IES MURILLO

Maths 3rd ESO

EXAM 3_2

1. Solve: (2.5 points)

a) $\frac{(x+1)^2}{16} - \frac{1+x}{2} = \frac{(x-1)^2}{16} - \frac{2+x}{4}$

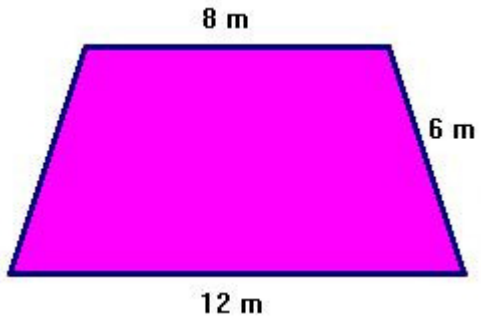
b) $\left.\begin{matrix} x+y=10 \\ x^2+y^2=68 \end{matrix}\right\}$

2. The area of a rectangle is 65 square centimetres. The length is 8 cm more than the width. Find the length and the width. (1.5 points)

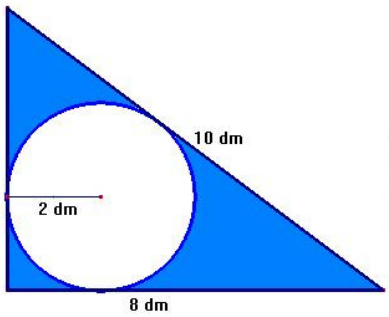
3. To wash a window that is 15 m off the ground, Peter leans a 20-metres ladder against the side of the building. To reach the window, how far away from the building should Peter place the base of the ladder? (1.5 points)

4. Find the area and perimeter of the shaded part in each diagram: (3 points)

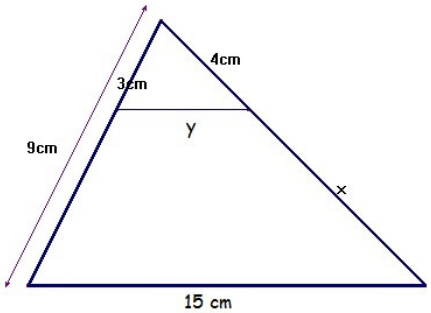
a)



b)



5. In the triangle, work out the length of x and y: (1.5 points)



SOLUTION

1. a) $\frac{(x+1)^2}{16}-\frac{1+x}{2}=\frac{(x-1)^2}{16}-\frac{2+x}{4}\rightarrow x^2+2x+1-8-8x=x^2-2x+1-8-4x$

$2x+1-8-8x=-2x+1-8-4x\rightarrow 2x-8x+2x+4x=1-8-1+8\rightarrow 0x=0$

Solution: all real numbers

b) $\left.\begin{matrix}x+y=10\\ x^2+y^2=68\end{matrix}\right\}\rightarrow y=10-x\Rightarrow x^2+(10-x)^2=68\Rightarrow 2x^2-20x+100=68$

$2x^2-20x+32=0\rightarrow x^2-10x+16=0\rightarrow x=\frac{10\pm\sqrt{100-64}}{2}=\frac{10\pm 6}{2}=\begin{cases}8\\2\end{cases}$

When $\begin{cases}x=8\rightarrow y=10-8=2\\ x=2\rightarrow y=10-2=8\end{cases}$

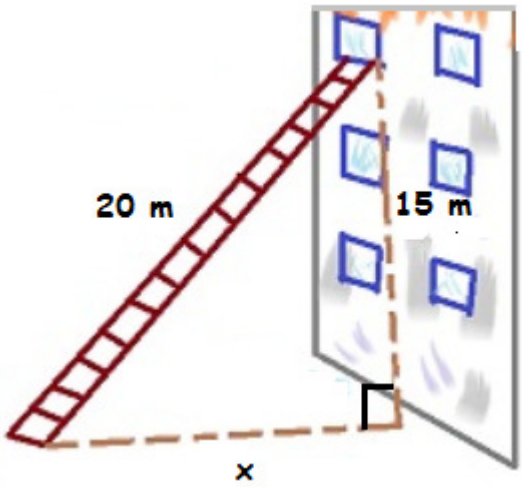
2. The area of a rectangle is 240 square centimetres. The length is 8 more than the width. Find the length and the width.

