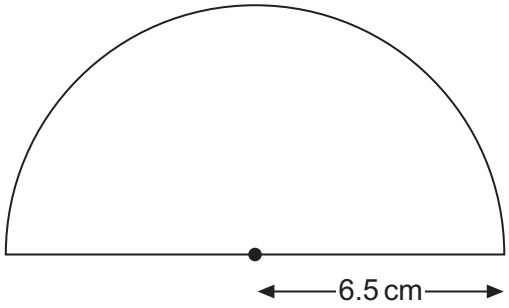
Answer ..... *(4 marks)*

12 Calculate the perimeter of this semicircle of radius 6.5 cm.



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

13 Number A written as a product of its prime factors is $2 \times 3^2 \times 7$
Number B written as a product of its prime factors is $2^2 \times 3 \times 5 \times 7$

13 (a) Show that the Highest Common Factor (HCF) of A and B is 42.

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(1 mark)

13 (b) Work out the Least Common Multiple (LCM) of A and B.

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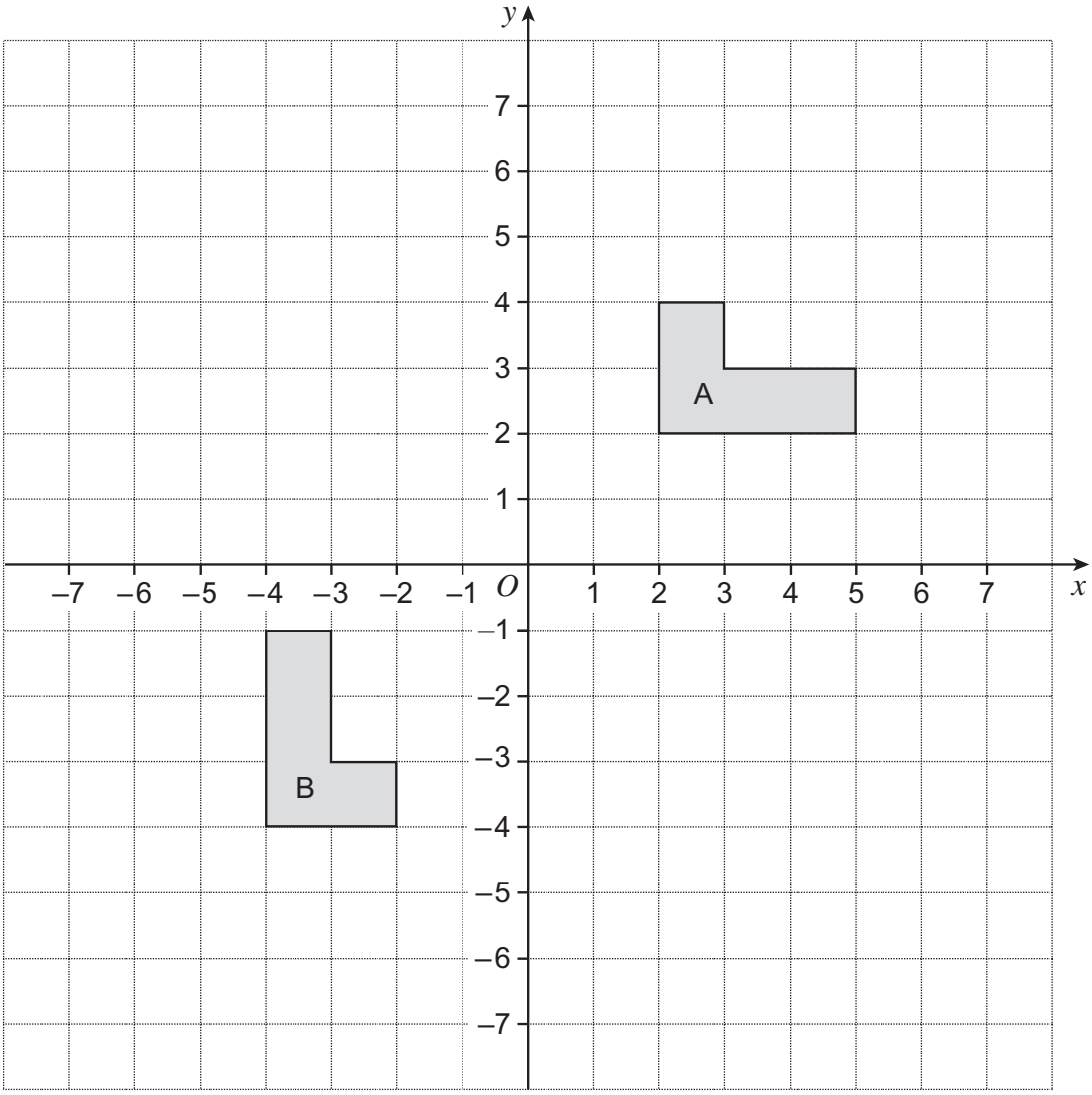
Answer ..... *(2 marks)*

