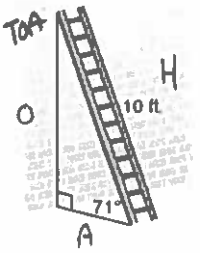
Solving Problems Using Right Triangles

Ex/ A ladder that is 10 feet long is leaning against a wall at a 71° angle. How far from the wall is the foot of the ladder? How high up the wall does the ladder reach?

① label
② SOH CAH TOA



$\cos 71 = \frac{A}{10}$ ↓ multiply by 10

$10\cos 71 = A$

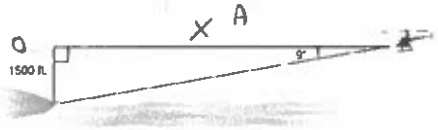
$A = 3.26$ ft from the wall

$\sin 71 = \frac{O}{10}$

$O = 10\sin 71$

$= 9.46$ ft up the wall

Ex/ A rescue helicopter is flying horizontally at an altitude of 1500 feet over Georgian Bay toward Beausoleil Island. The angle of depression to the island is 9°. How much farther must the helicopter fly before it is above the island? Give your answer to the nearest foot.



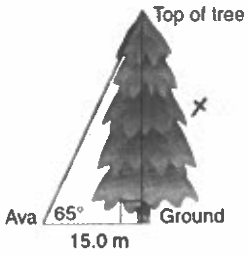
$\tan 9 = \frac{1500}{x}$ ↓ multiply by x

$\frac{x\tan 9}{\tan 9} = \frac{1500}{\tan 9}$ ↓ divide out tan 9

$x = 9470.63$ ft

∴ It must fly 9471 ft to the island

Ex/ Ava's town is having a contest to find the tallest tree. To measure the height of a pine tree on her family's farm, Ava walks 15 m from the base of the tree. She measures the angle of elevation from the ground to the top of the tree as 65°. How tall is the tree?



$\tan 65 = \frac{x}{15}$

$15\tan 65 = x$

$x = 32.17$ m

∴ The tree is 32.17 m tall

Ex/ A road rises 8 m over a distance of 90 m along its surface. At what angle is the road climbing?

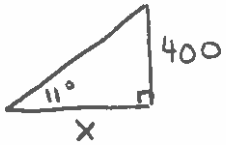
$\sin x = \frac{8}{90}$

$x = \sin^{-1}(8/90)$

$= 5.1°$

∴ The road is at an 5.1° angle

Ex/ An airplane climbs at an angle of 11° with the ground. Find the ground distance it has traveled when it has attained an altitude of 400 feet.



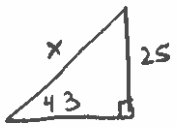
$\tan 11 = \frac{400}{x}$

$\frac{x\tan 11}{\tan 11} = \frac{400}{\tan 11}$

$X = 2057.82$

∴ The plane has traveled 2057.82 ft.

Ex/ Henry is flying a kite. The kite string makes an angle of 43° with the ground. If the kite is at a height of 25 feet, find the length of the kite string.



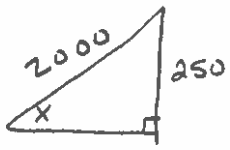
$\sin 43 = \frac{25}{x}$

$\frac{x \sin 43}{\sin 43} = \frac{25}{\sin 43}$

$x = 36.66$

∴ The kite's string is 36.66 ft. long.

Ex/ In order to reach the top of a hill which is 250 feet high, one must travel 2000 feet straight up a road which leads to the top. Find the number of degrees contained in the angle which the road makes with the horizontal.



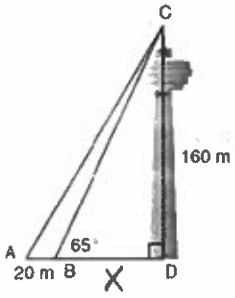
$\sin x = \frac{250}{2000}$

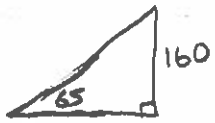
$x = \sin^{-1}(250/2000)$

$= 7.18°$

∴ The road is at an angle of 7.18°.

Ex/ The Skylon Tower in Niagara Falls is about 160 m high. From a certain distance, Cory measures the angle of elevation to the top of the tower to be 65°. Then he walks another 20 m away from the tower in the same direction and measures the angle of elevation again. Determine the measure of the new angle of elevation to the nearest degree.





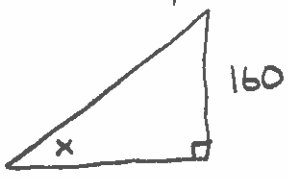
original spot

$\tan 65 = \frac{X}{160}$

$X = 160 \tan 65$

$X = 343.12$ ← original distance

new spot



20 + 343.12 = 363.12

Walked 20m more →

$\tan x = \frac{160}{363.12}$

$x = \tan^{-1}(160/363.12)$

$= 23.78$

$= 24°$

Practice: Handout - Solving Problems with Right Triangles