| Centre Number | | | | | | Candidate Number | | | | |
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| Surname | | | | | | | | | | |
| Other Names | | | | | | | | | | |
| Candidate Signature | | | | | | | | | | |

| For Examiner's Use | |
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| Examiner's Initials | |
| Pages | Mark |
| 3 | |
| 4 – 5 | |
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| TOTAL | |

General Certificate of Secondary Education
Higher Tier
June 2015

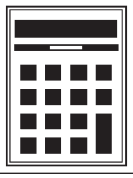
# Methods in Mathematics (Linked Pair) 93652H

H

## Unit 2 Geometry and Algebra

Monday 8 June 2015 9.00 am to 10.30 am

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



**Time allowed**
- 1 hour 30 minutes

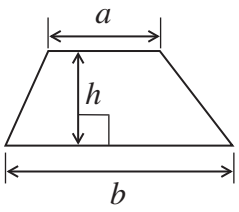
**Instructions**
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work that you do not want to be marked.
- If your calculator does not have a $\pi$ button, take the value of $\pi$ 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 7 and 21
  These questions are marked with an asterisk (*).
- You may ask for more answer paper, tracing paper and graph paper.
- These must be tagged securely to this answer book.
- You are expected to use a calculator where appropriate.

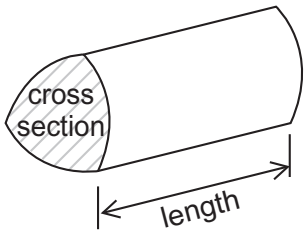
**Advice**
- In all calculations, show clearly how you work out your answer.

## Formulae Sheet: Higher Tier

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

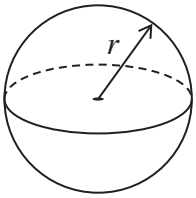



**Volume of prism** = area of cross section × length



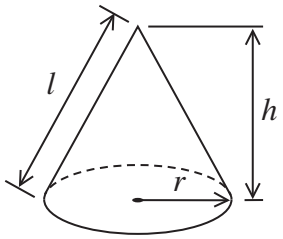

**Volume of sphere** = $\frac{4}{3}\pi r^3$

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




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

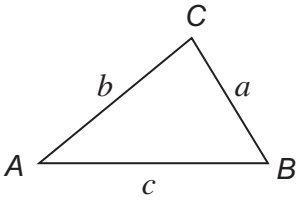
**Curved surface area of cone** = $\pi r l$




**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** Work out the circumference of a circle with a radius of 15 cm

**[2 marks]**

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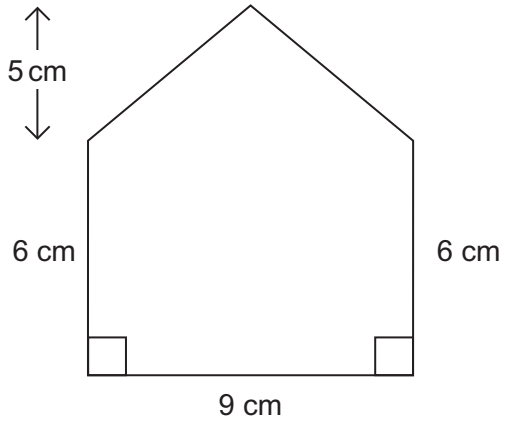
Answer ..... cm

