Forming & Solving Equations (F)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	Lisa Woods
Total Marks:	

1. Kieran, Jermaine and Chris play football.

   - Kieran has scored 8 more goals than Chris.

   - Jermaine has scored 5 more goals than Kieran.

   - Altogether they have scored 72 goals.

   How many goals did they each score?

$K = C + 8$ ∴ $C = K - 8$

$J = K + 5$

$K + C + J = 72$

$K + (K-8) + (K+5) = 72$

$3K = 75$

$K = 25$

Kieran ....25....

Jermaine ....30....

Chris ....17....

[5]

2. In this row of boxes, you start with 5 and 7.

5	7			

   You add 5 and 7 to get 12 to go in the third box.

   You add 7 and 12 to get 19 to go in the fourth box.

   You add 12 and 19 to get 31 to go in the fifth box.

5	7	12	19	31

Complete these rows of boxes using the rule shown above.

(a)

4	6	10	16	26

[1]

(b)

8	13	21	34	55

[2]

(c) Complete this row of boxes, writing your expressions in their simplest form.

a	b	$a + b$	$a + 2b$	$2a + 3b$

[2]

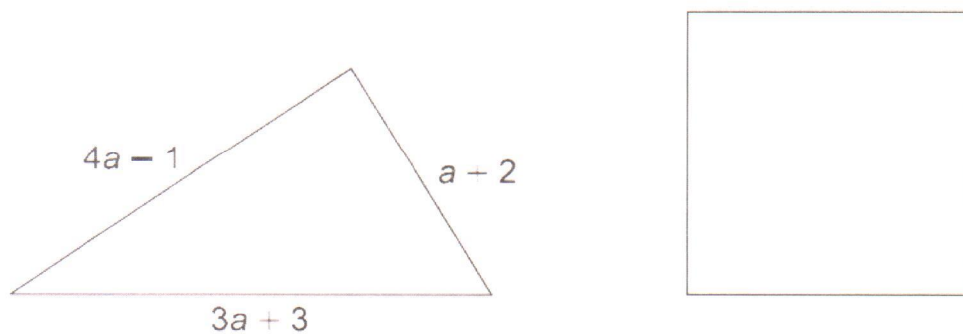(d) Use your answer to (c) to help you fill in the missing numbers in this row of boxes.

6	15	21	36	57

$a = 6$
$2a + 3b = 57$
$12 + 3b = 57$

$3b = 45$
$b = 15$

[3]

3. The perimeter of the triangle is the same length as the perimeter of the square.

$4a - 1$ $a + 2$

$3a + 3$

Find an expression for the length of one side of the square in terms of a.

Give your answer in its simplest form.

$4a - 1 + a + 2 + 3a + 3$

$8a + 4$

$\dfrac{8a + 4}{4} = 2a + 1$

.... $2a + 1$ .... [4]

4. Here is a pentagon.

$3x$

Not to scale

x x
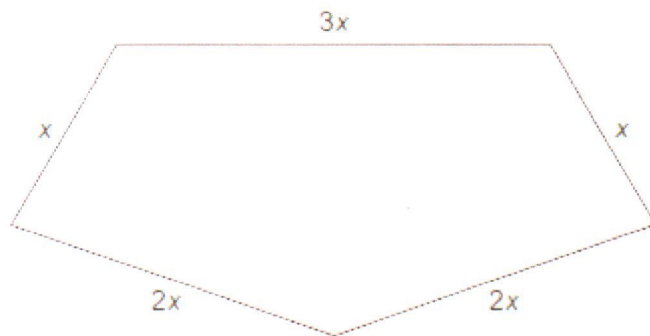
$2x$ $2x$

$3x + x + x + 2x + 2x$

$= 9x$

Write down an expression for the perimeter of the pentagon.

Give your answer in its simplest form.

