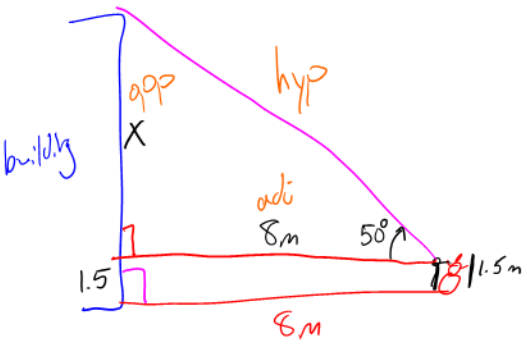
5.4: Applications of SOHCAHTOA

Learning Goal: We are learning to use SOHCAHTOA, Pythagorean theorem, and properties of similar triangles to solve problems involving triangles.

In real-life scenarios, we must choose the appropriate ratio to use based on which angle we are using and which side we know, and which side we are trying to find.

Example 1 – Angle of Elevation / Depression
From a point 8m from the base of a building, Olaf measures the angle of elevation to the top of the building using a 1.5m tall transit instrument. The angle of elevation is 50°. How tall is the building?



$\tan 50 = \frac{opp}{adj}$

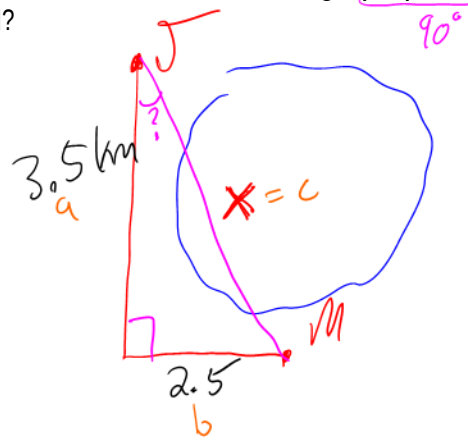
$\tan 50 = \frac{x}{8}$

$8(1.1918) = \frac{x}{8}(8)$

$9.5 = x$

∴ The building is 9.5m + 1.5m which is 11m tall.

Example 2 – Pythagorean Theorem & SOHCAHTOA
Jill and Micu both live in cottages on the shore of a lake. To walk to Micu's home, Jill hs to travel along a straight road for 3.5 km, and then along a perpendicular road for another 2.5 km. How far is it from Jill's home to Micu's by road?



∴ To travel along the road, the distance is 6 km.

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

$2.5^2 + 3.5^2 = c^2$

$6.25 + 12.25 = c^2$

$\sqrt{18.5} = \sqrt{c^2}$

$4.3 = c$

∴ the shortest distance is 4.3 km

What angle is formed between the Jill's road and her house?

$\sin J = \frac{opp}{hyp}$

$\sin J = \frac{2.5}{4.3}$

$\sin J = 0.5814$

$J = \sin^{-1}(0.5814)$

$J = 36°$

∴ The angle between Jill's road and house is 36°

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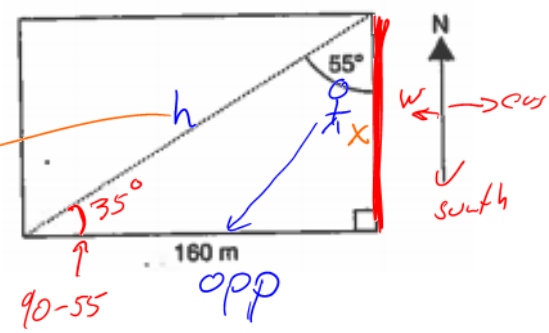
Example #3 – SOHCAHTOA

A utility company needs to run a power cable from the southwest corner of this rectangular field to the northeast corner. How long is the diagonal of the field, to the nearest metre?



$\sin 55 = \frac{160}{h}$

$h = \frac{160}{\sin 55} = \frac{160}{0.8192} = 195.3\text{m}$

Use the sine ratio to find the length of the east side of the field?

$\sin 35 = \frac{x}{195.3}$

$195.3(0.5736) = \frac{x}{195.3}(195.3)$

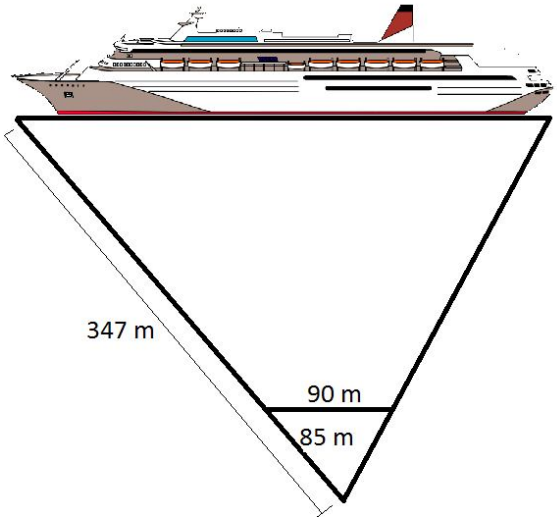
$x = 112\text{ m}$

What other method(s) could we use to find the east side of the field?

How much cable does the utility company save by going along the diagonal of the field, instead of along the south and east sides?

Example 4 – Similar Triangles

A surveyor is trying to calculate the length of a cruise liner docked in port. He uses a fancy laser to measure that the front of the cruise liner is 347 m away. From his position, he sets up a similar triangle on the dock. His first marker is 85 m away from him, towards the bow of the ship and the second marker is 90 m away along the dock, in a direct line to the stern of the ship. About how long is the cruise ship to the nearest metre?



Success Criteria

- I can sketch a diagram illustrating a word problem that involves triangles
- I can tell when to use SOHCAHTOA, similar triangles, or the Pythagorean theorem to solve a word problem involving triangles.