

Centre Number						Candidate Number				
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Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Pages	Mark
3	
4 – 5	
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12 – 13	
14 – 15	
16 – 17	
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TOTAL	



General Certificate of Secondary Education
Higher Tier
January 2012

Methods in Mathematics (Linked Pair Pilot)

93652H

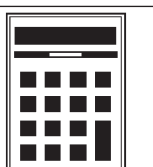
Unit 2 Geometry and Algebra

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.



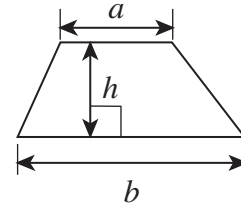
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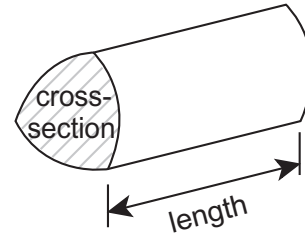
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Formulae Sheet: Higher Tier

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

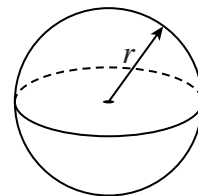


Volume of prism = area of cross-section \times length



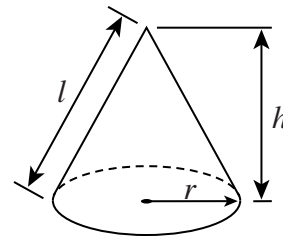
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

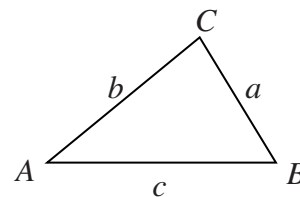


In any triangle ABC

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 $5(x + 7)$

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Answer (1 mark)

2 (b) Factorise $3x - 12$

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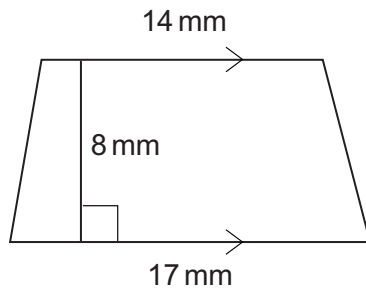
Answer (1 mark)

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 mm² (2 marks)

10

Turn over ►

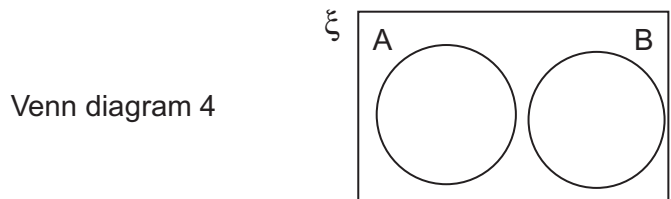
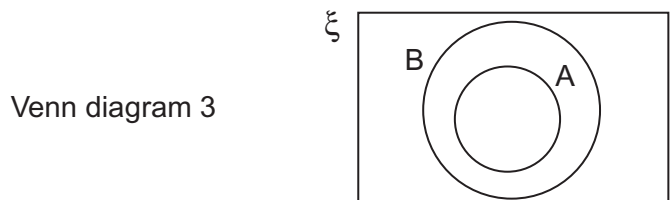
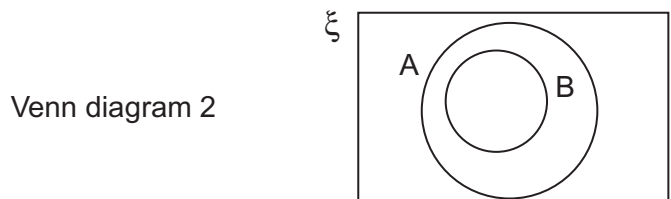
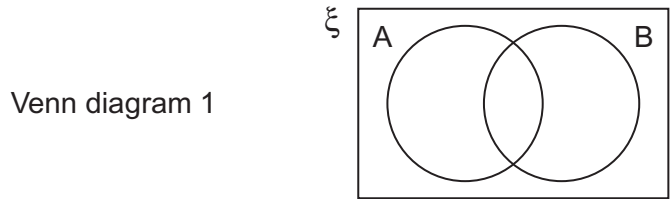


4 Match the appropriate Venn diagram with the following pairs of sets.

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.