$9x$

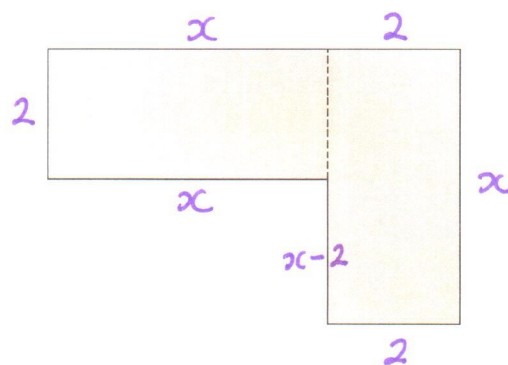.. [1]

5. Shape A is a rectangle of length x cm and width 2 cm.

x cm

A   2 cm
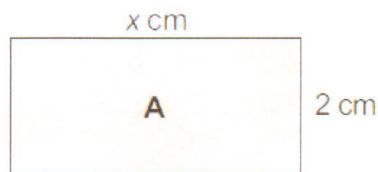
Not to scale

The shape below contains two rectangles that are identical to shape A.

x 2

Not to scale

2

x

$x-2$ x

2

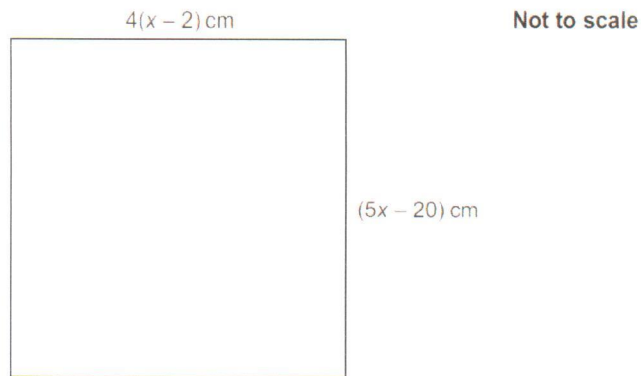Work out an expression for the perimeter of this shape.

Give your answer in its simplest form.

$6 + 3x + x - 2$

$4x + 4$

$4x + 4 = 4(x + 1)$ cm [3]

6. This is a square.

4(x − 2) cm   **Not to scale**

(5x − 20) cm

Work out the length of the side of the square.

$4(x-2) = (5x-20)$

$4x-8 = 5x-20$

$-8 = x-20$

$12 = x$

$5 \times 12 - 20 = 40$

.... 40 .... cm [5]

7. ABCH is a square.

HCFG is a rectangle.

CDEF is a square.

Not drawn accurately

A   (x − 3) cm   B

x + 3

H   x + 3   C   D

3   3 cm

G   F   3   E
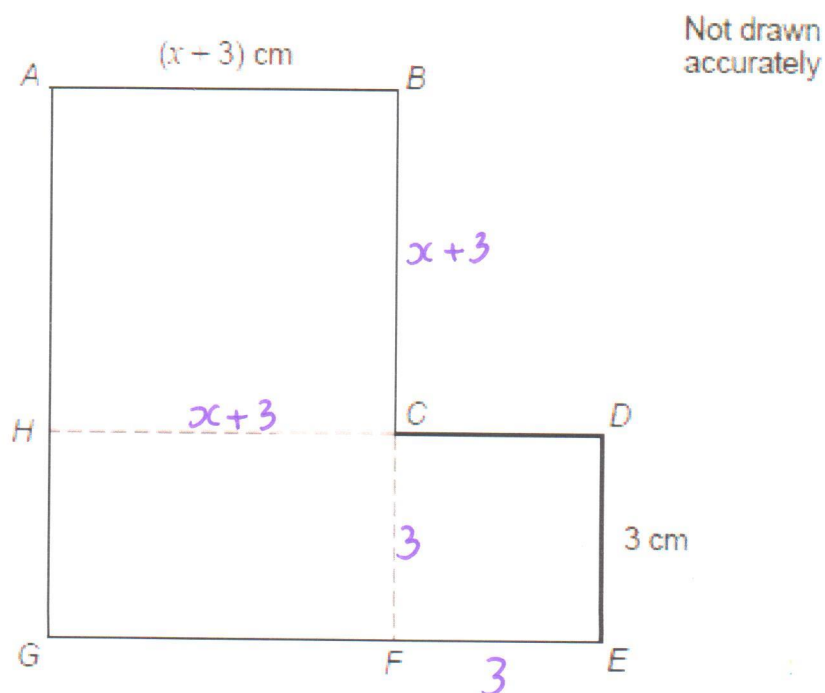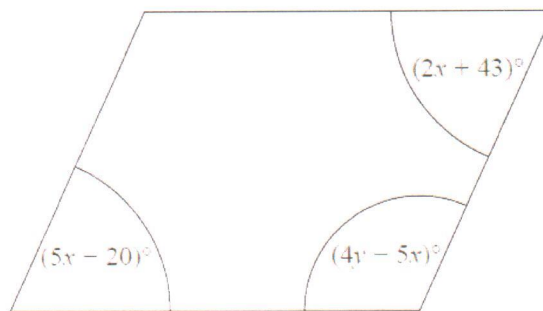
They are joined to make an L-shape.