**Turn over for the next question**

2

**2** Work out the area of this shape.

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**[3 marks]**

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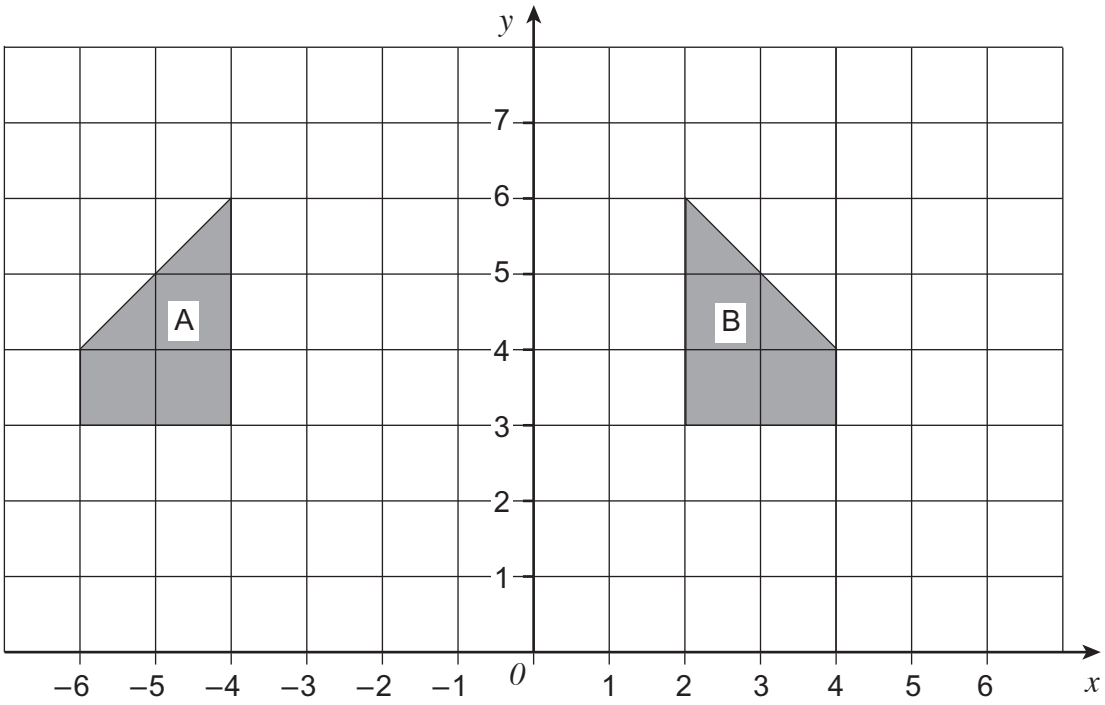
Answer ..... $cm^2$

**3** Describe the **single** transformation that maps shape A to shape B.

**[2 marks]**




Answer .....

**Turn over for the next question**

5

**4** Solve $8x - 7 = 3x + 10$

**[3 marks]**

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$x =$ .....

**5** $a$ and $b$ are prime numbers.

$27ab = 405$

Work out the values of $a$ and $b$.

**[2 marks]**

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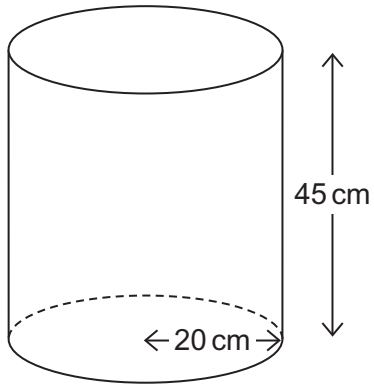
Answer ..... and .....

**6** A cylinder has radius 20 cm and height 45 cm




**[3 marks]**

Work out the volume of the cylinder.
Give your answer as a multiple of $\pi$.

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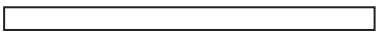
Answer ..... $cm^3$

**Turn over for the next question**

8

***7** A framework is made from white rods and black rods.

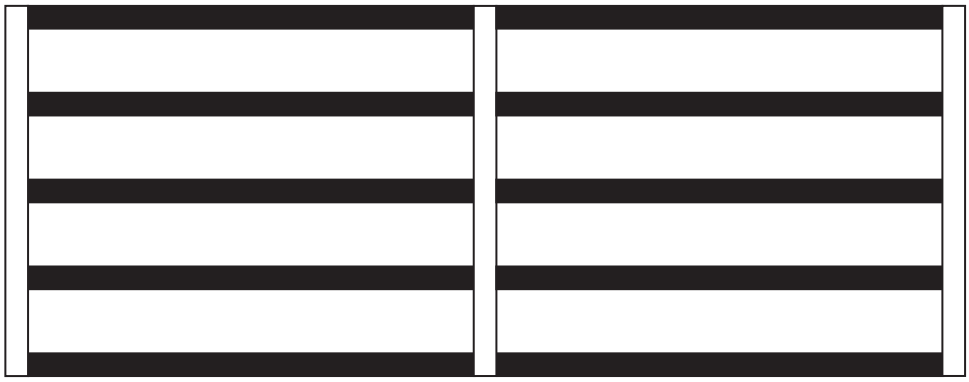
White rods are $x$ cm long.
Black rods are $(x + 7)$ cm long.



$x$ cm

$(x + 7)$ cm

Not drawn accurately



The total length of all the rods in the framework is 343 cm
Work out the value of $x$.

