

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Secondary Education
Higher Tier

Methods in Mathematics (Linked Pair Pilot)

93652H

Unit 2 Higher Tier

Specimen Paper

H

<p>For this paper you must have:</p> <ul style="list-style-type: none"> a calculator mathematical instruments. 	
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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 7, 10 and 21. 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

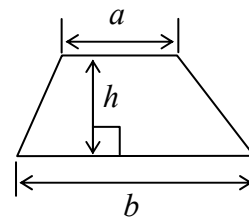
- In all calculations, show clearly how you work out your answer.

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 – 19	
TOTAL	

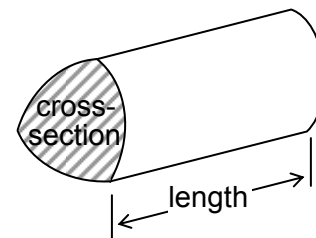
93652H

Formulae Sheet: Higher Tier

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

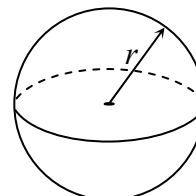


$$\text{Volume of prism} = \text{area of cross-section} \times \text{length}$$



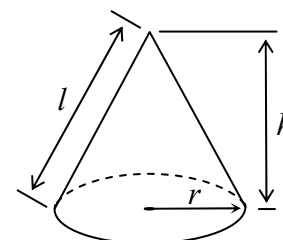
$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$