Show that the total area of the L-shape, in cm², is x² + 9x + 27

$(x+3)^2 + 3(x+3) + 3^2$

$x^2 + 6x + 9 + 3x + 9 + 9$

$= x^2 + 9x + 27$

[4]

8. Here is a parallelogram.

$(2x + 43)°$

$(5x - 20)°$ $(4y - 5x)°$

Work out the value of x and the value of y.

$5x - 20 = 2x + 43$

$3x - 20 = 43$

$3x = 63$

$x = 21$

$2x + 43$

$2 \times 21 + 43 = 85$

$360 - 85 - 85 = 190$

$\therefore 4y - 5x = \frac{190}{2}$

$4y - 5 \times 21 = 95$

$4y - 105 = 95$
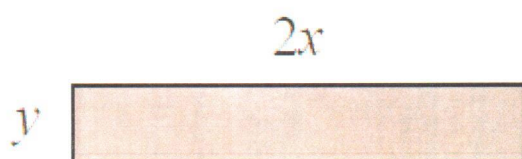
$4y = 200 \therefore y = 50$

x = 21

y = 50

[5]

9. Rob buys p packets of plain crisps and c packets of cheese crisps.

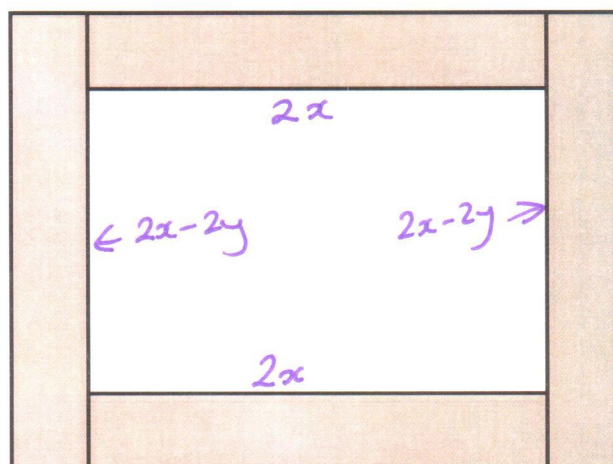Write down an expression for the total number of packets of crisps Rob buys.

$p + c$

[1]

10. Here is a rectangle made of card.

$$2x$$

y [rectangle]

The measurements in the diagram are in centimetres.

Lily fits four of these rectangles together to make a frame.

[frame diagram with labels:]
$2x$
$2x-2y$ $2x-2y$
$2x$

The perimeter of the inside of the frame is P cm.

(a) Show that P = 8x – 4y

$$2x + 2x + 2x - 2y + 2x - 2y$$
$$= 8x - 4y$$

[2]

Magda says,

   "When x and y are whole numbers, P is always a multiple of 4."

(b) Is Magda correct?

You must give a reason for your answer.

Yes. $8x - 4y \equiv 4(2x - y)$
                    $\therefore$ always a multiple of 4.

[2]

11. Dimitar has 20 sweets.

   Pip also has 20 sweets.

   Dimitar gives Pip x sweets.

   Dimitar then eats 5 of his sweets.

   Pip then eats half of her sweets.

$$D = 20 - x - 5$$
$$P = \frac{20 + x}{2}$$

Write expressions for the number of sweets Dimitar and Pip now have.

$$D = 15 - x$$

$$P = 10 + \frac{x}{2}$$

Dimitar ....$15 - x$.... Pip ....$10 + \frac{x}{2}$.... [3]

12. You can use this rule to work out the total cost, in pounds, of hiring a carpet cleaner.

> Multiply the number of days by 7.8 and then add 12

Andy hires a carpet cleaner.

