

FluidMaths

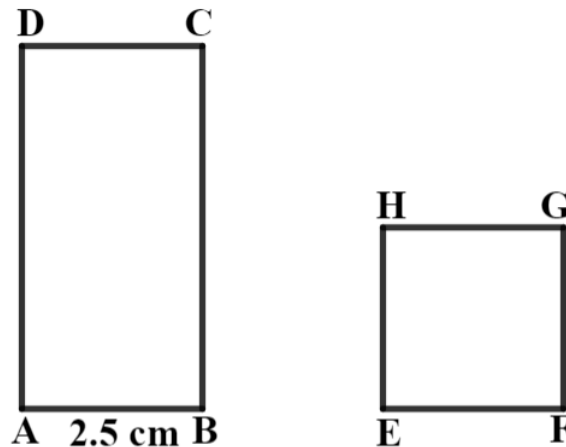
GCSE Mathematics (Grade 9-1)

Problem Solving
Area and Perimeter 1
Solutions

The marks shown are for guidance purposes only

The questions are repeated here for your convenience

- 1 ABCD is a rectangle
EFGH is a square



$$AB = 2.5 \text{ cm}$$

The perimeter of the square is 20 cm

The rectangle and the square have the same area

Calculate the perimeter of the rectangle.

Solution

$$\text{Side length of the square} = 20 \div 4 = 5 \text{ cm}$$

[1mark]

$$\text{Area of the square} = 5 \times 5 = 25$$

[1mark]

$$\text{Therefore, the height of the rectangle} = 25 \div 2.5 = 10 \text{ cm}$$

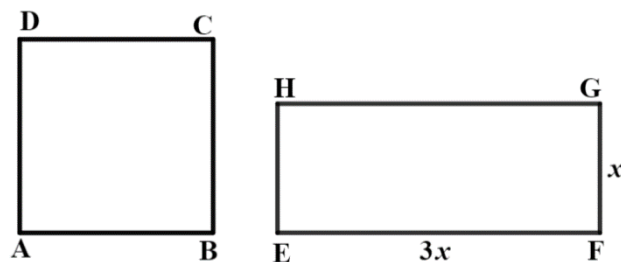
[1mark]

The perimeter of the rectangle will be

$$2.5 + 2.5 + 10 + 10 = 25 \text{ cm}$$

[1mark]

- 2 ABCD is a square
EFGH is a rectangle



$$EF = 3x$$

$$FG = x$$

The area of the square is 81 cm^2

The square and the rectangle have the same perimeter.
Calculate the value of x .

Solution

The side length of the Square is $\sqrt{81} = 9 \text{ cm}$ [1mark]

The perimeter of the square will be $9 \times 4 = 36 \text{ cm}$ [1mark]

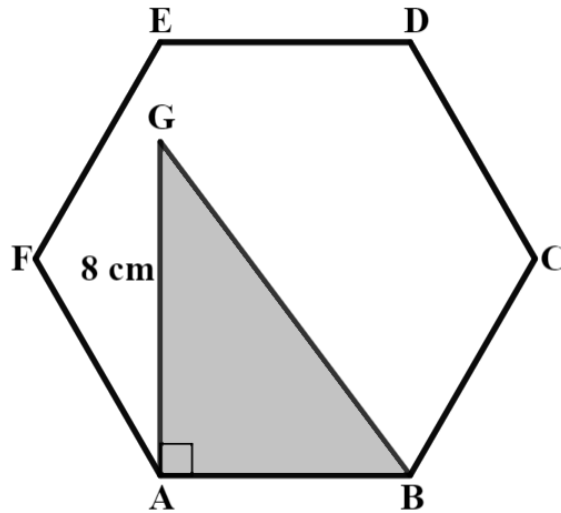
The perimeter of the rectangle = $x + x + 3x + 3x = 8x$
[1mark]

Therefore, $8x = 36$

$$x = 4.5$$

[1mark]

- 3 ABCDEF is a regular hexagon
 ABG is a right-angled triangle



$$AG = 8 \text{ cm}$$

The area of the triangle is 22 cm^2

Calculate the perimeter of the hexagon

Solution

$$\left\{ \text{Area of triangle} = \frac{1}{2}bh \right\}$$

$$\text{Therefore, } 22 = \frac{1}{2} \times b \times 8 \quad [1\text{mark}]$$

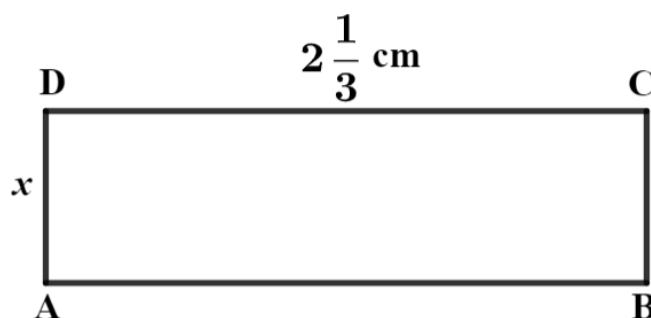
$$4b = 22$$

$$\text{Therefore, } b = 5.5 \quad [1\text{mark}]$$

Hence, $AB = 5.5 \text{ cm}$

Hence, the perimeter of the hexagon is $6 \times 5.5 = 33 \text{ cm}$
[1mark]