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



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

$$\text{Curved surface area of cone} = \pi r l$$

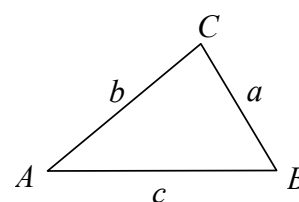


In any triangle ABC

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

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

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



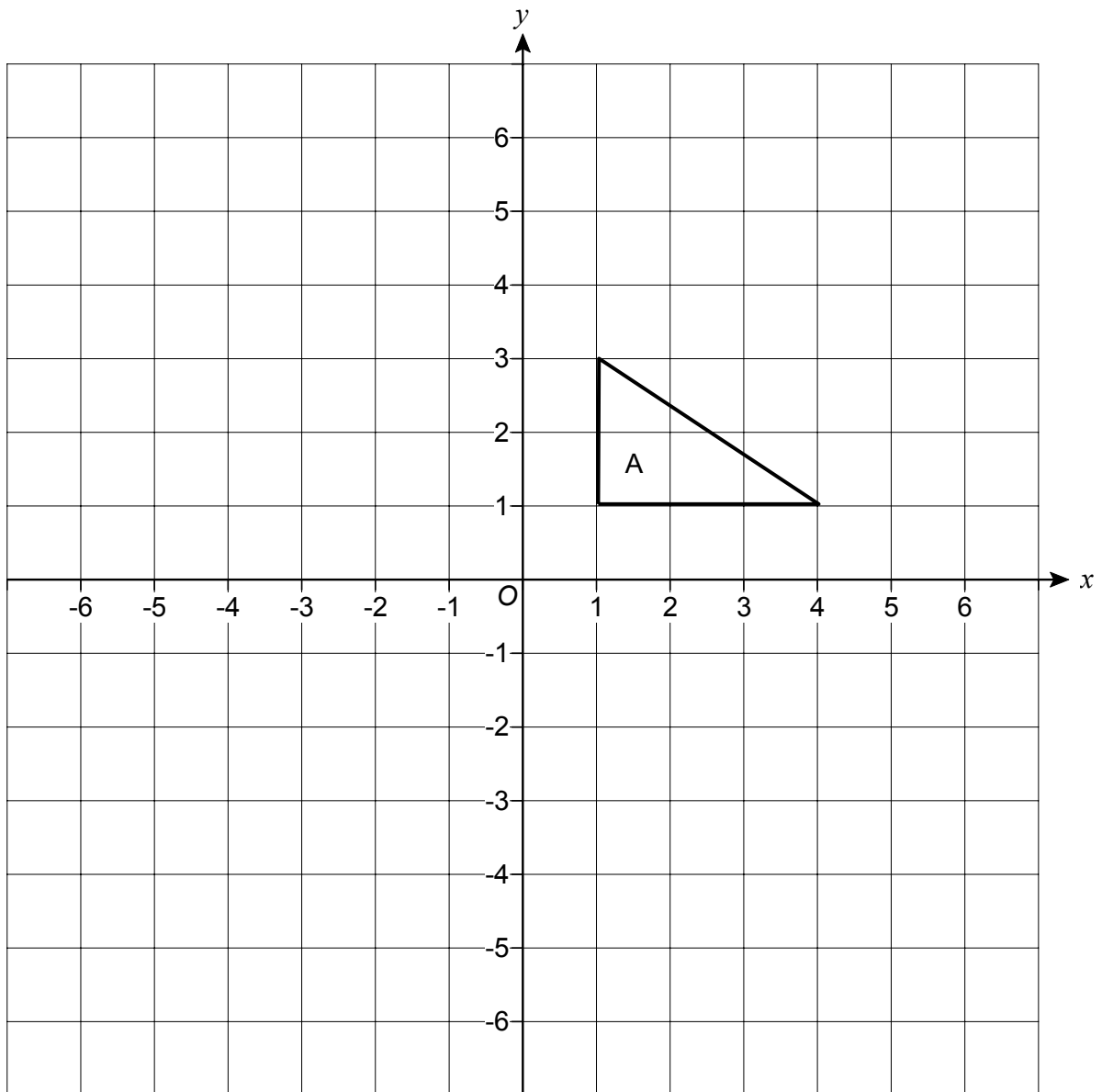
The Quadratic Equation

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 Rotate triangle A, 90° clockwise, about the origin.



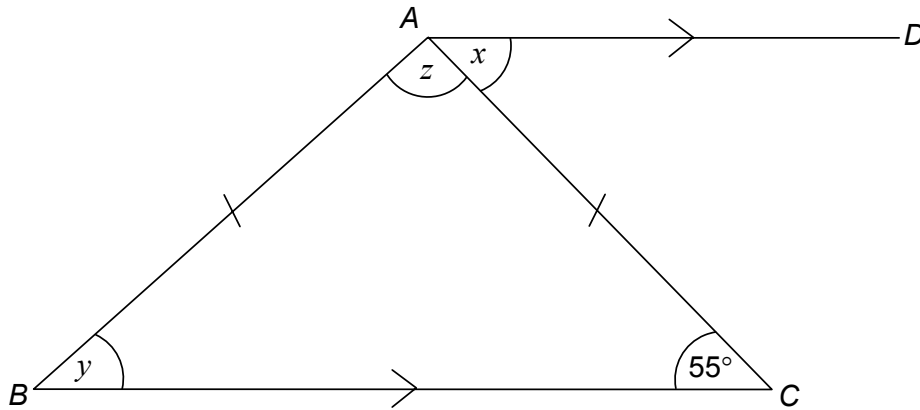
(3 marks)

2

ABC is an isosceles triangle with $AB = AC$

BC is parallel to AD and angle $BCA = 55^\circ$

Not drawn
accurately



Work out the sizes of the angles marked x , y and z .

.....

.....

Answer $x =$ degrees

$y =$ degrees

$z =$ degrees

(4 marks)

- 3** In a class of 30 pupils
16 have a mobile phone and a computer.
27 have a mobile phone.
17 have a computer.

Work out how many pupils do not have a mobile phone or a computer.

.....
.....

