IES MURILLO

Maths 4th ESO

EXAM 2_3 (Geometry-Trigonometry)

1. A 5-foot-tall person casts an 8-foot shadow. A vertical pole that supports a basketball hoop is 12 feet high. How long is the shadow of the pole? (1.5 p)

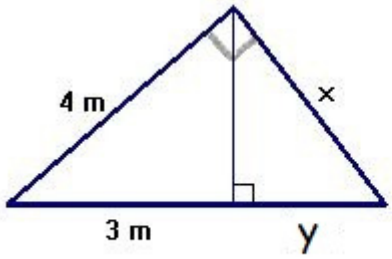
2. From a point 10 m from a vertical wall, the angles of elevation of the bottom and the top of a statue of Sir Isaac Newton, set in the wall, are 40° and 52°. Calculate the height of the statue. (1.5 points)

3. Calculate the size of the acute angle between the two diagonal of a rectangle which diagonal is 12 cm long and has a side of 5 cm. Give your answer rounding to degrees and minutes. (1.5 points)

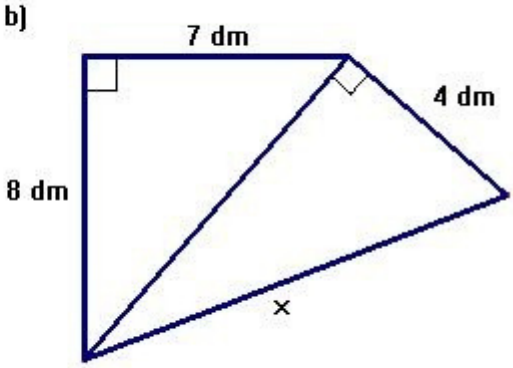
4. Find the length of the diagonal of a cube of side 5 dm. (1.5 points)

5. In each triangle find the missing length (write the steps you have taken to reach the solution): (4 points)

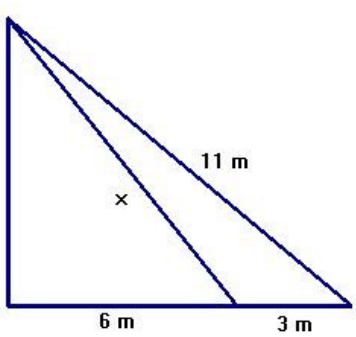
a)



b)



c)



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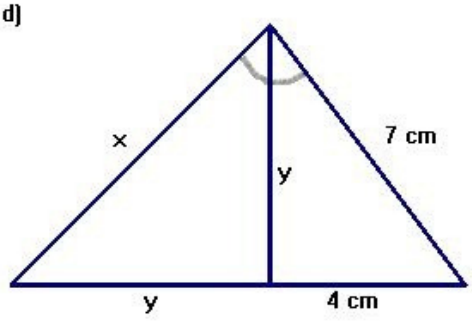
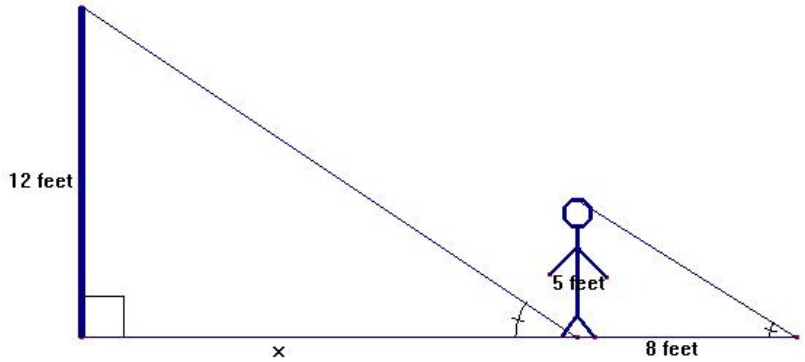


SOLUTION

1. A 5-foot-tall person casts an 8-foot shadow. A vertical pole that supports a basketball hoop is 12 feet high. How long is the shadow of the pole?

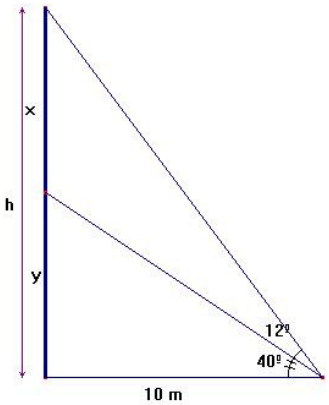


Similar triangles because they have congruent angles.

$$\frac{12}{5}=\frac{x}{8}\Rightarrow x=\frac{8\cdot 12}{5}=19.2$$

The shadow is 19.2 feet long

2. From a point 10 m from a vertical wall, the angles of elevation of the bottom and the top of a statue of Sir Isaac Newton, set in the wall, are 40° and 52°. Calculate the height of the statue.



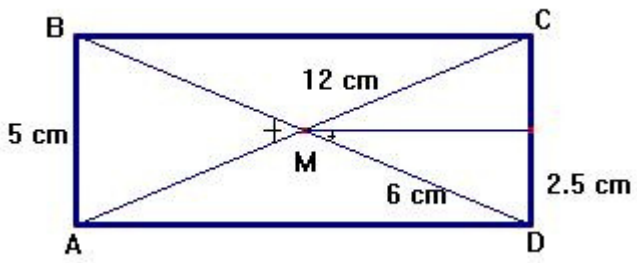
$$tan\,40^{o}=\frac{y}{10}\Rightarrow y=10\,tan\,40^{o}=8.39\text{m}$$

$$tan\,52^{o}=\frac{h}{10}\Rightarrow h=10\,tan\,52^{o}=12.80\text{m}$$

Height of the statue:

$$x=12.80-8.39=4.41\,\text{m}$$

3. Calculate the size of the acute angle between the two diagonal of a rectangle which diagonal is 12 cm long and has a side of 5 cm. Give your answer rounding to degrees and minutes.