**[4 marks]**

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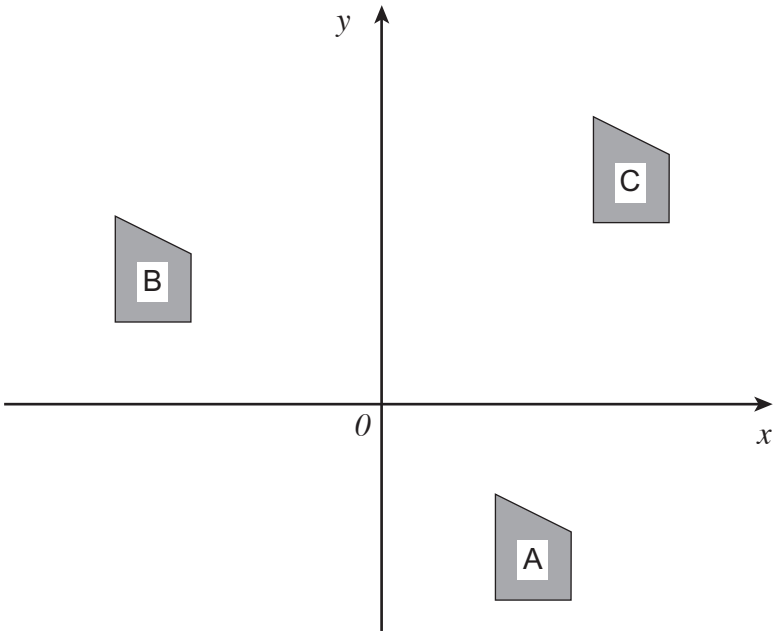
$x$ = .....

**8** Shape A is mapped to shape B by the translation $\begin{pmatrix} -5 \\ 4 \end{pmatrix}$

Shape B is mapped to shape C by the translation $\begin{pmatrix} 7 \\ 2 \end{pmatrix}$

Describe fully the **single** transformation that maps shape A to shape C.

**[2 marks]**

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Answer .....

6

**9** $y$ is 80% of 350
$z$ is 60% of $y$.

What percentage of 350 is $z$?

**[3 marks]**

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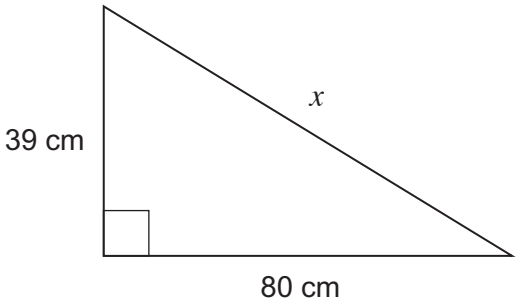
Answer ..... %

**10** Work out the length $x$.

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**[3 marks]**

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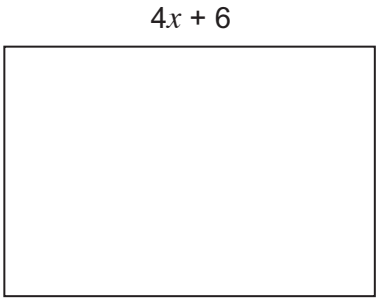
Answer ..... cm

**Turn over for the next question**

6

**11** The diagram shows a rectangle.

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**11 (a)** Write down an expression for the perimeter of the rectangle.
Simplify your answer.

**[2 marks]**

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Answer .....

**11 (b)** Work out an expression for the area of the rectangle in the form $ax^2 + bx + c$

**[2 marks]**

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Answer .....

**12 (a)** Circle the least common multiple (LCM) of 15 and 20

**[1 mark]**

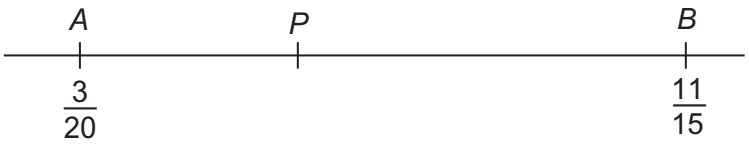
5 10 60 120 300

**12 (b)** Part of a number line is shown.

$A$ is the fraction $\frac{3}{20}$

$B$ is the fraction $\frac{11}{15}$

$AP : PB = 2 : 3$

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Work out the value of the fraction $P$.

