

Applications of the Primary Trigonometric Ratios

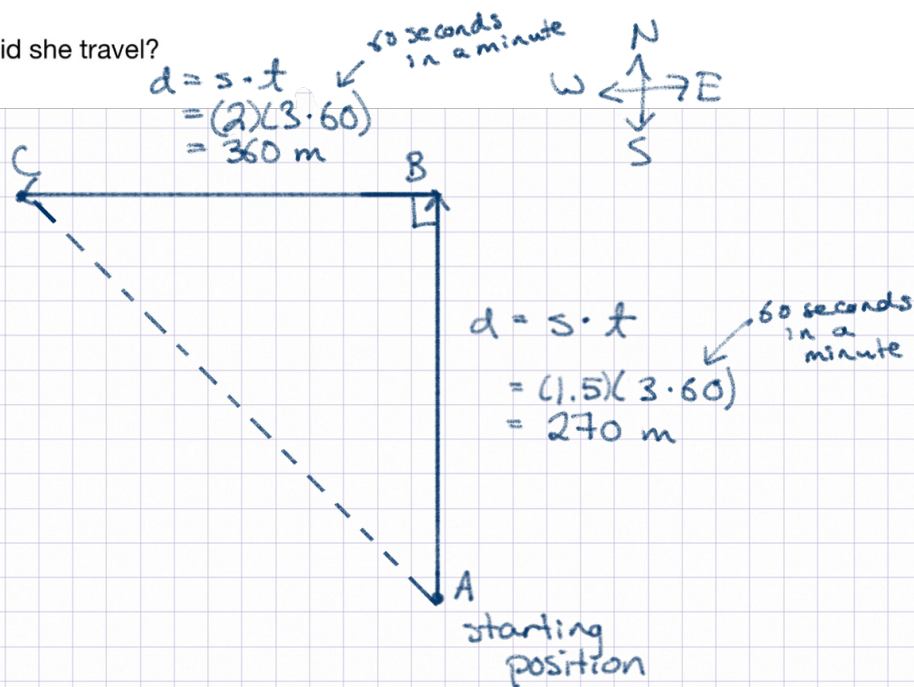
Example 1

A scuba driver swam north at 1.5 m/s across a current running from east to west at 2.0 m/s.

She swam for 3 minutes and then surfaced.

- a. Draw a diagram showing where the dive boat will pick her up relative to where she dove.

- b. How far did she travel?



$$AC^2 = AB^2 + BC^2$$

$$AC^2 = 270^2 + 360^2$$

$$AC^2 = 202500$$

$$\sqrt{AC^2} = \sqrt{202500}$$

$$AC = 450$$

\therefore She travelled 450 m on her dive.

Without an east to west current, the scuba diver would simply travel 270 m north.

With the current pushing her east to west, she will end up at point C having travelled a long line segment AC.

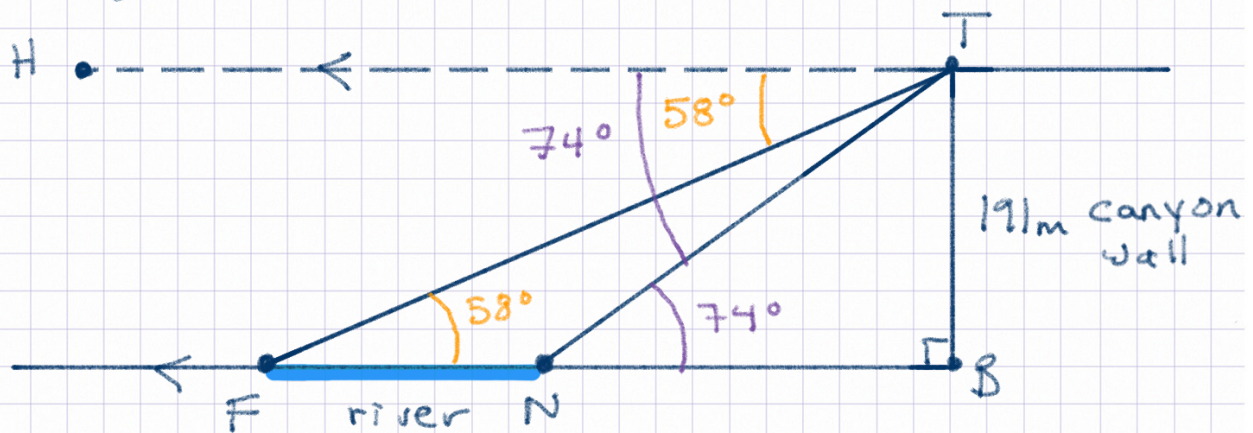
Example 2

From the top of a canyon, the angle of depression to the far side of the river is 58 degrees, and the angle of depression to the near side of the river is 74 degrees. The depth of the canyon is 191 m.

