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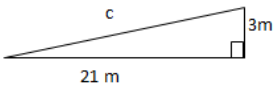
MCF3M Unit 4, Lesson 1

Finding Side Lengths in Right Triangles

Given 2 sides of a right triangle it is always possible to find the 3rd side using Pythagorean Theorem.

Examples



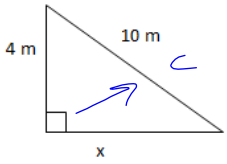
$c^2 = a^2 + b^2$

$c^2 = 21^2 + 3^2$

$c^2 = 450$

$c = \sqrt{450}$

$c \doteq 21.2m$



$c^2 = a^2 + b^2$

$10^2 = x^2 + 4^2$

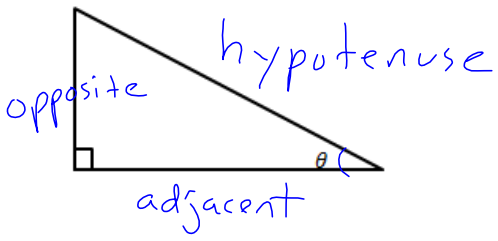
$10^2 - 4^2 = x^2$

$x^2 = 84$

$x = \sqrt{84}$

$x \doteq 9.16m$

If we know the value of one of the angles of a right triangle (other than the 90° angle) then we may use the sine, cosine and tangent ratios to find the other sides in the triangle. **SOH CAH TOA**

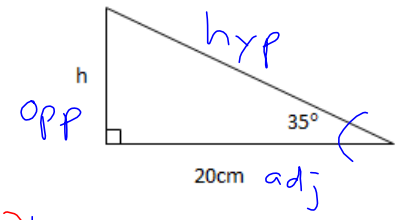


$\sin\theta = \frac{opp}{hyp}$ $\cos\theta = \frac{adj}{hyp}$

$\tan\theta = \frac{opp}{adj}$

Examples

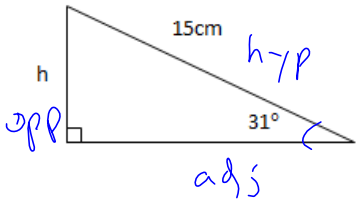
Find the unknown side in each triangle below.



$(20)\tan 35° = \frac{h}{20}(20)$

$h = 20\tan 35°$

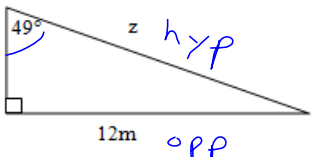
$h \doteq 14\text{cm}$



$\sin 31° = \frac{h}{15}$

$h = 15\sin 31°$

$h \doteq 7.7\text{cm}$



$(z)\sin 49° = \frac{12}{z}(z)$

$z\sin 49° = 12$

$z = \frac{12}{\sin 49°}$

$z \doteq 15.9\text{m}$

$\frac{\sin 49°}{1} = \frac{12}{z}$

$z\sin 49 = 12$

$z = \frac{12}{\sin 49°}$

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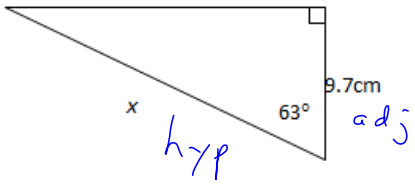


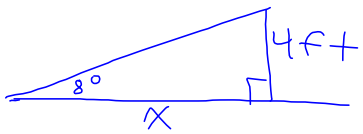
$$\cos 63^\circ = \frac{9.7}{x}$$

$$x \cos 63^\circ = 9.7$$

$$x = \frac{9.7}{\cos 63^\circ}$$

$$x \doteq 21.4 \text{cm}$$

A wheelchair ramp is required to have an angle of elevation (inclination) that is not greater than 8°. Suppose a wheel chair ramp needs to reach an entranceway that is 4 feet off the ground. What horizontal length does th wheel chair ramp need to have?



$$\tan 8^\circ = \frac{4}{x}$$

$$x \tan 8^\circ = 4$$

$$x = \frac{4}{\tan 8^\circ}$$

$$x \doteq 28.5$$

28.5 ft

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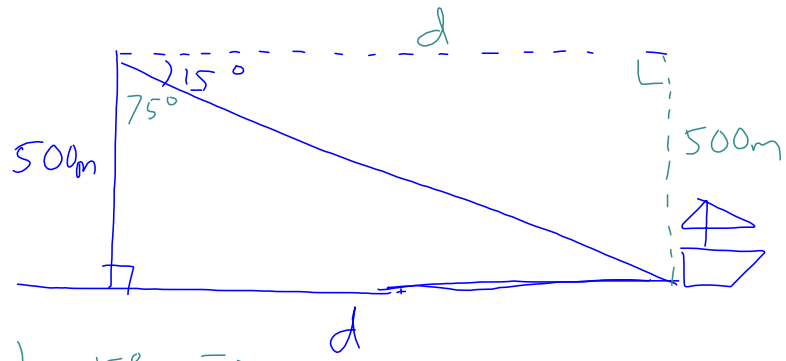
A helicopter spots a boat that needs rescuing. The helicopter is flying at an elevation of 500m. The angle of depression to the boat is 15°. How far does the helicopter need to fly so it is directly over top of the boat?



$\tan 15° = \frac{500}{d}$

$d = \frac{500}{\tan 15°}$

$d \doteq 1866\text{m}$ or 1.9km