The total cost is £82.20

(a) Work out the number of days Andy hires the carpet cleaner for.

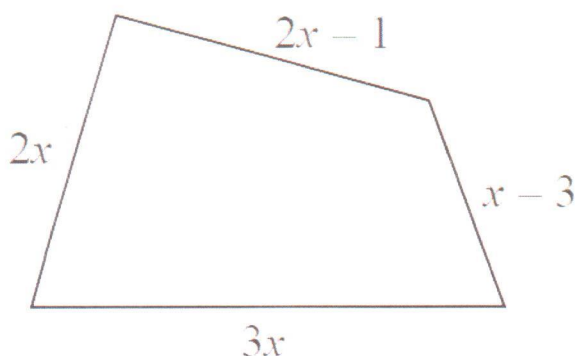$$7.8x + 12 = 82.2$$
$$7.8x = 70.2$$
$$x = 9$$

....9....days [2]

Chloe hires a carpet cleaner for y days.

The total cost is £T.

(b) Write down a formula for T in terms of y.

$$T = 7.8y + 12$$ ....[2]

13. In the diagram all measurements are in centimetres.
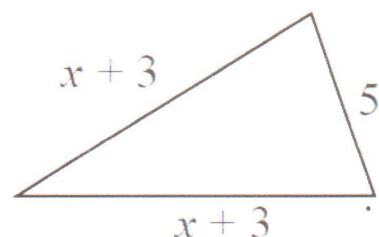
$2(x+3+x+3+5) = 2x + 3x + 2x - 1 + x - 3$

$4x + 22 = 8x - 4$

The perimeter of the quadrilateral is twice the perimeter of the triangle.

Work out the perimeter of the quadrilateral.
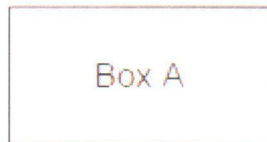
$22 = 4x - 4$

$26 = 4x$

$x = 6.5$

$24 \times 2 = 48$

.... cm [4]

14. Write an expression for the total cost, in pounds, of

       x jumpers at £15 each $15x + 12y$

       and

       y shirts at £12 each.

[1]

15. Three boxes contain counters.

Box A	Box B	Box C

There are 62 counters in total.

The total number of counters in box A and box B is 34

The difference between the number of counters in box A and box C is 9

Work out the number of counters in each box.