Answer Pair X matches Venn diagram

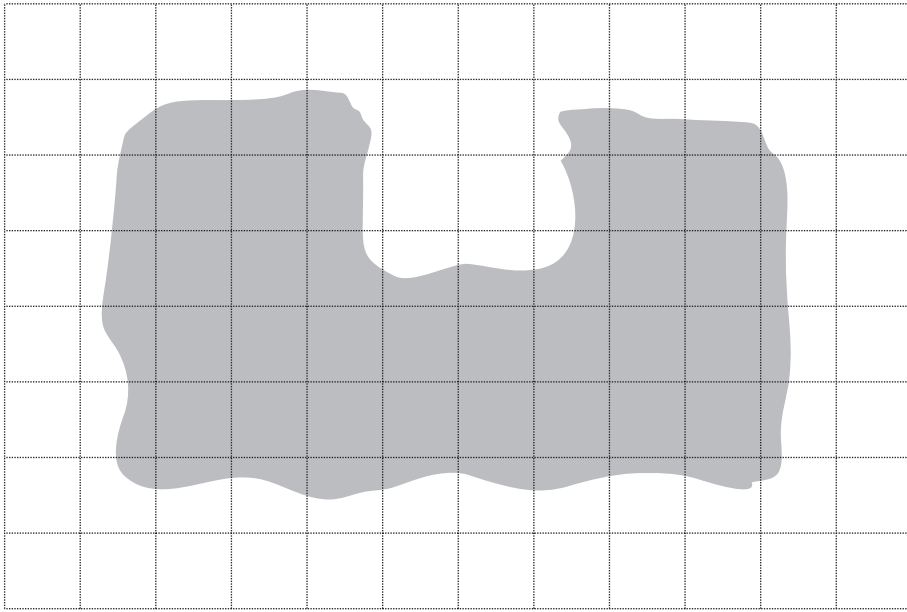
Pair Y matches Venn diagram

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

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?

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(1 mark)

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

How many of each stamp does he buy?

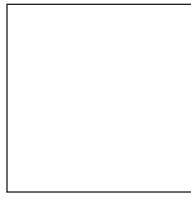
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Answer Airmail stamps

First class stamps (3 marks)



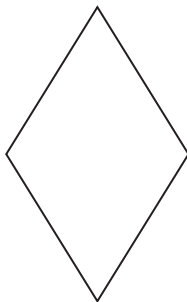
8 (a) How many lines of symmetry does a square have?



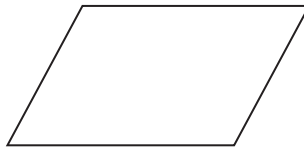
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Answer (1 mark)

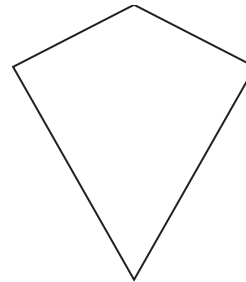
8 (b) Here are three quadrilaterals.



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

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(1 mark)

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

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(1 mark)



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

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Answer $x =$ (3 marks)

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

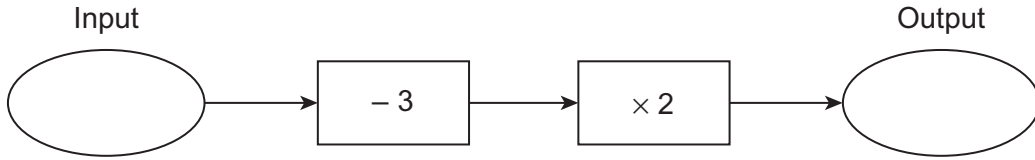
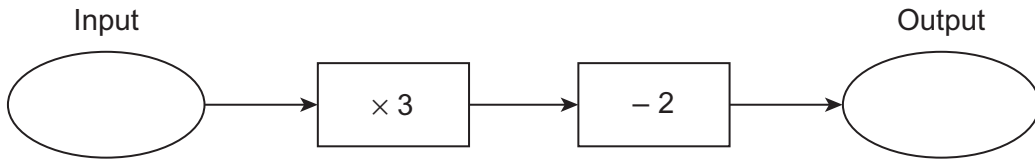
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Answer $y =$ (3 marks)



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



11 (a) Work out the n th term of the sequence.

6 11 16 21 26

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Answer (2 marks)

11 (b) Work out the n th term of the sequence.