12

14 The diagram shows shapes A and B.



Shape A is mapped onto shape B by a reflection in one of the axes followed by a rotation.

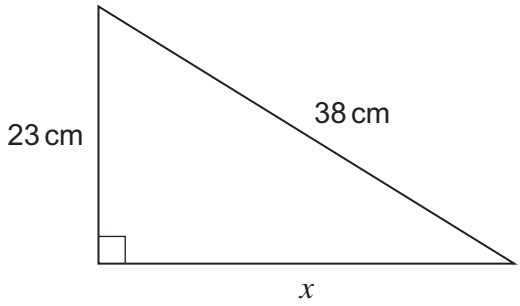
Complete the sentence.

Shape A is mapped onto shape B by a reflection in .....

followed by a rotation .....

(3 marks)

15 (a) Calculate the length x in the triangle.



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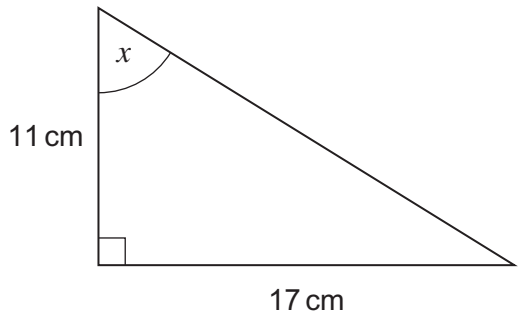
Answer ..... cm *(3 marks)*

15 (b) Calculate the angle x in the triangle.



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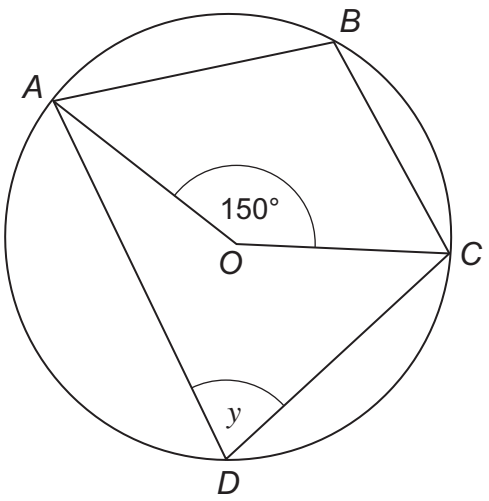
Answer ..... degrees *(3 marks)*

9

Turn over ▶

16 (a) *ABCD* are points on the circumference of a circle centre *O*.

Angle *AOC* = 150º.



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Write down the value of angle y.
Give a reason for your answer.

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Answer ..... degrees

Reason .....