$A + B + C = 62$

$A + B = 34 \quad \therefore B = 34 - A$

$A - C = 9 \quad \therefore C = A - 9$

$A + 34 - A + A - 9 = 62$
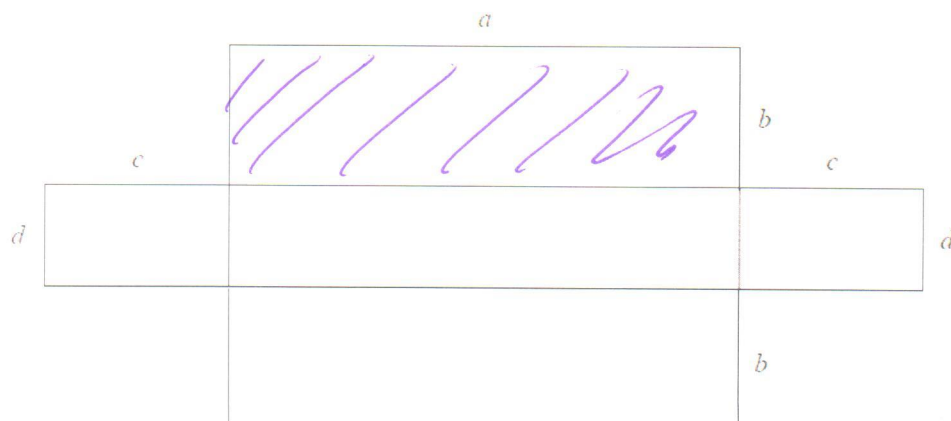
$A + 25 = 62$

$A = 37 \cdots$ try

$C = A + 9$

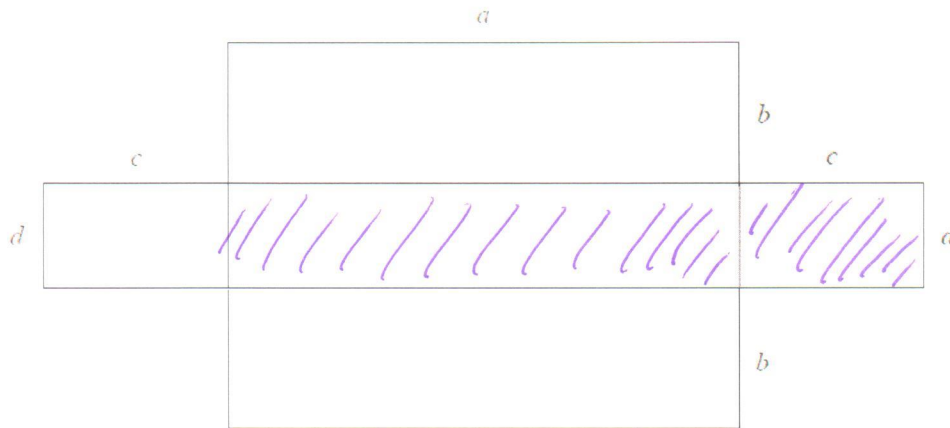$A = 19$

Box A __19__ Box B __15__ Box C __28__ [3]

16. A shape is made from rectangles.
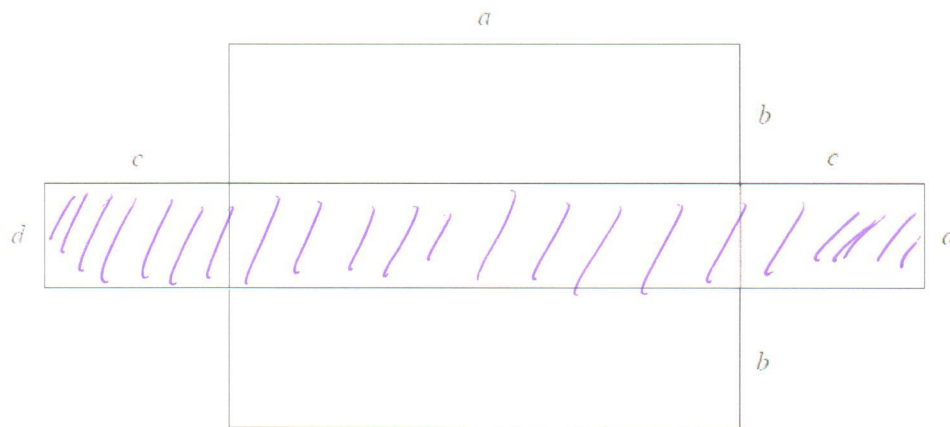
(a) On the diagram below shade an area represented by the expression ab

[1]

(b) On the diagram below shade an area represented by the expression ad + cd
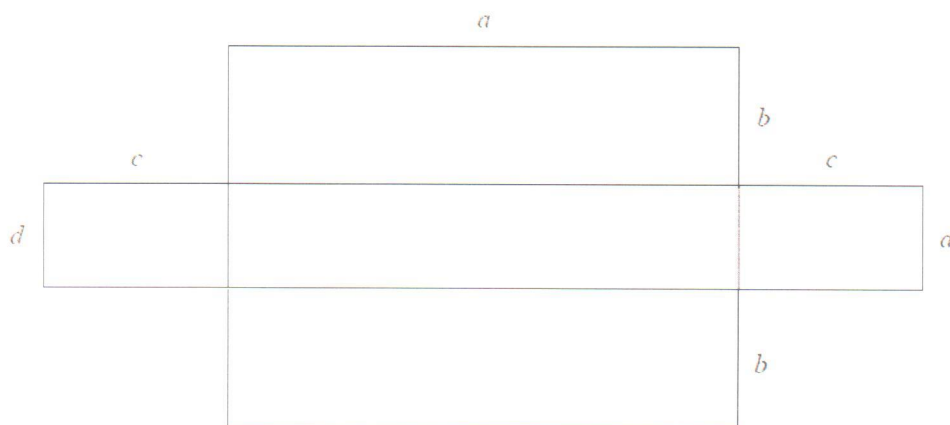
a

b

c c

d d

b

[1]

(c) On the diagram below shade the area represented by the expression d(a + 2c)

a

b

c c

d d

b

[1]

(d) Write down an expression for the area of the whole shape.

a

b

c c

d d

b

[1]

$2ab + d(a + 2c)$

17. Three straight lines are shown.

Work out the value of x.