**[4 marks]**

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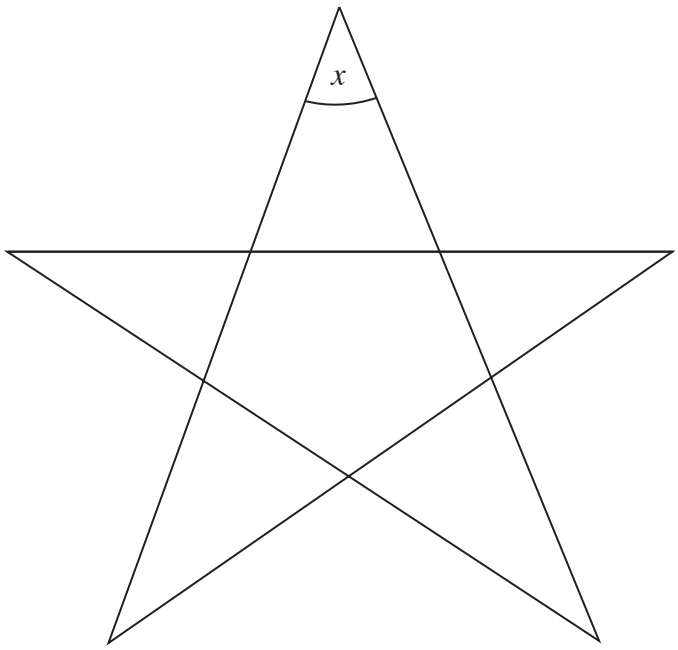
Answer .....

9

**Turn over ▶**

**13** The polygon at the centre of the star is a **regular** pentagon.




Not drawn accurately

Calculate the size of angle $x$.
You **must** show your working, which may be on the diagram.

**[3 marks]**

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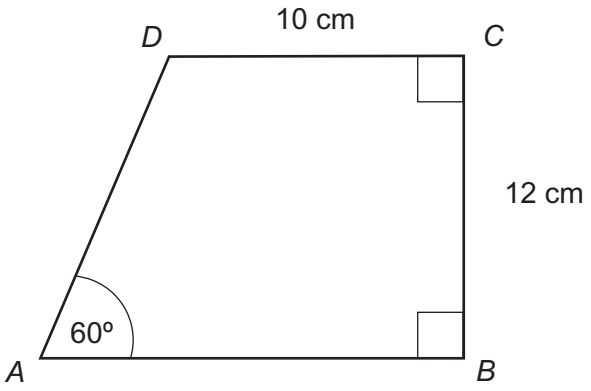
Answer ..... degrees

**14** *ABCD* is a trapezium.

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Calculate the area of the trapezium.

**[5 marks]**

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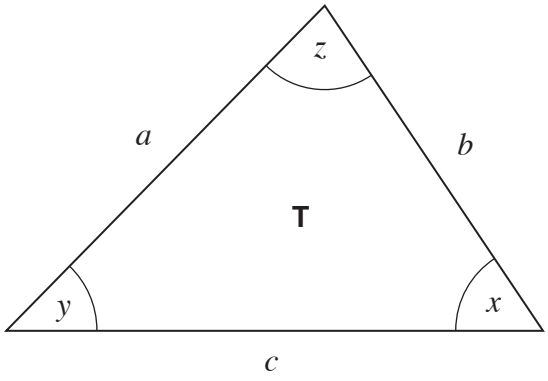
Answer ..... $cm^2$

8

**15 (a)** Scalene triangle **T** has sides $a$, $b$ and $c$ and angles $x$, $y$ and $z$.

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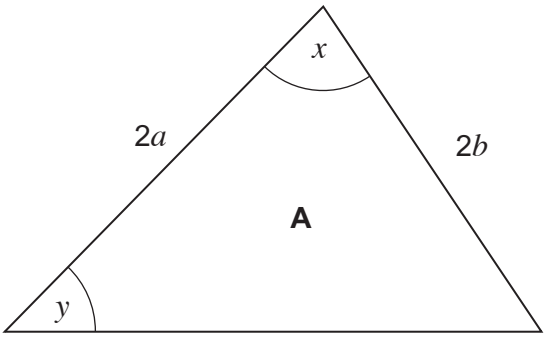
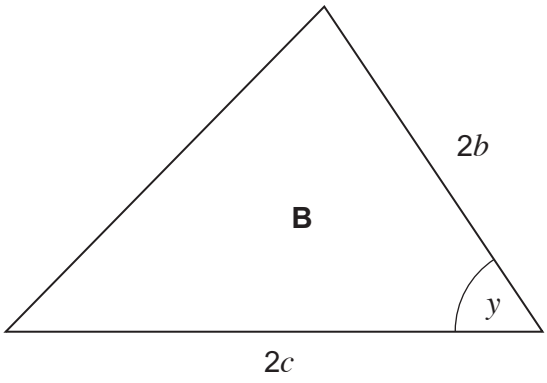
Which **one** of the following triangles is **similar** to T?