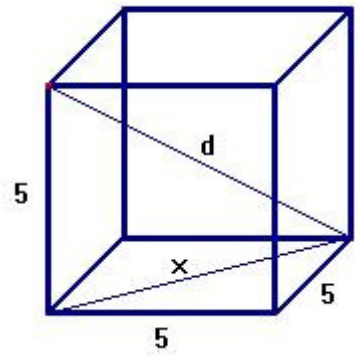


$$sin\,\alpha=\frac{2.5}{6}\Rightarrow \alpha=24^{o}37'28''$$

The acute angle between the diagonals is

$$2\alpha=2\cdot 24^{o}37'28''=49^{o}15'$$

4. Find the length of the diagonal of a cube of side 5 dm. Give your answer rounding to the hundreth

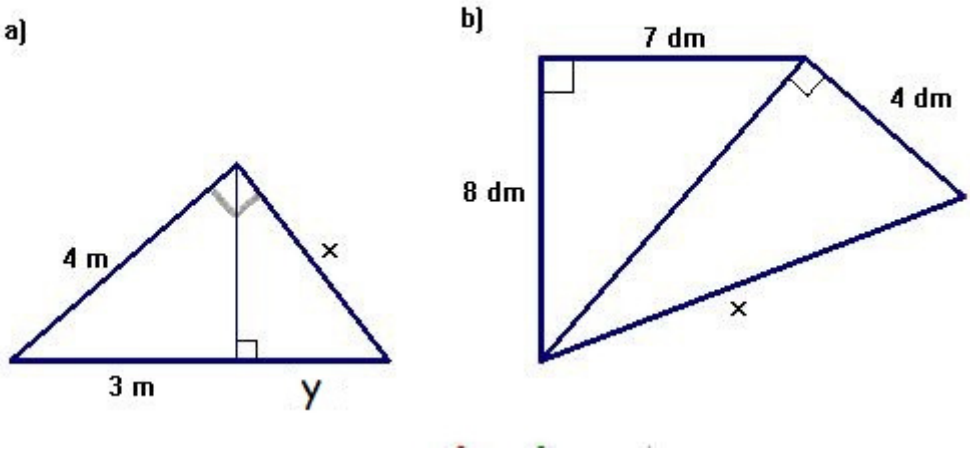


$x^2 = 5^2 + 5^2 \Rightarrow x = \sqrt{50}$

$d^2 = x^2 + 5^2 \Rightarrow d^2 = 50 + 25 = 75$

$d = \sqrt{75} = 8.66$ dm

5. In each triangle find the missing length (write the steps you have taken to reach the solution):



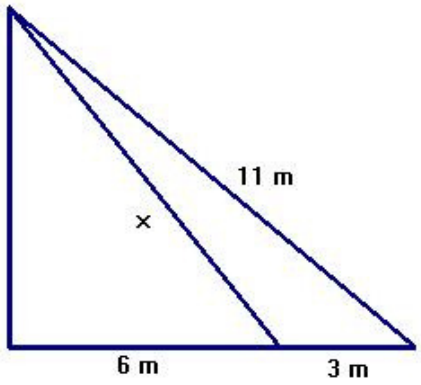
a) It is a right-angle triangle: (leg's theorem) $4^2 = 3 \cdot (3 + y) \Rightarrow 16 = 9 + 3y \Rightarrow y = \frac{7}{3}$ m

Pythagorean theorem: $\left(3 + \frac{7}{3}\right)^2 = 4^2 + x^2 \Rightarrow x^2 = \frac{256}{9} - 16 = \frac{112}{9} \Rightarrow x = \frac{\sqrt{112}}{3} \approx 3.53$m

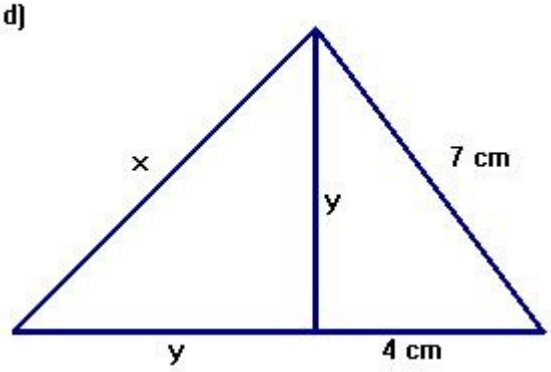
b) Pythagorean theorem: $a^2 = 8^2 + 7^2 \Rightarrow a^2 = 113 \Rightarrow a = \sqrt{113}$ dm

$x^2 = \sqrt{113}^2 + 4^2 \Rightarrow x^2 = 113 + 16 \Rightarrow x = \sqrt{129} \approx 11.36$ dm

c)



d)



C) Pythagorean theorem: $11^2 = 9^2 + h^2 \Rightarrow h^2 = 121 - 81 \Rightarrow h = \sqrt{40}$ m

$x^2 = 6^2 + h^2 = 36 + 40 = 76 \Rightarrow x = \sqrt{76} \approx 8.72$ m

d) Pythagorean theorem: $7^2 = 4^2 + y^2 \Rightarrow y^2 = 49 - 16 = 33 \Rightarrow y = \sqrt{33} \approx 5.74$ cm

$x^2 = y^2 + y^2 \Rightarrow x^2 = 2\sqrt{33}^2 \Rightarrow y^2 = 66 \Rightarrow y = \sqrt{66} \approx 8.12$ cm