$2x - 15°$

$2x + 15$

$3x - 38°$

$2x + 15 = 3x - 38$
$53 = x$

[3]

18. Which of these can be written as $\dfrac{}{}$? $\dfrac{a}{b}$

Circle your answer.

[1]

$b \div a$ $a - b$ $\boxed{a \div b}$ $b - a$

19. The diagram shows a square.

$(7x - 3)$ cm

$3(x + 1)$ cm
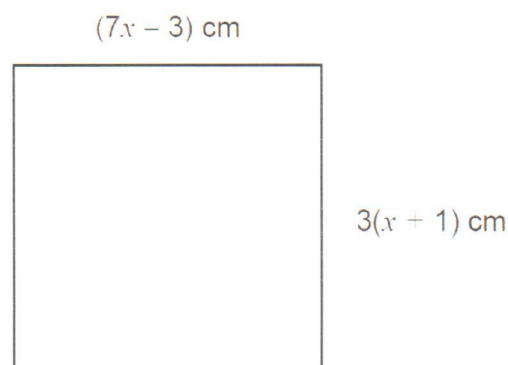
Work out the length of one side of the square.

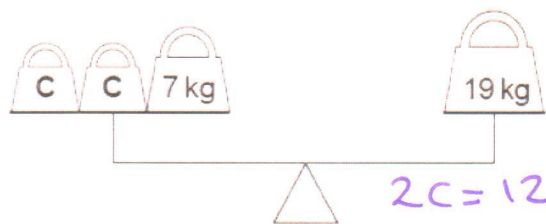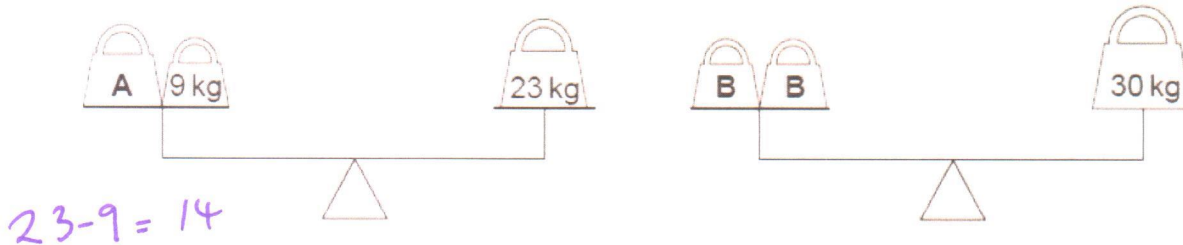$7x - 3 = 3(x + 1)$
$7x - 3 = 3x + 3$
$4x - 3 = 3$
$4x = 6$
$x = \dfrac{3}{2}$

[4]

7.5 cm

20. Each diagram represents a balance with the total weight on each side being equal.

Find the values of A, B and C.

23 − 9 = 14

2C = 12

A = ...14........kg B = ...15........kg C = ...6........kg [3]

21. Charlie has x pens.

Lisa has 3 more pens than Charlie.

Julian has twice as many pens as Lisa.

How many pens do Charlie, Lisa and Julian have altogether?

Simplify your answer as far as possible.

$C = x$

$L = x + 3$

$J = 2(x + 3)$

$x + x + 3 + 2(x + 3)$

$= 4x + 9$

[4]

22. The diagram shows a square.
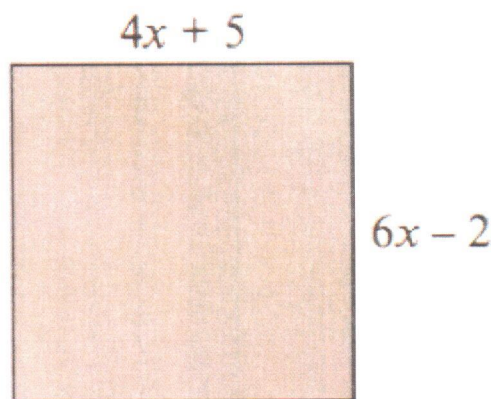
$$4x + 5$$

$$6x - 2$$

Diagram not drawn to scale

All the lengths are measured in centimetres.