**[1 mark]**

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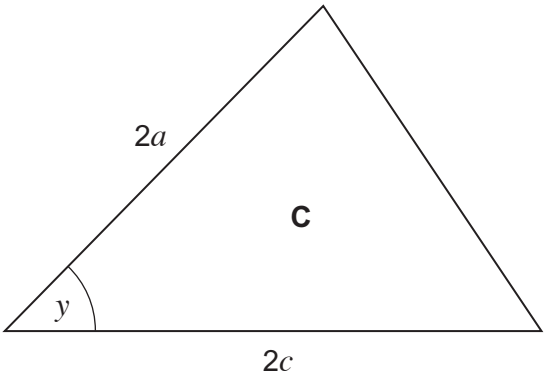
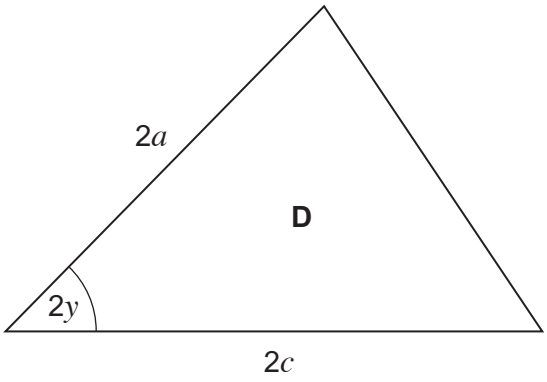
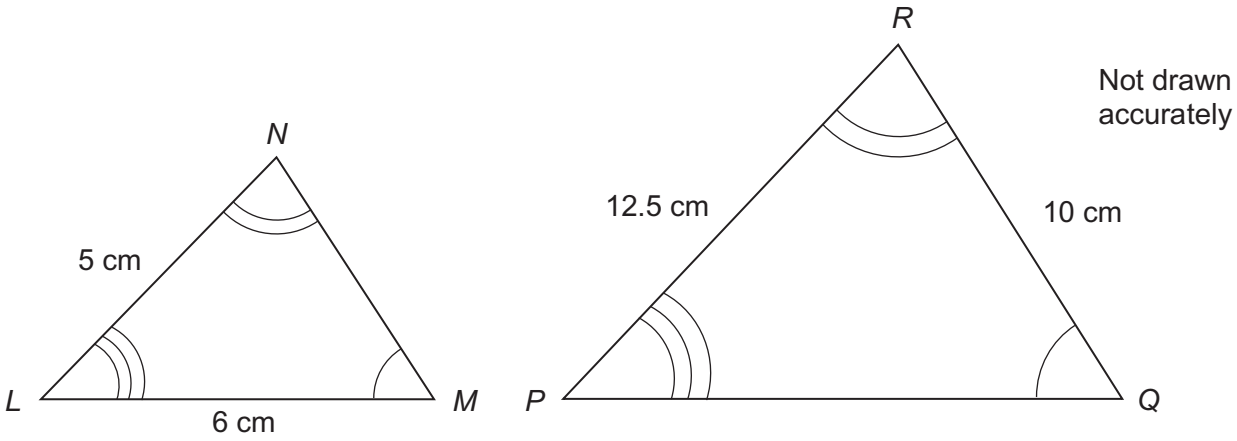



Circle your answer.

**A** **B** **C** **D**

**15 (b)** Triangles *LMN* and *PQR* are similar.




Work out the length *PQ*.

**[2 marks]**

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Answer ..... cm

**Turn over for the next question**

3

**16** There are 60 balls in a bag.
The balls are either blue, red or yellow.

The ratio of blue balls to red balls is 5 : 3
The ratio of red balls to yellow balls is 1 : 4

Work out how many **red** balls are in the bag.

