Name: _____

GCSE (1 – 9)

Forming and Solving Equations

Instructions

- Use **black** ink or ball-point pen.
- Answer all questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- You must **show all your working out.**

Information

- The marks for each question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end

1   The lengths, in cm, of the sides of a triangle are $3x - 5$, $2x - 1$ and $x + 1$
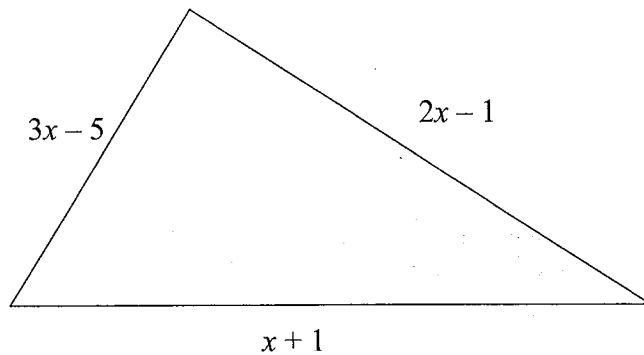
(a) Write down an expression, in terms of x, for the perimeter of the triangle.

$$3x - 5 + 2x - 1 + x + 1$$

................$6x - 5$................ cm

(2)

The perimeter of the triangle is 31 cm.

(b) Work out the value of x.

$$6x - 5 = 31$$
$$6x = 36$$
$$x = 6$$

................6................ [cm]

(2)

(Total for question 1 is 4 marks)

2 A rectangle has a length of $(2x + 3)$ cm and a width of $(x + 5)$ cm.

$x + 5$

$2x + 3$
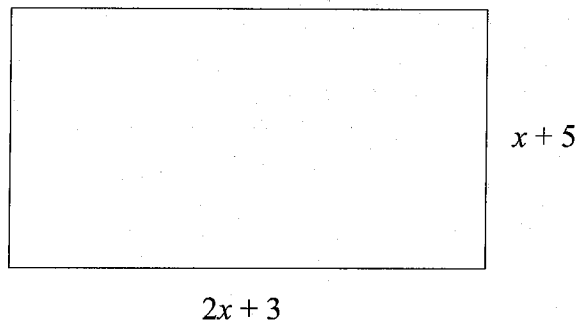
(a) Find an expression for the perimeter of the rectangle.

$$2(2x + 3) + 2(x + 5)$$
$$4x + 6 + 2x + 10$$
$$6x + 16$$

_____6x + 16_____ cm

(2)

(b) Given the rectangle has a perimeter of 43 cm find the value of x.

$$6x + 16 = 43$$
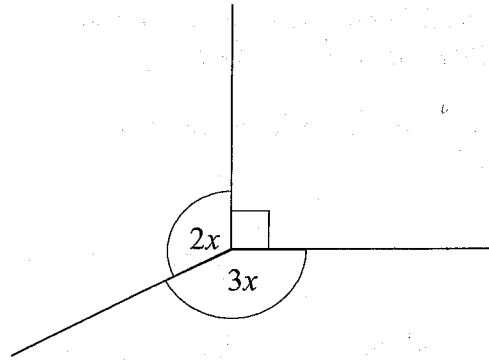$$6x = 27$$
$$x = \frac{27}{6} = \frac{9}{2} = 4.5$$

_____4.5 [cm]_____

(2)

(Total for question 2 is 4 marks)

$$\left(\text{or } \frac{9}{2} \right)$$

3

Find the value of x.
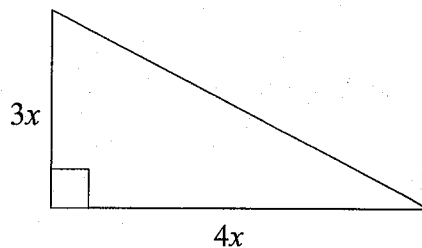
$2x + 3x + 90 = 360$

$5x + 90 = 360$

$5x = 270$

$x = 54$

$54°$

(Total for question 3 is 3 marks)

4   The diagram shows a right angled triangle.

3x

4x

The area of the triangle is 294 cm²

Work out the value of x.

