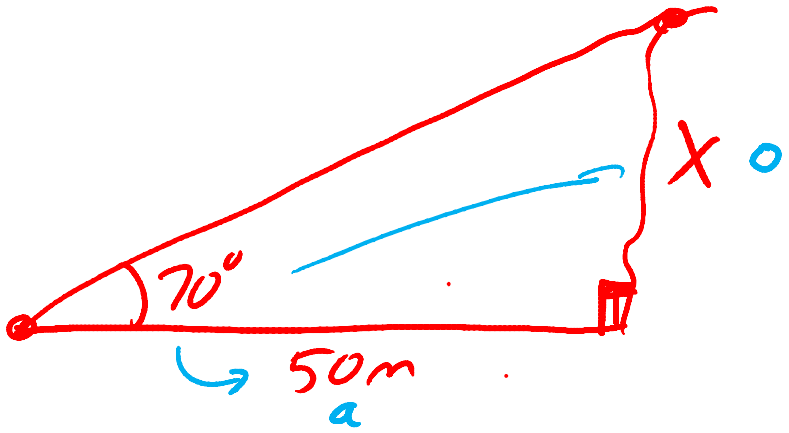
Mathematics 10D

7.6 – Solving Right Triangle Problems

Mr. D. Hagen

Janice is getting ready to climb a steep cliff. She needs to fasten herself to a rope that is anchored at the top of the cliff. To estimate how much rope she needs, she stands 50 m from the base of the cliff and estimates that the angle of elevation to the top is 70°. How high is the cliff?



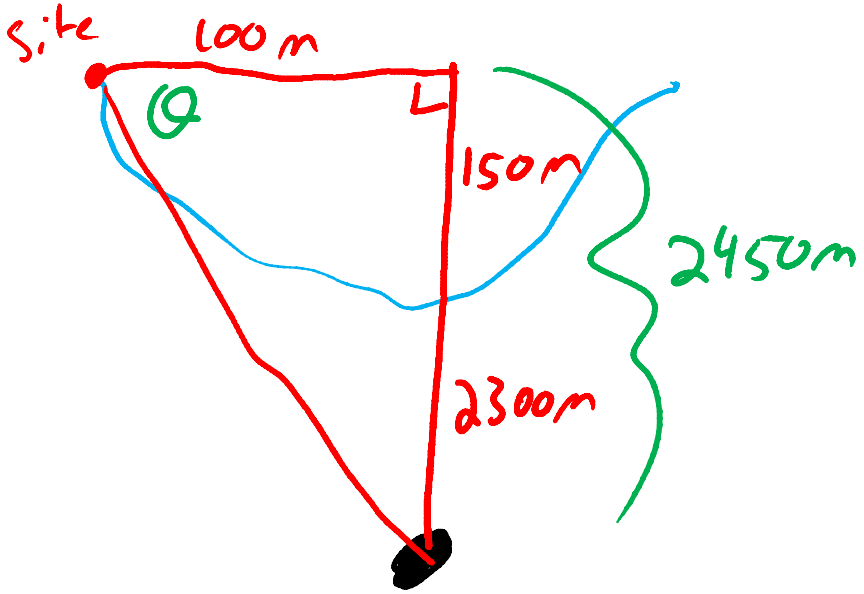
$\tan 70 = \frac{x}{50}$

$50 \tan 70 = x$

$137.4\text{m} = x$

∴ the height of the cliff is 137.4m.

Jackie works for an oil company. She needs to drill a well to an oil deposit. The deposit lies 2300 m below the bottom of a lake, which is 150 m deep. The well must be drilled at an angle from a site on land. The site is 1000 m away from a point directly above the deposit.

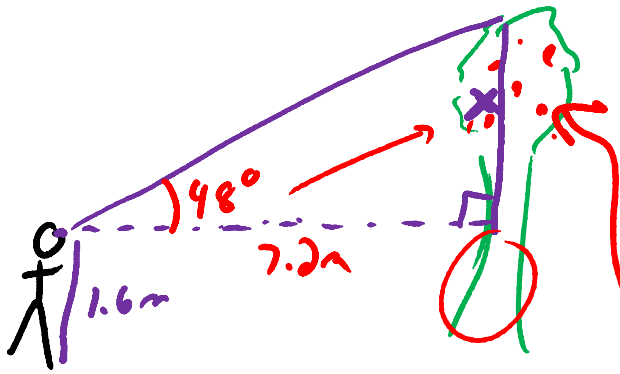


$\tan\theta = \frac{2450}{100}$

$\theta = \tan^{-1}\left(\frac{2450}{100}\right)$

$\theta = 88^\circ$

Ayesha is a forester. She uses a clinometer (a device used to measure angles of elevation) to sight the top of a tree. She measures an angle of 48°. She is standing 7.2 m from the tree, and her eyes are 1.6 m above ground. How tall is the tree?