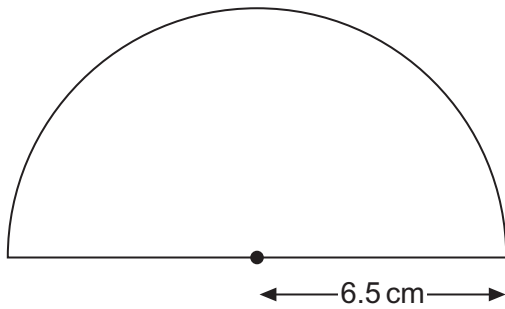
9 15 23 33 45

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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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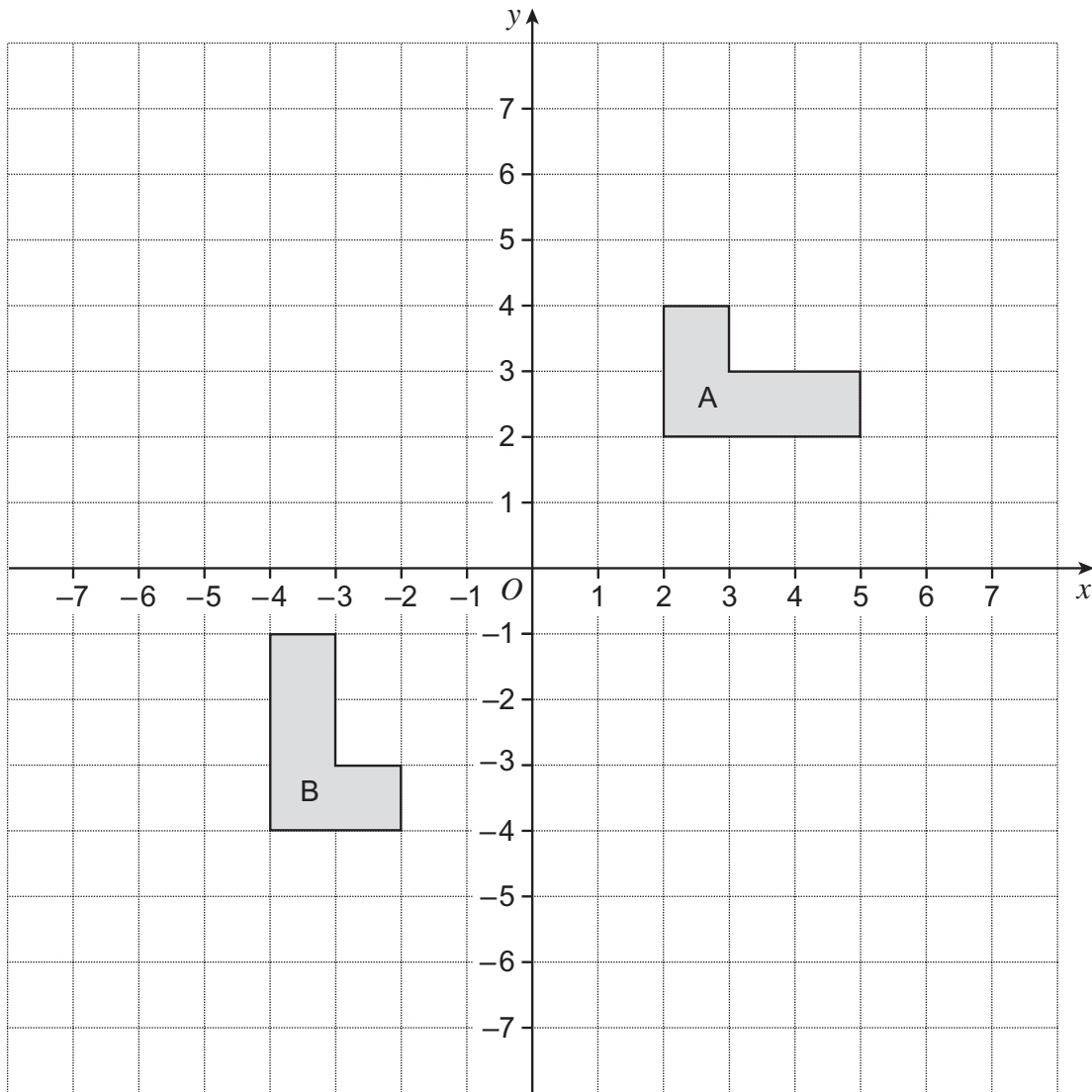
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Answer (2 marks)



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.

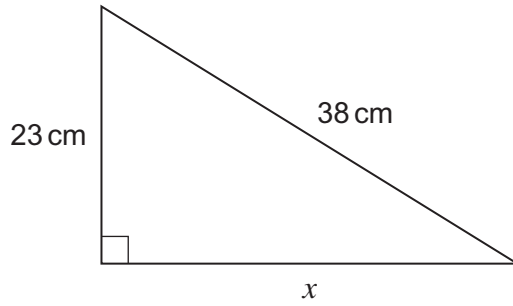
Complete the sentence.

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.