$\frac{1}{2} \times 4x \times 3x = 294$

$\frac{1}{2} \times 12x^2 = 294$

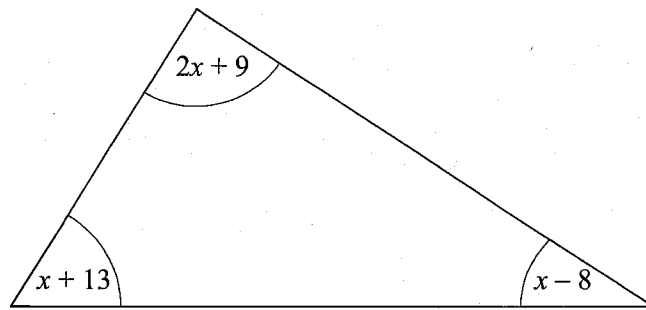$6x^2 = 294$

$x^2 = \frac{294}{6} = \frac{147}{3} = 49$

$x = \sqrt{49}$

$= 7$

$7 \quad [cm]$

(Total for question 4 is 3 marks)

5 The sizes of the angles, in degrees, of a triangle are $2x + 9$, $x + 13$ and $x - 8$

A triangle with angles labelled $2x + 9$ (top), $x + 13$ (bottom left) and $x - 8$ (bottom right).

Work out the value of *x*.

$$2x + 9 + x - 8 + x + 13 = 180$$
$$4x + 14 = 180$$
$$4x = 166$$
$$x = \frac{166}{4} = \frac{83}{2} = 41.5$$

_____ 41.5 or $\frac{83}{2}$ _____

(Total for question 5 is 3 marks)

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6 The diagram shows a rectangle.
All measurements are in centimetres.

A rectangle with top side $2x + 5$, left side x, right side x, bottom side $3x - 2$. Handwritten annotations: 19 (top), 7 (left), 7 (right), 19 (bottom).
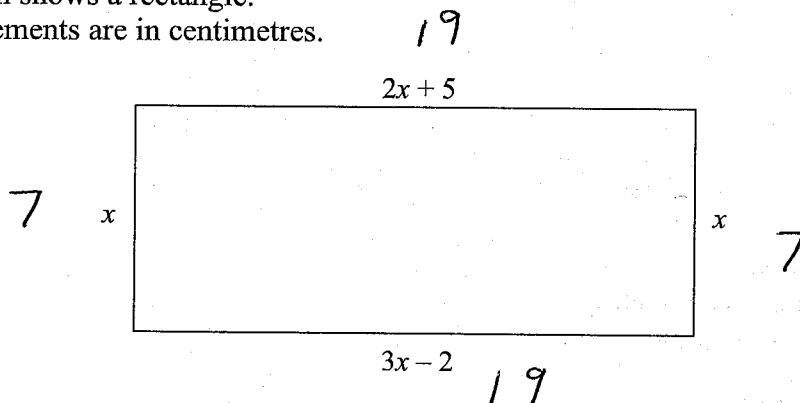
Find the perimeter of the rectangle.

$$2x + 5 = 3x - 2$$
$$5 = x - 2$$
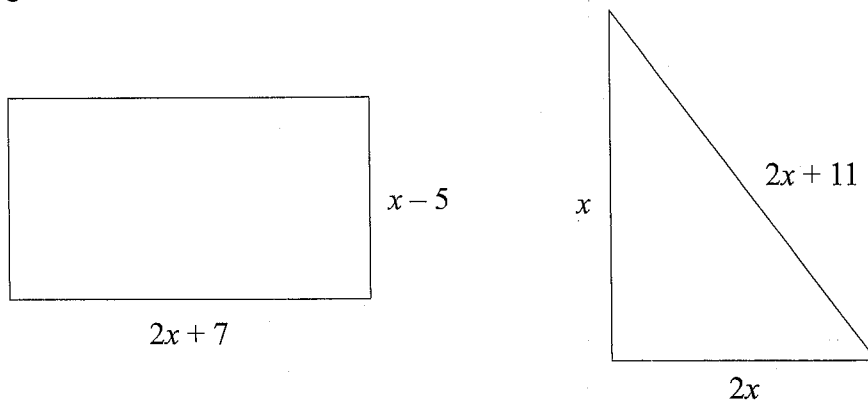$$\underline{7 = x}$$

$$2(7) + 5 = 19$$

$$2(19) + 2(7)$$
$$38 + 14$$

_____ 52 _____ cm

(Total for question 6 is 3 marks)