4 Here is rectangle ABCD



$$CD = 2\frac{1}{3} \text{ cm}$$

$$AD = x$$

The perimeter of the rectangle is $6\frac{1}{4}$ cm

Calculate the value of x .

Give your answer as a fraction in its simplest form

Solution

$$\text{Therefore, } 2\frac{1}{3} + 2\frac{1}{3} + x + x = 6\frac{1}{4} \text{ [1mark]}$$

{Simplify the LHS of the equation}

$$4\frac{2}{3} + 2x = 6\frac{1}{4} \text{ [1mark] } \text{ {Subtract } 4\frac{2}{3} \text{ from both sides}}$$

$$2x = 6\frac{1}{4} - 4\frac{2}{3}$$

RHS: Change both fractions to improper fractions

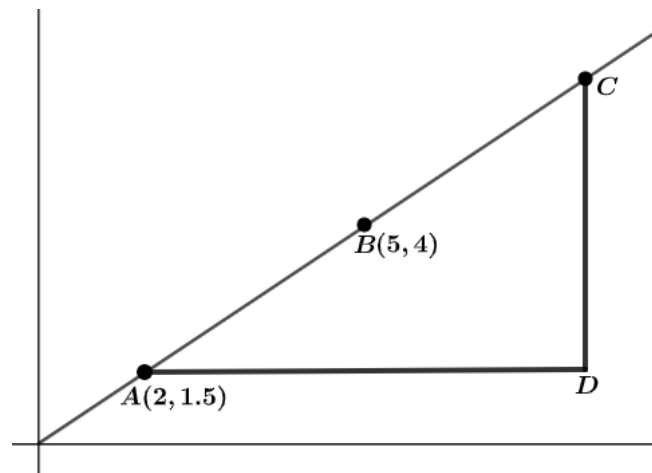
$$\frac{25}{4} - \frac{14}{3} = \frac{75}{12} - \frac{56}{12} = \frac{19}{12} \text{ [1mark]}$$

$$\text{Therefore, } 2x = \frac{19}{12} \text{ {Divide both sides by 2}}$$

$$x = \frac{19}{12} \div 2 \text{ [1mark]}$$

$$x = \frac{19}{12} \times \frac{1}{2} = \frac{19}{24} \text{ [1mark]}$$

5 The diagram below shows the line AC



A has coordinates (2, 1.5)

B has coordinates (5, 4)

B is the midpoint between A and C

Calculate the area of triangle ADC

Solution

Coordinates of C will be (8, 6.5)

[1mark]

Coordinates of D will be (8, 1.5)

[1mark]

This means the base AD of the triangle is $8 - 2 = 6$

The height DC of the triangle is $6.5 - 1.5 = 5$

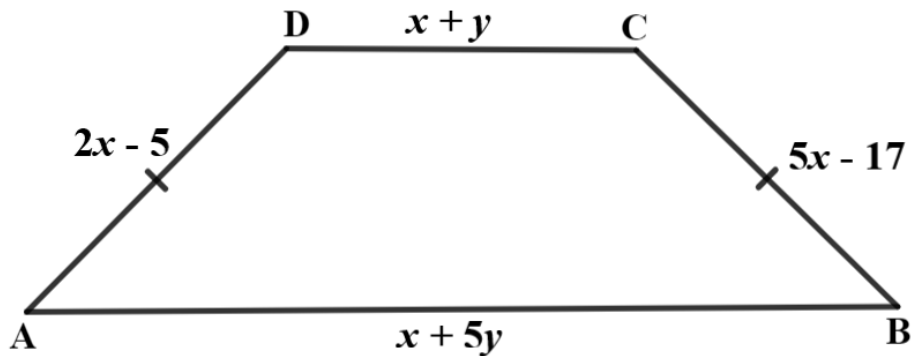
[1mark]

Therefore, the area of the triangle will be

$6 \times 5 \div 2 = 15$ square units

[1mark]

6 ABCD is an isosceles trapezium



$$AD = BC$$

$$AB = 3DC$$

All measurements are in centimeters

Calculate the perimeter of the trapezium.