Diagram not drawn to scale

Use an algebraic method to find the length of one side of the square.
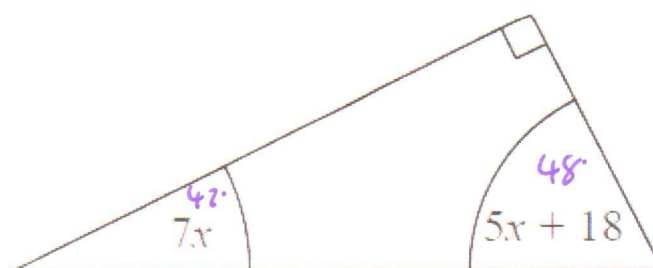
$$4x + 5 = 6x - 2$$
$$5 = 2x - 2$$
$$7 = 2x$$
$$x = 3.5$$

$$4 \times 3.5 + 5$$
$$= \underline{19 \, cm}$$

[5]

23. The diagram shows a right-angled triangle.

42°
7x
48°
5x + 18

All the angles are in degrees.

Work out the size of the smallest angle of the triangle.

$$7x + 5x + 18 = 90$$
$$12x = 72$$
$$x = 6$$

$$7 \times 6 = 42$$
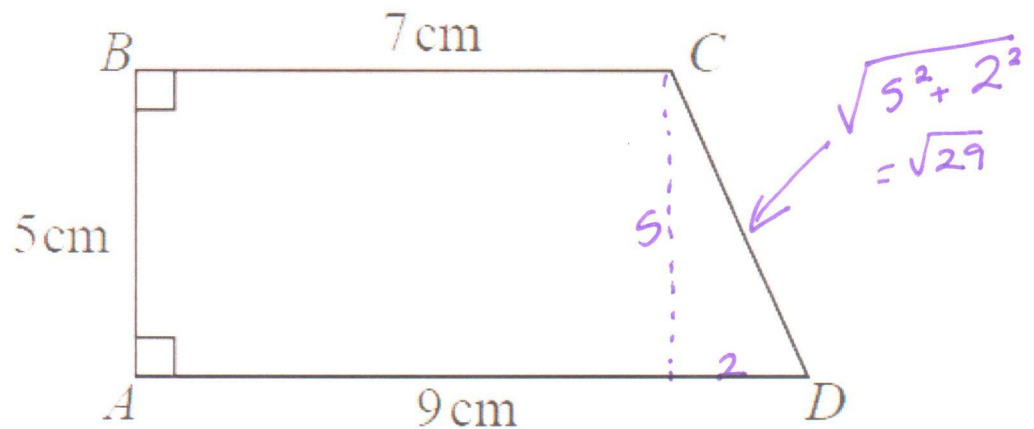
$$\underline{42°}$$

[3]

24. ABCD is a trapezium.

$$\sqrt{5^2 + 2^2} = \sqrt{29}$$

A square has the same perimeter as this trapezium.

Work out the area of the square.

Give your answer correct to 3 significant figures.
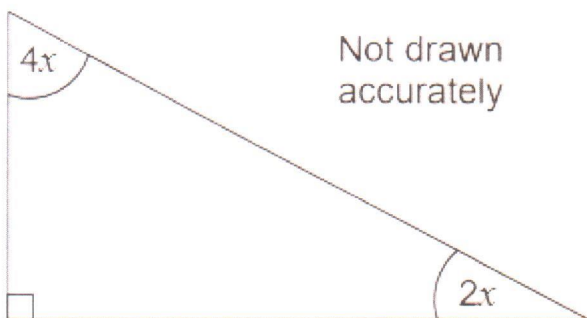
$5 + 7 + 9 + \sqrt{29} = 21 + \sqrt{29}$

Side length of square $= \dfrac{21 + \sqrt{29}}{4}$

area $= \left(\dfrac{21 + \sqrt{29}}{4}\right)^2$

.... 43.5 .... cm² [5]

25. Work out the value of x.

Not drawn
accurately

$4x + 2x = 90$

$6x = 90$

$x = 15°$

[3]