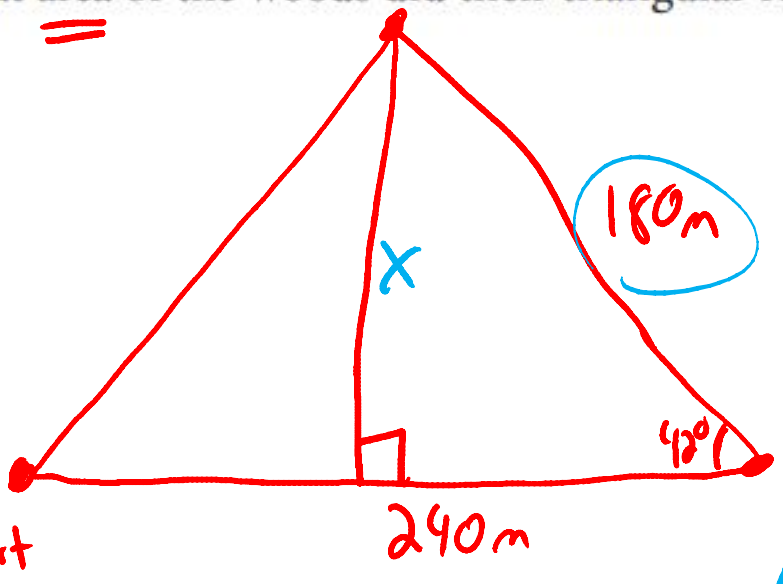
$\tan 48 = \frac{x}{7.2}$

$7.2 \tan 48 = x$

$8 = x$

∴ The tree is 9.6m tall.

A group of students are on an outdoor education trip. They leave their campsite and travel 240 m before reaching the first orienteering checkpoint. They turn, creating a 42° angle with their previous path, and travel another 180 m to get to the second checkpoint. They turn again and travel the shortest possible path back to their campsite. What area of the woods did their triangular route cover?



$A = \frac{bh}{2}$

$\sin 42 = \frac{x}{180}$

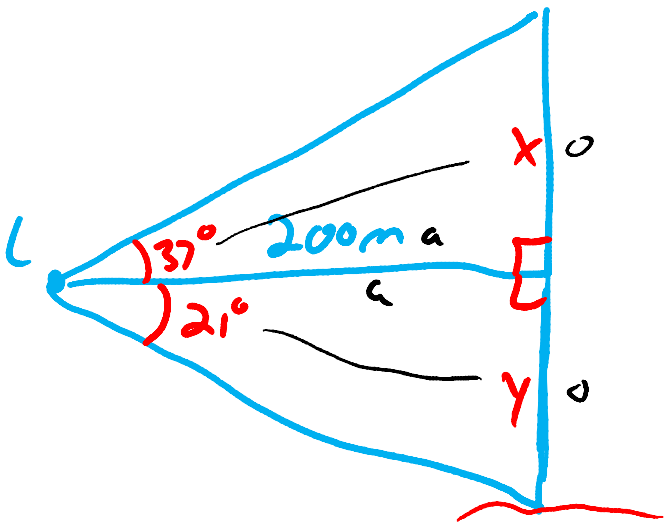
$180 \sin 42 = x$

$120.4 = x$

$A = \frac{(240)(120.4)}{2}$

$A = 14{,}448\ m^2$

Lyle stood on land, 200 m away from one of the towers on a bridge. He reasoned that he could calculate the height of the tower by measuring the angle to the top of the tower and the angle to its base at water level. He measured the angle of elevation to its top as 37° and the angle of depression to its base as 21°. Calculate the height of the tower from its base at water level, to the nearest metre.



$\tan 37 = \frac{x}{200}$

$200 \tan 37 = x$

$150.7 = x$

$\tan 21 = \frac{y}{200}$

$200 \tan 21 = y$

$76.8 = x$

The tower is $150.7 + 76.8$ m

$= 227.5$ m tall