Solution

$$AD = BC$$

$$\text{Therefore, } 2x - 5 = 5x - 17 \quad [1\text{mark}]$$

$$2x = 5x - 12$$

$$-3x = -12$$

$$x = 4 \quad [1\text{mark}]$$

$$AB = 3DC$$

$$\text{Therefore, } x + 5y = 3(x + y)$$

$$x + 5y = 3x + 3y$$

$$\text{Substitute } x = 4 \text{ into } x + 5y = 3x + 3y$$

$$\text{So, we have } 4 + 5y = 3 \times 4 + 3y$$

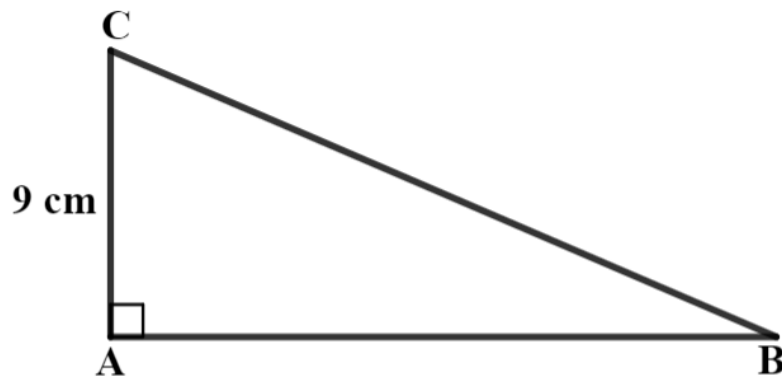
$$4 + 5y = 12 + 3y$$

$$-8 = -2y$$

$$y = 4 \quad [2\text{marks}]$$

$$\begin{aligned} \text{Therefore, the perimeter of the trapezium will be} \\ = 24 + 3 + 3 + 8 = 38 \text{ cm } [1\text{mark}] \end{aligned}$$

7 ABC is a right-angled triangle



$$AC = 9 \text{ cm}$$

The area of the triangle is 49.5 cm^2

Calculate the perimeter of the triangle

Give your answer to 1 decimal place

Solution

We need to find the base length of the triangle

$$\left\{ \text{The area of a triangle} = \frac{1}{2}bh \right\}$$

$$\text{Therefore, } 49.5 = \frac{1}{2} \times b \times 9 \quad [1\text{mark}]$$

$$b = \frac{49.5 \times 2}{9} = 11 \quad [1\text{mark}]$$

Therefore, $AB = 11 \text{ cm}$

Apply the Pythagoras theorem to find BC

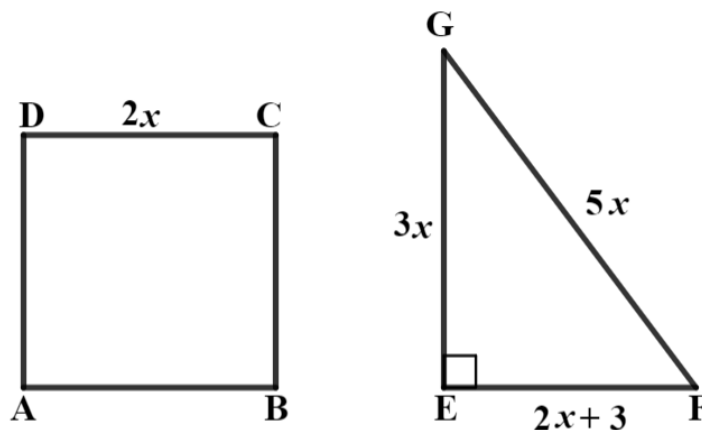
$$(BC)^2 = 9^2 + 11^2 \quad [1\text{mark}]$$

$$BC = \sqrt{202} = 14.2 \text{ (3sf)} \quad [1\text{mark}]$$

Hence, the perimeter of the triangle will be

$$11 + 9 + 14.2 = 34.2 \text{ cm (1dp)} \quad [1\text{mark}]$$

- 8 ABCD is a square of side $2x$
 EFG is a right-angled triangle



$$EF = 2x + 3$$

$$FG = 5x$$

$$EG = 3x$$

The perimeter of the triangle is 42 cm
 Calculate the area of the square.

Solution

The perimeter of the triangle will be

$$5x + 3x + 2x + 3 = 10x + 3 \quad [1\text{mark}]$$

$$\text{Therefore, } 10x + 3 = 42 \quad [1\text{mark}]$$

$$10x = 39$$

$$x = 3.9 \quad [1\text{mark}]$$

Therefore, the side length of the square = $2 \times 3.9 = 7.8$
[1mark]

$$\text{Area of the square} = 7.8 \times 7.8 = 60.84 \text{ cm}^2 \quad [1\text{mark}]$$