Answer (3 marks)

- 4** Use your calculator to evaluate $\frac{6.1 \times 5.9}{8.7 - 3.4}$

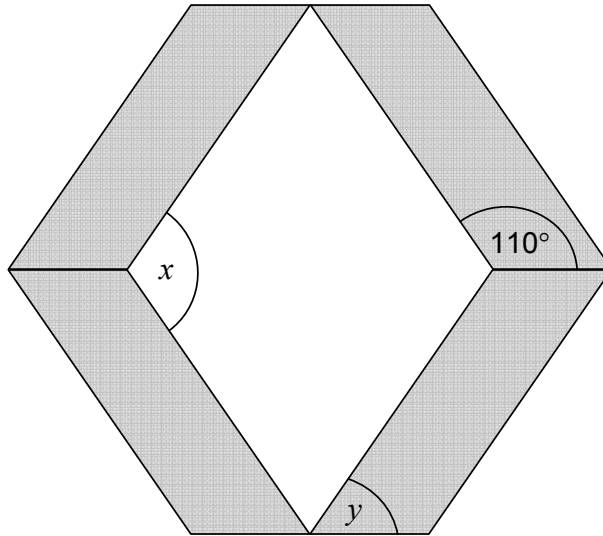
- 4 (a)** Write down your full calculator display.

Answer (1 mark)

- 4 (b)** Write down your answer to a suitable degree of accuracy.

Answer (1 mark)

- 5 Four identical parallelograms are joined to form this pattern.



Not drawn
accurately

Work out the sizes of the angles marked x and y .

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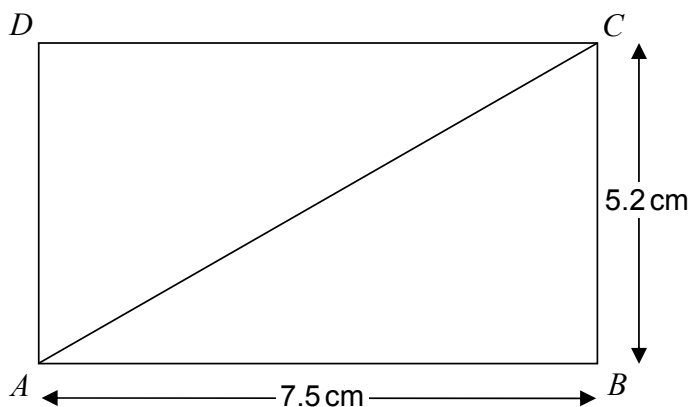
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Answer $x =$ degrees, $y =$ degrees (3 marks)

- 6 $ABCD$ is a rectangle.
 $AB = 7.5$ cm and $BC = 5.2$ cm



Not drawn
accurately

Calculate the length of the diagonal, AC .

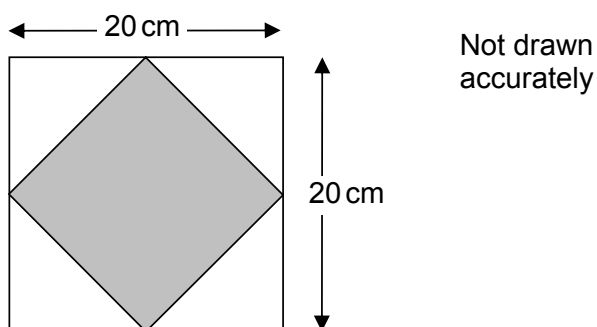
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Answer cm (3 marks)

Turn over for the next question

- * 7 Emily is drawing and shading shapes.
Each time she starts with a square of side 20 cm.

- 7 (a) She draws a second square by joining the midpoints of the original one.
She shades the second square.



Show that half of the original square is shaded.

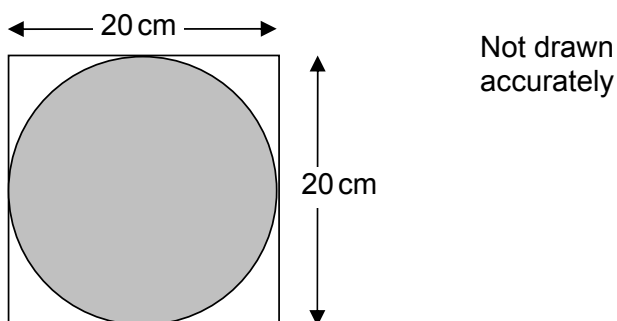
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(2 marks)

- 7 (b) Emily now draws a circle that just touches the sides of the original square.
She shades the circle.