7 The diagram shows a rectangle and a triangle.

Rectangle: $x - 5$ (height), $2x + 7$ (base)

Triangle: x (left side), $2x + 11$ (hypotenuse), $2x$ (base)
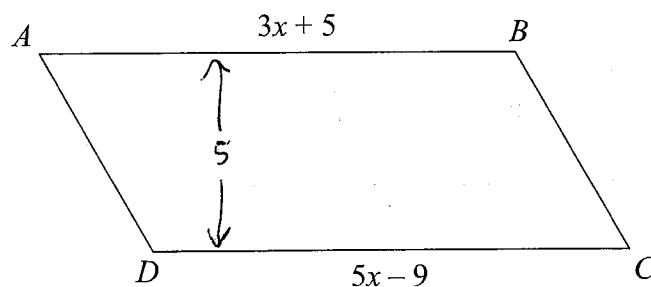
The perimeter of the rectangle is equal to the perimeter of the triangle.

Find the value of x.

$$2(x - 5) + 2(2x + 7) = x + 2x + 2x + 11$$
$$2x - 10 + 4x + 14 = 5x + 11$$
$$6x + 4 = 5x + 11$$
$$x + 4 = 11$$
$$x = 7$$

7

(Total for question 7 is 3 marks)

8

A —— $3x + 5$ —— B

5 (perpendicular height)

D —— $5x - 9$ —— C

ABCD is a parallelogram
All measurements are in centimetres.
The perpendicular height of the parallelogram is 5 cm.

Find the area of ABCD

$$3x + 5 = 5x - 9$$
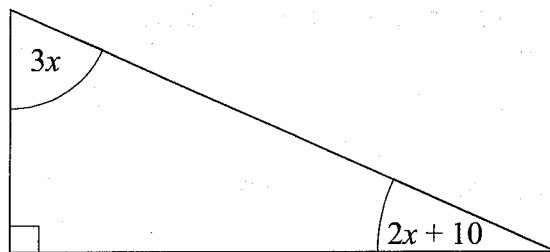$$5 = 2x - 9$$
$$14 = 2x$$
$$x = 7$$

$$3(7) + 5 = 26$$

$$26 \times 5$$

$$130 \ cm^2$$

(Total for question 8 is 4 marks)

9 The diagram shows a right-angled triangle.
All of the angles are in degrees.

Find the value of size of the smallest angle in the triangle.

$$3x + 2x + 10 + 90 = 180$$
$$5x + 100 = 180$$
$$5x = 80$$
$$x = 16$$

$$3(16) = 48 \qquad 2(16) + 10 = 42$$

...........42............°

(Total for question 9 is 3 marks)

10 Adam has some marbles.
Bradley has twice as many marbles are Adam.
Chris has 5 more marbles than Bradley.

In total they have 55 marbles.

How many marbles does Chris have?

Adam = x
Bradley = $2x$
Chris = $2x + 5$

$$x + 2x + 2x + 5 = 55$$
$$5x + 5 = 55$$
$$5x = 50$$
$$x = 10$$
$$2(10) + 5 = 25$$

...........25...........

(Total for question 10 is 3 marks)

11 The size of the largest angle in a triangle is three times the size of the smallest angle.
The other angle is 35° more than the smallest angle.

Work out, in degrees, the size of each angle in the triangle.
You must show your working.

$3x$ x

$x + 35$

$$3x + x + x + 35 = 180$$

$$5x + 35 = 180$$

$$5x = 145$$

$$x = 29$$

$$29 + 35 = 64$$

$$3(29) = 87$$

<u>29</u> °, <u>64</u> °, <u>87</u> °

(Total for question 11 is 5 marks)

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12 Lucy is three times as old as Alex.
Lucy is 7 years older than Megan.
The sum of their ages is 126.

$3x$ x

Find the ratio of Alex's age to Lucy's age to Megan's age.

$$Alex = x$$
$$Lucy = 3x$$
$$Megan = 3x - 7$$

$$x + 3x + 3x - 7 = 126$$
$$7x - 7 = 126$$
$$7x = 133$$
$$x = \underline{19}$$

$$3(19) = \underline{57}$$

$$57 - 7 = \underline{50}$$

$19 : 57 : 50$

(Total for question 12 is 4 marks)