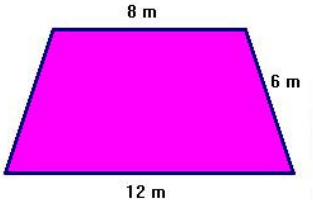
Maths 3rd ESO

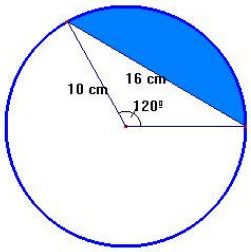
GEOMETRY

1. Find the area of the shaded regions: (2.5 points)

a)

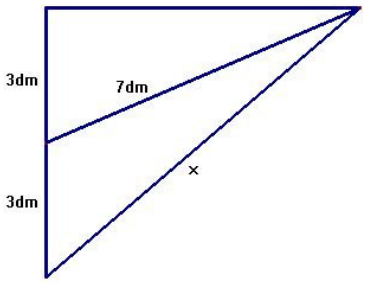


b)



2. The diagonal of a rectangle exceeds the length by 2 cm. If the width of the rectangle is 10 cm, find the length. (1 point)

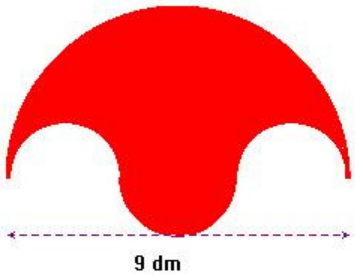
3. In the following diagram calculate x: (1 point)



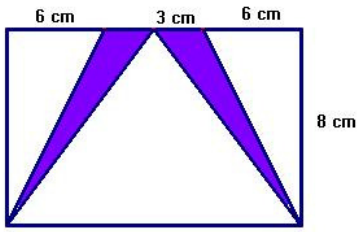
4. A circular pond of diameter 12 m is surrounded by a path of width 1 m. Find the area of the path. (1 point)

5. Calculate the perimeter and area of the shaded regions: (2.5 points)

a)



b)



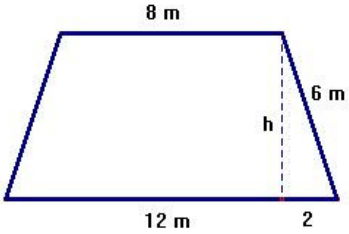
6. Solve: (2 points)

a) $\frac{3x+1}{7} - \frac{2-4x}{3} = \frac{7x}{6} - \frac{5x+4}{14}$

b) $x^2 + (1-x)^2 = 5 - (2-x)^2$

SOLUTION

2. Find the area of the shaded regions:

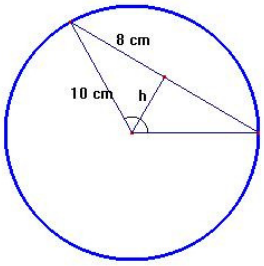


a) Trapezoid: $A = \frac{B+b}{2} \times h$

We calculate the height using Pythagoras Theorem:

$6^2 = h^2 + 2^2 \rightarrow h^2 = 36 - 4 = 32 \rightarrow h = \sqrt{32}m$

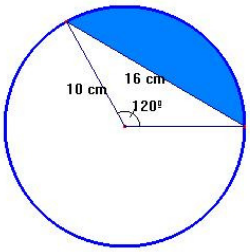
$A = \frac{B+b}{2} \times h = \frac{12+8}{2}\sqrt{32} = 10\sqrt{32} = 56.57m^2$



b) We calculate the area of the circle sector and the area of the triangle:

$10^2 = h^2 + 8^2 \rightarrow h^2 = 100 - 64 = 36 \rightarrow h = 6cm$

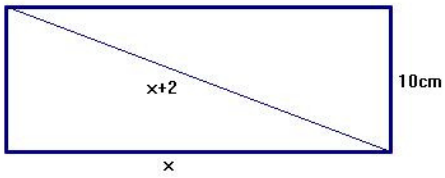
$A_{triangle} = \frac{b \times h}{2} = \frac{16 \times 6}{2} = 48cm^2$



$A_{sector} = \frac{\pi r^2 \times n^o}{360} = \frac{100\pi \times 120}{360} = 104.72cm^2$