Not drawn accurately

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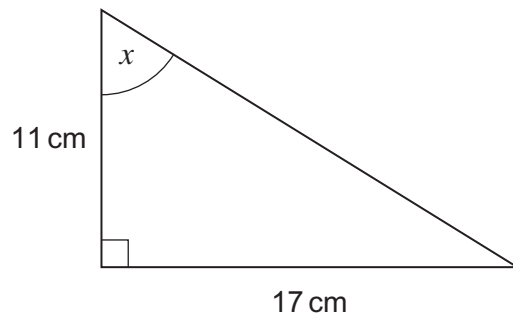
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Answer cm (3 marks)

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



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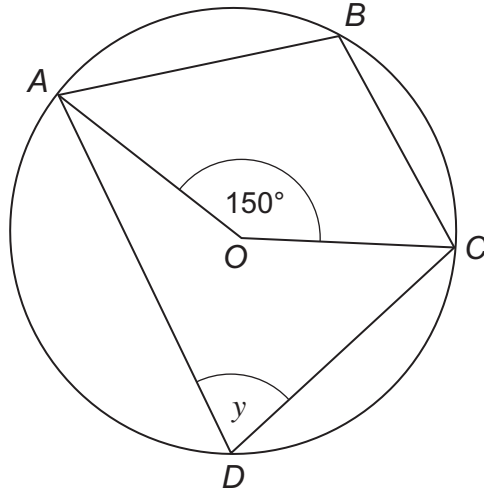
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Answer degrees (3 marks)



16 (a) $ABCD$ are points on the circumference of a circle centre O .
Angle $AOC = 150^\circ$.



Not drawn
accurately

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

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Answer degrees

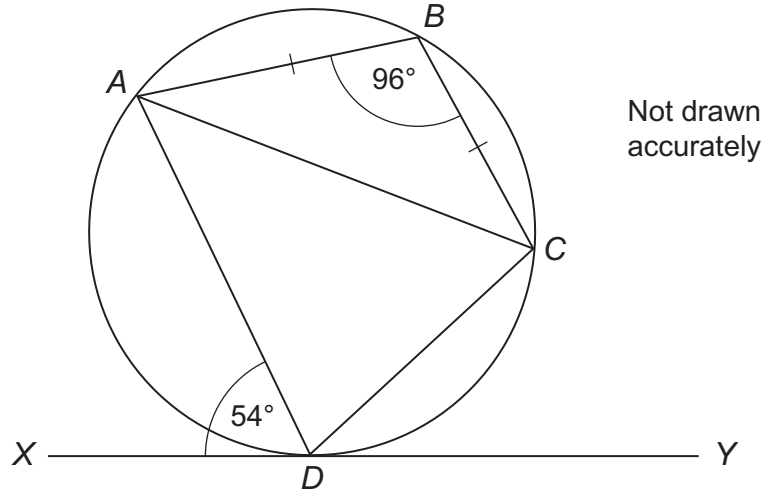
Reason

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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 $ABC = 96^\circ$
 Angle $XDA = 54^\circ$



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

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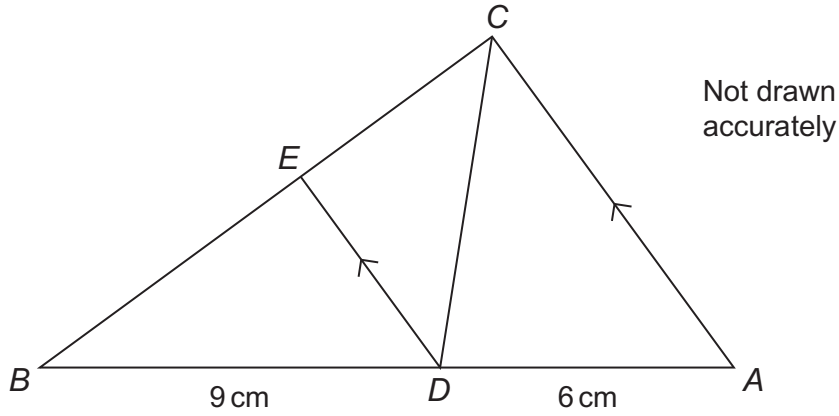
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(5 marks)



- 17 Triangle ABC has an area of 50 cm^2 .
 DE is parallel to AC .
 $AD = 6 \text{ cm}$ and $DB = 9 \text{ cm}$.



- 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)

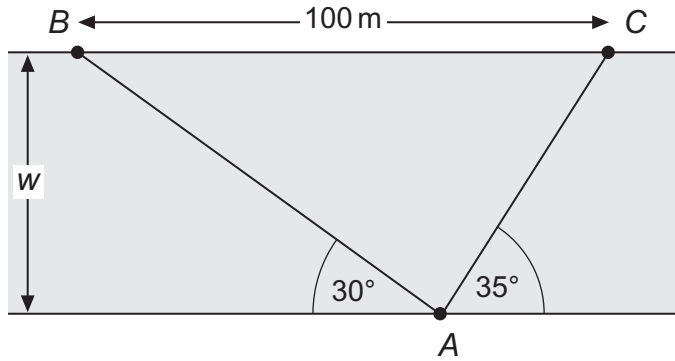
Turn over for the next question



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 30° .
The angle between the bank and the line AC is 35° .



Not drawn accurately

Work out the width of the river, w .

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Answer m (5 marks)

END OF QUESTIONS

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