Emily says that more than 80% of the original square is shaded.

Is Emily correct?

You **must** show your working.

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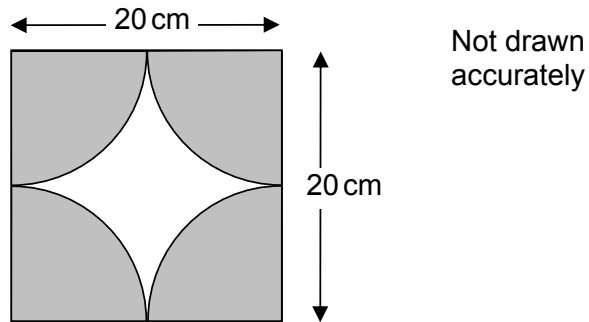
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(3 marks)

- 7 (c) Finally Emily draws quadrants of circles and shades them.



Explain why she does not need to do any further calculations to work out the shaded area.

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(1 mark)

Turn over for the next question

8 The n th term of a sequence is $\frac{2(n-1)(n-2)}{5}$

Show that the third term is the first non-zero term and find its value.

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Answer (3 marks)

9 $N = a^2 b$ is a formula where a and b are prime numbers.

9 (a) Find N when $a = 5$ and $b = 3$

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Answer $N =$ (1 mark)

9 (b) Find b when $a = 3$ and $N = 99$

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Answer $b =$ (1 mark)

9 (c) Find the values of a and b when $N = 2009$

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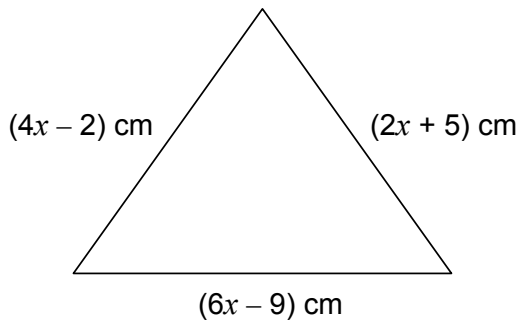
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Answer $a =$ $b =$ (3 marks)

* 10 The triangle has lengths $(4x - 2)$ cm, $(2x + 5)$ cm and $(6x - 9)$ cm.



Not drawn
accurately

Find the value of x that makes this triangle equilateral.

Show clearly how you work out your answer.

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Answer (4 marks)

11 (a) A sequence starts

2, 7, 17,

The rule for finding the next term in the sequence is to multiply the previous term by 2 and then add on 3

Work out the next term.

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Answer (1 mark)

11 (b) The rule for finding the next term in a different sequence is to multiply the previous term by 2 and then add on a , where a is an integer.

The first term is 8 and the fourth term is 127

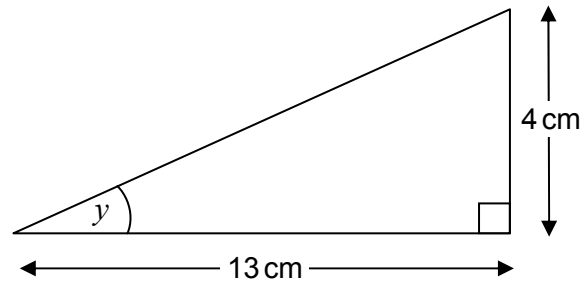
8 127

Work out the value of a .

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Answer $a =$ (4 marks)

12

Not drawn
accuratelyCalculate the size of angle y .