What is the width of the river at the bottom of the canyon?

Round to the nearest tenth of a meter.

Assuming a "sheer" canyon wall that meets ground at 90°.



$$\angle FTH = \angle TFB = 58^\circ \text{ (Z pattern)}$$

$$\angle NTH = \angle TNB = 74^\circ \text{ (Z pattern)}$$

Need FN, the width of the river.

$$FN = FB - NB$$

to get FB:

$$\tan TFB = \frac{TB}{FB}$$

$$\tan 58^\circ = \frac{191}{FB}$$

$$FB \left[\tan 58^\circ \right] = \left[\frac{191}{FB} \right] FB$$

$$FB(\tan 58^\circ) = 191$$

$$\frac{FB(\tan 58^\circ)}{\tan 58^\circ} = \frac{191}{\tan 58^\circ}$$

$$FB = 119.35$$

to get NB

$$\tan TNB = \frac{TB}{NB}$$

$$\tan 74^\circ = \frac{191}{NB}$$

$$NB \left[\tan 74^\circ \right] = \left[\frac{191}{NB} \right] NB$$

$$NB(\tan 74^\circ) = 191$$

$$\frac{NB(\tan 74^\circ)}{\tan 74^\circ} = \frac{191}{\tan 74^\circ}$$

$$NB = 54.77$$

to get FN

$$FN = FB - NB$$

$$= 119.35$$

$$- 54.77$$

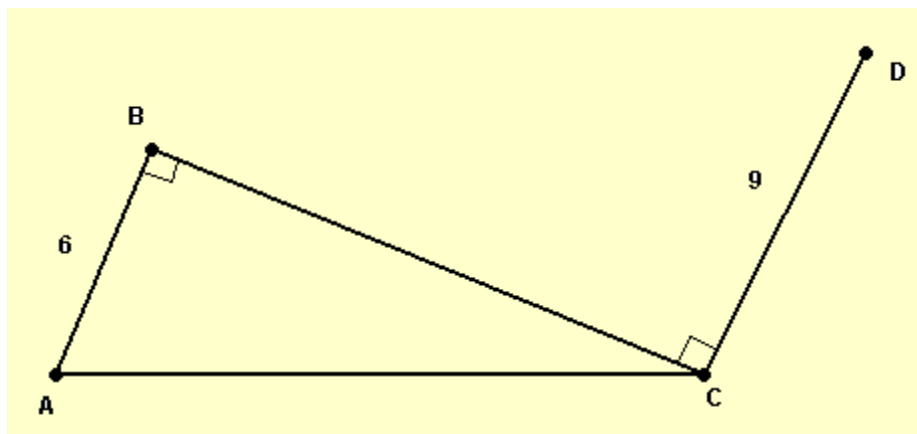
$$= 64.6$$

∴ the river is about 64.6m wide

Opportunity to Learn

1. In the figure below AB and CD are perpendicular to BC and the size of angle ACB is 31° .

Find the length of line segment BD .



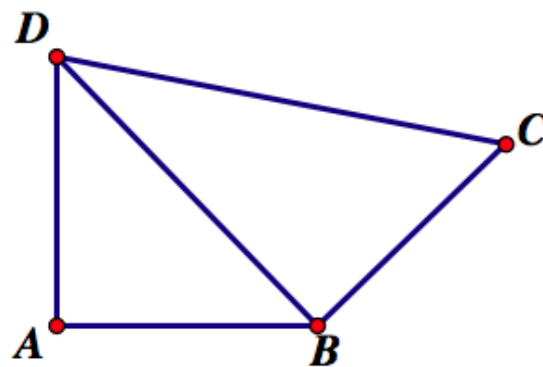
2. $\angle DAB$ and $\angle DBC$ are both 90° .

$\angle DBA$ is 46° . $\angle DCB$ is 55° .

\overline{AB} is 55 m.

What is \overline{DC} ?

Show your work, please.



3. A plane is flying at a constant altitude of 14,000 ft and a constant speed of 500 mph. The angle of depression from the plane to a lake is 6 degrees. To the nearest minute, how much time will pass before the plane is directly over the lake?