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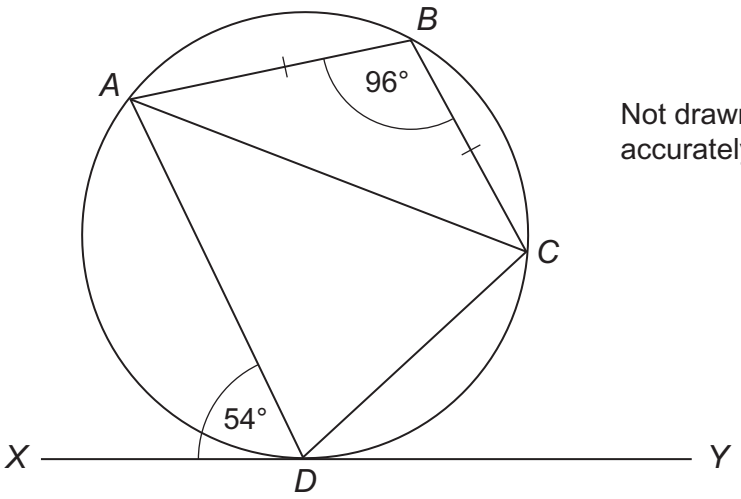
(2 marks)

***16 (b)** *ABCD* is a cyclic quadrilateral.
Triangle *ABC* is isosceles.
XY is a tangent to the circle at *D*.
Angle *ABC* = 96º
Angle *XDA* = 54º



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Prove that *AD* is parallel to *BC*.
Give reasons for any angles you write down or calculate.

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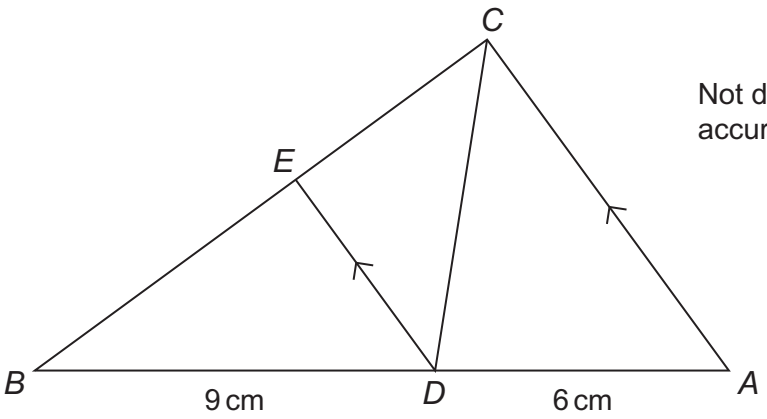
(5 marks)

7

17 Triangle *ABC* has an area of 50 cm^2.

DE is parallel to *AC*.

AD = 6 cm and *DB* = 9 cm.



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17 (a) Show clearly why the area of triangle *BDC* is 30 cm^2.

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(2 marks)

17 (b) Work out the area of triangle *BDE*.

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

18 Solve the equation $\frac{5}{2x-1} - \frac{2}{2x+1} = 2$

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Answer x = ... *(6 marks)*

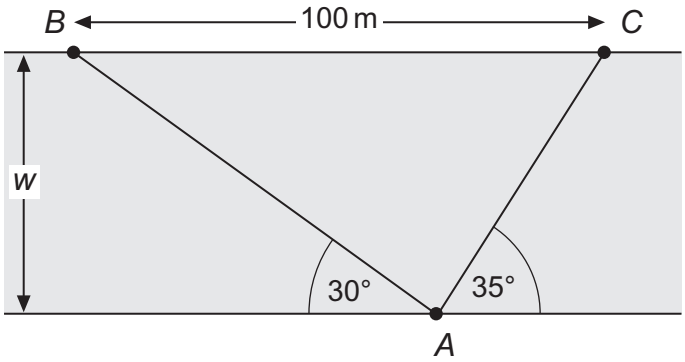
Turn over for the next question

11

19 Max stands at a point *A* on the bank of a river with parallel straight sides.

He can see two posts at *B* and *C* on the other side of the river.
He knows the posts are 100 metres apart.

The angle between the bank and the line *AB* is 30º.
The angle between the bank and the line *AC* is 35º.



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Work out the width of the river, *w*.

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

END OF QUESTIONS

5

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