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Answer degrees (3 marks)

13 (a) Factorise fully $10x^2 - 15xy$

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Answer (2 marks)

13 (b) Solve $x^2 + 15x - 54 = 0$

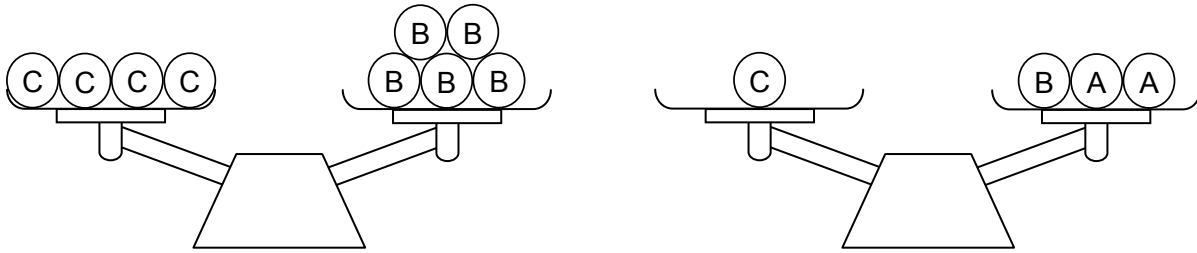
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Answer (3 marks)

14 A, B and C are different weights.
Both the scales shown balance exactly.



Work out how many A weights make a B weight.

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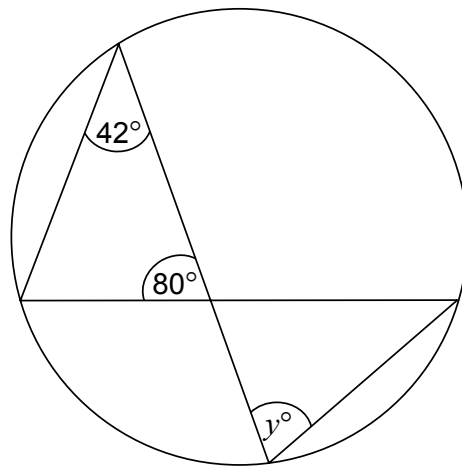
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Answer (3 marks)

15



Not drawn accurately

Work out the value of y .

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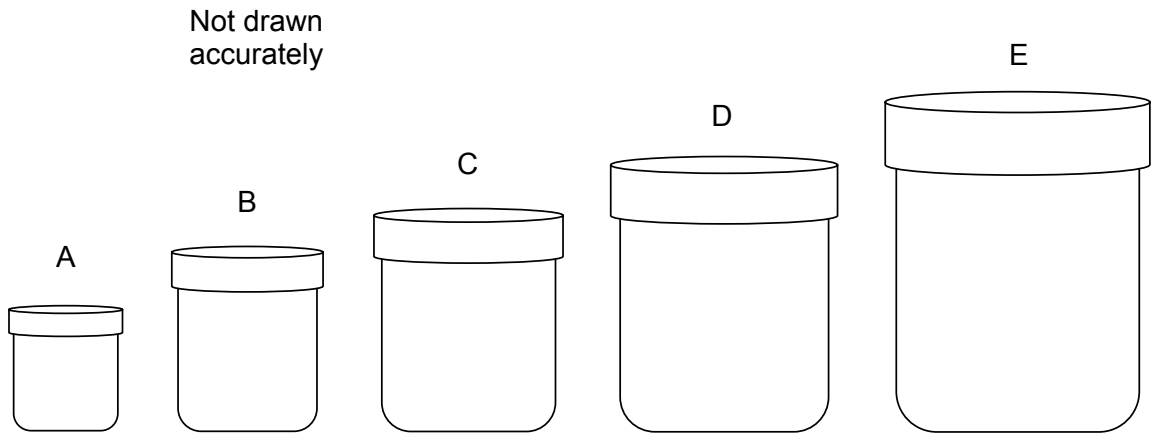
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Answer degrees (2 marks)

16 Five toy beakers A, B, C, D and E are mathematically similar.
 Their heights are in the ratio 2 : 3 : 4 : 5 : 6
 Beaker B has height 4.2 cm and surface area 45 cm^2 .



16 (a) Work out the height of beaker D.

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Answer cm (2 marks)

16 (b) Work out the surface area of beaker C.