$A_{shaded} = A_{sector} - A_{triangle} = 104.72 - 48 = 56.72cm^2$

2. The diagonal of a rectangle exceeds the length by 2 cm. If the width of the rectangle is 10 cm, find the length.



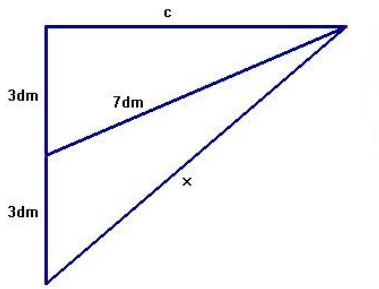
Pythagoras Theorem:

$(x+2)^2 = x^2 + 10^2 \rightarrow x^2 + 4x + 4 = x^2 + 100$

$4x + 4 = 100 \rightarrow 4x = 96 \rightarrow x = 24cm$

The length is 24 cm

3. In the following diagram calculate x:



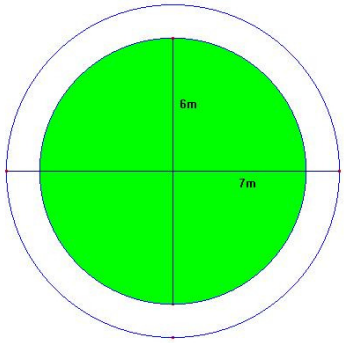
Pythagoras Theorem (little right-triangle):

$7^2 = c^2 + 3^2 \rightarrow c^2 = 49 - 9 = 40 \rightarrow c = \sqrt{40}$

Pythagoras Theorem (big right- triangle):

$x^2 = c^2 + 6^2 \rightarrow x^2 = 40 + 36 = 76 \rightarrow x = \sqrt{76} = 8.72dm$

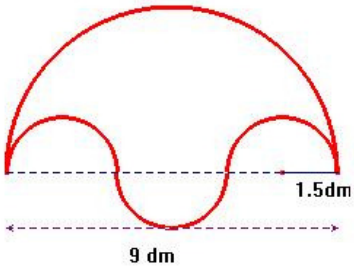
4. A circular pond of diameter 12 m is surrounded by a path of width 1 m. Find the area of the path.



$$A_{path} = A_{big\_circle} - A_{pond} = \pi R^2 - \pi r^2$$
$$A_{path} = 49\pi - 36\pi = 13\pi = 40.84m^2$$

5. Calculate the perimeter and area of the shaded regions:

a)



Area:

Big semi-circle: $A_{BSC} = \frac{4.5^2\pi}{2} = 31.81dm^2$

Little semi-circle: $A_{LSC} = \frac{1.5^2\pi}{2} = 3.53dm^2$

$A = A_{BSC} + A_{LSC} - 2A_{LSC} = A_{BSC} - A_{LSC} = 28.28dm^2$

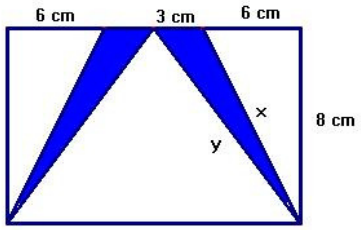
Perimeter:

Big semi-circle: $P_{BSC} = \frac{2\pi \cdot 4.5}{2} = 14.14dm$

Little semi-circle: $P_{LSC} = \frac{2\pi \cdot 1.5}{2} = 4.71dm$

$P = P_{BSC} + P_{LSC} + 2P_{LSC} = P_{BSC} + 3P_{LSC} = 28.28dm$

b)



Area: BLUE TRIANGLES

$A_{triangle} = \frac{b \times h}{2} = \frac{3 \times 8}{2} = 12cm^2$

Shaded area: $A = 2 \times 12 = 24cm^2$

Perimeter: $P = 2 \times (3 + x + y)$

Pythagoras Theorem :

$x^2 = 8^2 + 6^2 \rightarrow x^2 = 64 + 36 = 100 \rightarrow x = 10cm$

$y^2 = 8^2 + 9^2 \rightarrow y^2 = 64 + 81 = 145 \rightarrow y = 12.04cm$

$P = 2 \times (3 + 10 + 12.04) = 50.08cm$

6. Solve:

a) $\frac{3x+1}{7} - \frac{2-4x}{3} = \frac{7x}{6} - \frac{5x+4}{14}$

b) $x^2 + (1-x)^2 = 5 - (2-x)^2$