**[3 marks]**

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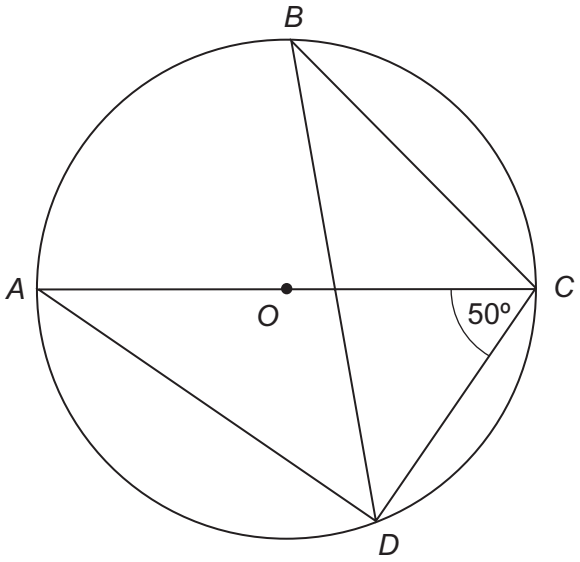
Answer .....

**17** *A*, *B*, *C* and *D* are points on the circumference of a circle, centre *O*.
*AC* is a diameter.
Angle *ACD* = 50º

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**17 (a)** Write down the size of angle *ADC*.

**[1 mark]**

Answer ..... degrees

**17 (b)** Work out the size of angle *DBC*.

**[1 mark]**

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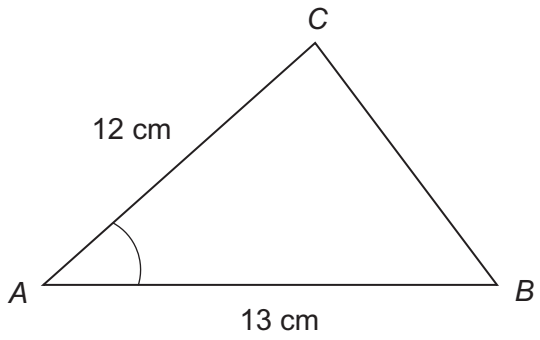
Answer ..... degrees

5

**Turn over ▶**

**18 (a)** The area of triangle *ABC* is 48 cm$^2$

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Work out the size of angle *CAB*.

**[3 marks]**

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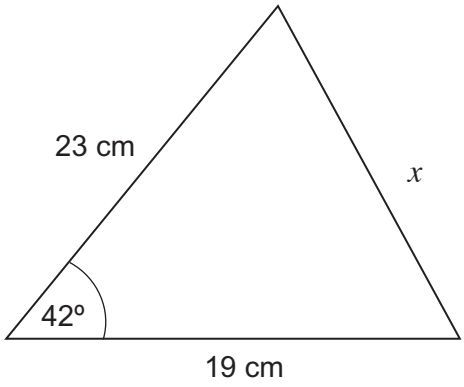
Answer ..... degrees

**18 (b)** Work out the length $x$.

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**[3 marks]**

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Answer ..... cm

**Turn over for the next question**

6

**19** Work out an expression for the $n$th term of the quadratic sequence

4 8 15 25 38 ....

**[4 marks]**

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Answer .....

**20** Solve by factorisation $2x^2 + 3x - 9 = 0$

**[3 marks]**

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Answer .....

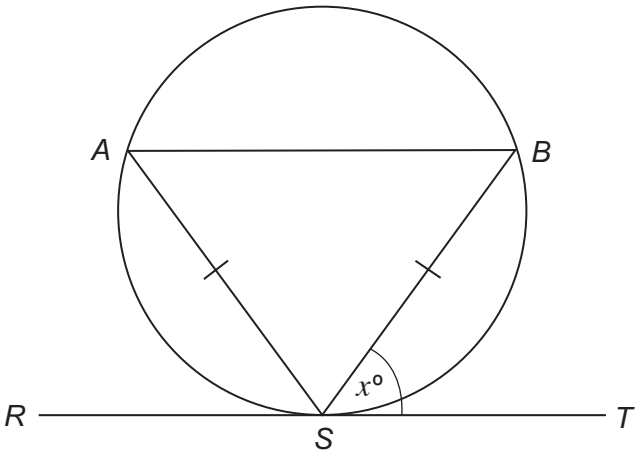
**Turn over for the next question**

7

***21** Fill in the missing reasons in the proof below.

**[2 marks]**

*A*, *B* and *S* are points on a circle.
*RST* is a tangent to the circle.
*AS* = *BS*
Angle *TSB* = $x°$

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Prove that *AB* is parallel to *RT*.