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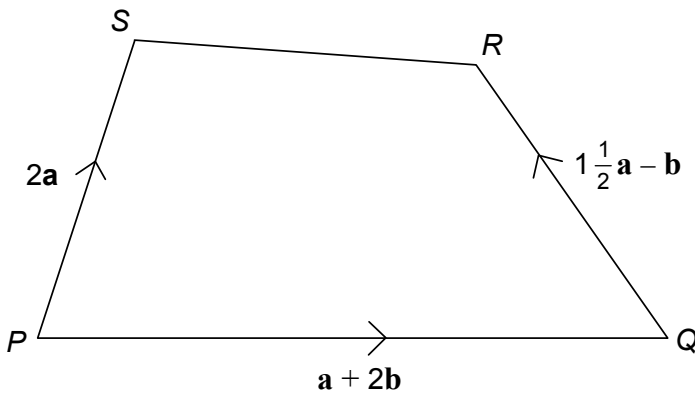
Answer cm^2 (2 marks)

16 (c) Beaker A is used to fill beaker E with sand.
 How many full beakers of sand are needed to fill beaker E?

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Answer (2 marks)

17 In the diagram $\vec{PQ} = \mathbf{a} + 2\mathbf{b}$, $\vec{PS} = 2\mathbf{a}$, $\vec{QR} = 1\frac{1}{2}\mathbf{a} - \mathbf{b}$



Not drawn accurately

17 (a) Work out \vec{SR}

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Answer (2 marks)

17 (b) What type of quadrilateral is PQRS?
Give a reason for your answer.

Answer

Reason

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(2 marks)

18 Show that the solutions of the quadratic equation

$$x^2 - 4x - 3 = 0 \quad \text{are} \quad x = 2 \pm \sqrt{7}$$

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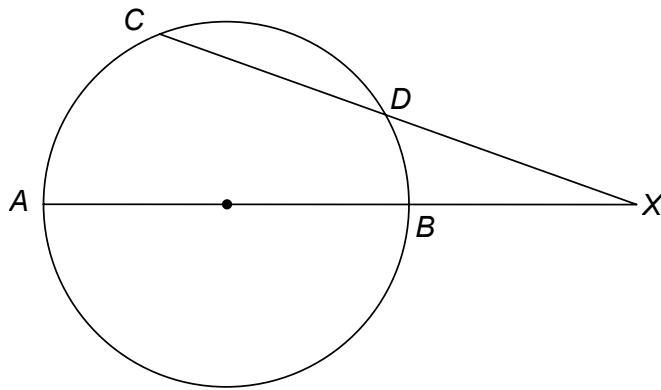
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(3 marks)

- 19** AB is the diameter and CD a chord of a circle.
 AB and CD are extended to meet at X .
 AX is 20 cm, CD is 7 cm and DX is 8 cm.



Not drawn
accurately

Calculate AB , the diameter of the circle.

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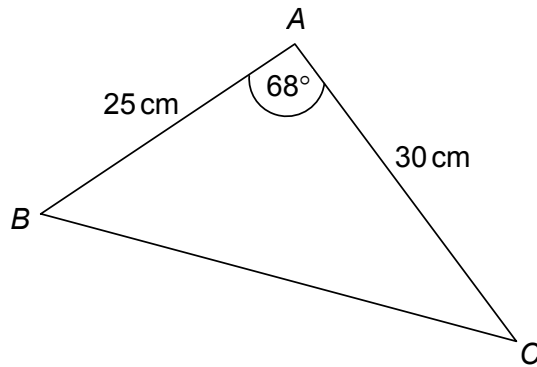
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Answer cm (3 marks)

Turn over for the next question

20 In the triangle ABC

$AB = 25$ cm, $AC = 30$ cm and angle $BAC = 68^\circ$



Not drawn
accurately

20 (a) Calculate the area of triangle ABC .

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Answer cm^2 (2 marks)

20 (b) Calculate the length BC

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Answer cm (3 marks)

There are no questions printed on this page

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