Length x+8 , width x Area: $A=(x+8)x\rightarrow 65=x^2+8x\rightarrow x^2+8x-65=0$

$x=\frac{-8\pm\sqrt{64+260}}{2}=\frac{-8\pm 18}{2}=\begin{cases}5\\-13\text{ NO}\end{cases}$

Answer: the width is 5 cm and the length 13 cm

3. To wash a window that is 15 m off the ground, Peter leans a 20-metres ladder against the side of the building. To reach the window, how far away from the building should Peter place the base of the ladder?



Pythagorean Theorem:

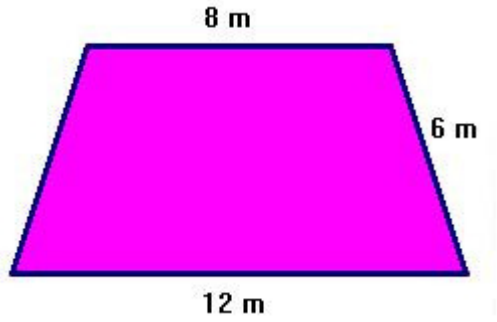
$20^2=x^2+15^2\rightarrow 400=x^2+225$

$x^2=400-225=175$

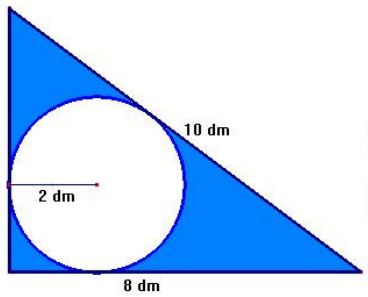
$x=\sqrt{175}=\sqrt{5^2\cdot 7}=5\sqrt{7}\text{metres}$

Find the area and perimeter of the shaded part in each diagram:

a)



b)



a) 12-8=4,

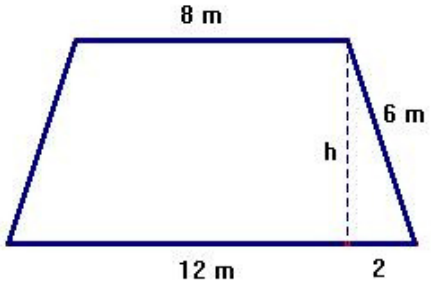
Pythagorean theorem:

$6^2 = h^2 + 2^2 \rightarrow 36 = h^2 + 4$

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

$P = 8 + 6 + 6 + 12 = 32\,m$

$A = \frac{(8+12)\cdot 4\sqrt{2}}{2} = 40\sqrt{2}\,m^2$



b) Pythagorean theorem:

$10^2 = b^2 + 8^2 \rightarrow 100 = b^2 + 64$

$b^2 = 100 - 64 \rightarrow h = \sqrt{36} = 6\,dm$; $A_{Shaded} = A_{Triangle} - A_{Circle}$

$A_{Shaded} = \frac{8\cdot 6}{2} - \pi\cdot 2^2 = 24 - 4\pi\,dm^2$

$P_{Shaded} = P_{Triangle} + P_{Circle} = 6 + 8 + 10 + 2\cdot\pi\cdot 2 = 24 + 4\pi\,dm$

4. In the triangle, work out the length of x and y:

They are similar triangles, so

$\frac{9}{3} = \frac{4+x}{4} \rightarrow 4 + x = \frac{4\cdot 9}{3} = 12$

$x = 12 - 4 \Rightarrow x = 8\,cm$

$\frac{9}{3} = \frac{15}{y} \rightarrow 9y = 15\cdot 3 \Rightarrow y = \frac{15\cdot 3}{9} = 5\,cm$