Angle SAB = x° ( ..... )

Angle ABS = x° (Base angles in an isosceles triangle are equal)

So, AB is parallel to RT ( ..... )

**22** Simplify fully $\dfrac{9x^2 - 4}{6x^2 + x - 2}$

**[4 marks]**

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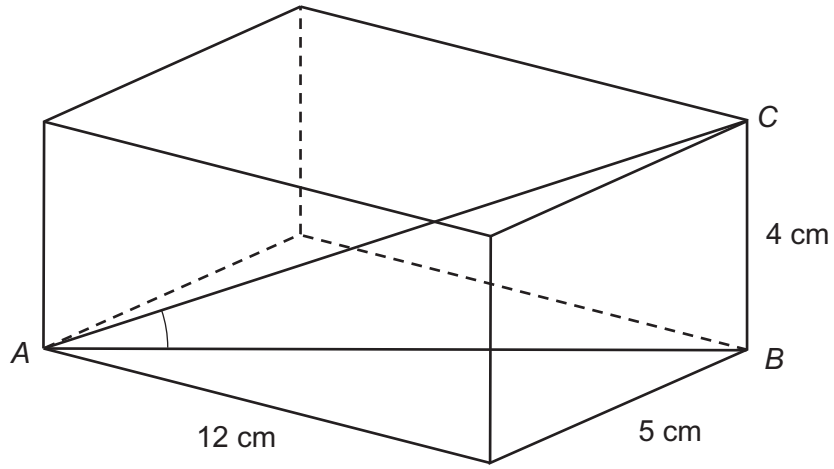
Answer .....

**Turn over for the next question**

6

**23** A cuboid has dimensions 4 cm, 5 cm and 12 cm




Work out the size of angle *CAB*.

**[4 marks]**

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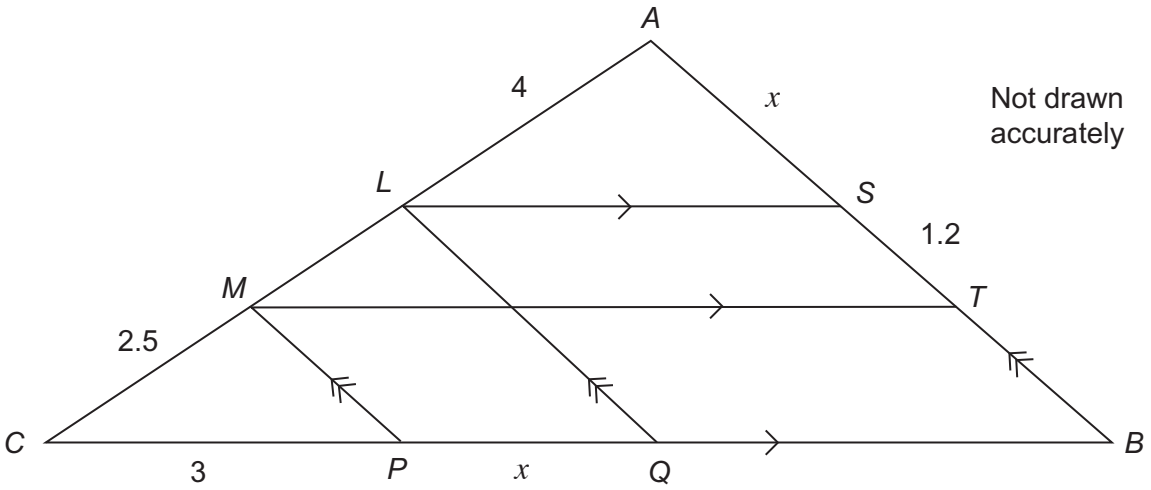
Answer ..... degrees

**24** All lengths are in centimetres.
*ABC* is a triangle.

$CM = 2.5$, $CP = 3$, $LA = 4$ and $ST = 1.2$
$PQ = AS = x$




**24 (a)** Which **one** of the following is **not** correct?
Circle your answer.

**[1 mark]**

$\frac{3}{x} = \frac{2.5}{ML}$ $\quad \frac{3}{2.5} = \frac{x}{ML}$ $\quad ML = \frac{2.5x}{3}$ $\quad \frac{3}{ML} = \frac{x}{2.5}$

**24 (b)** $PQ = AS = x$

Work out the length $x$.

**[4 marks]**

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Answer ..... cm

**END OF QUESTIONS**

9

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**