2.2 Using the Tangent Ratio to Calculate Lengths

Lesson Focus

Apply the tangent ratio to calculate side lengths

$$\tan \boldsymbol{\theta} = \frac{\boldsymbol{opposite}}{\boldsymbol{adjacent}}$$

Indirect Measure

*We use **direct measurement** when we use a measuring instrument to determine a length or an angle*

We use **indirect measurement** when we use math to calculate a length or an angle

Last section we used **indirect measurement** to calculate _____
This section we will learn to use **indirect measurement** to calculate _____ _____

Tangent

$$\tan\theta = \frac{\qquad\qquad\qquad\qquad\qquad\qquad}{\qquad\qquad\qquad\qquad\qquad\qquad}$$

- We used to use the **opposite** and **adjacent** sides to find the **missing angle**

- Now we'll use a **given angle** and one of the **sides lengths** to find the other missing side length

Example

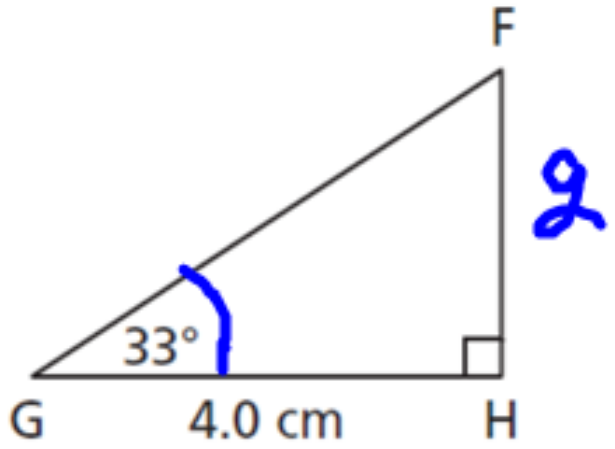
What is the given informationin this picture?

What pieces of information do we need for the **tangent** ratio?

Therefore what missing piece could we find?

side "g"

$4.0 \left(\tan 33^\circ\right) = \frac{g}{4.0}$ 4.0

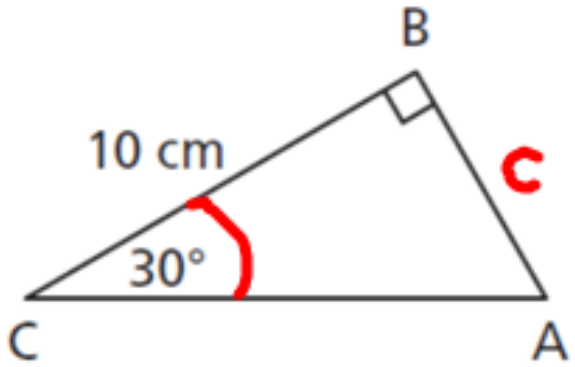


$(4.0)\tan 33^{\circ} = g$

$2.6 = g$ cm

Example

Determine the length of AB to the nearest tenth of a centimetre.



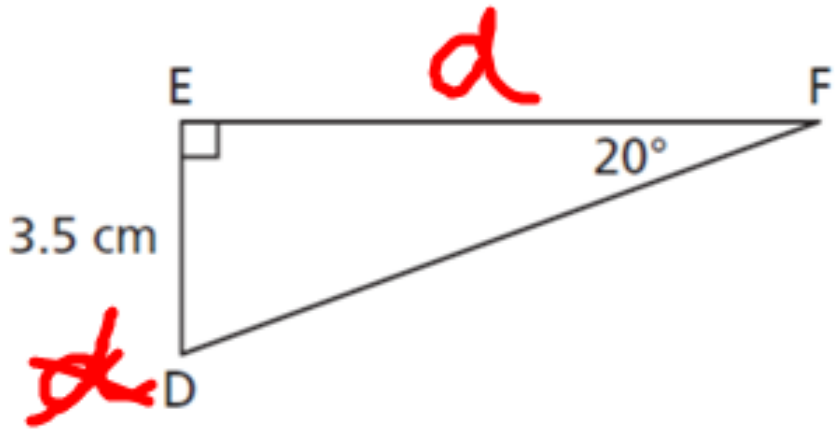
$10(\tan 30^\circ) = \frac{c}{10}(10)$

$10(\tan 30^\circ) = c$

$5.8 \text{ cm} = c$

Example

Determine the length of EF to the nearest tenth of a centimetre.



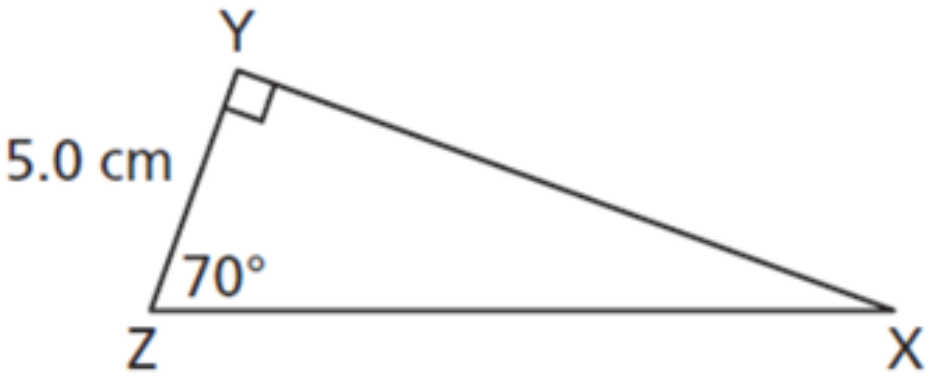
$$d \tan 20^\circ = \frac{3.5}{d} \times d$$

$$\frac{d(\tan 20^\circ)}{\tan 20^\circ} = \frac{3.5}{\tan 20^\circ}$$

$$d = 9.6 \text{ cm}$$

Example – Your turn

Determine the length of XY to the nearest tenth of a centimetre.

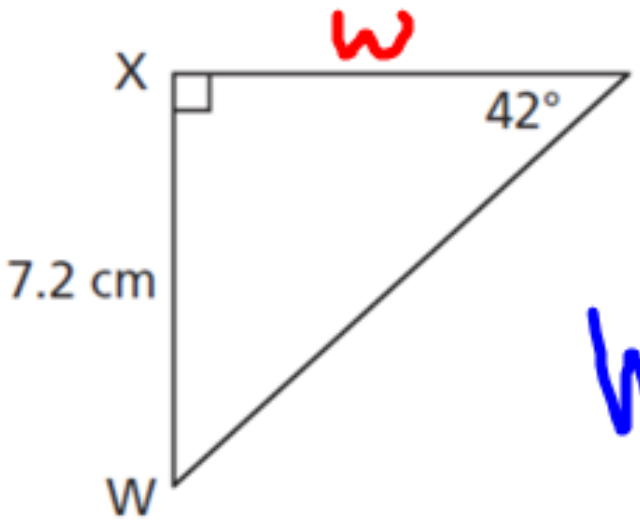


Discuss

Suppose you know or can calculate the lengths of the legs in a right triangle. Why can you always calculate its hypotenuse?

Example – Your turn

Determine the length of VX to the nearest tenth of a centimetre.



$(W)\tan 42^\circ = \frac{7.2}{W}$

$W = \frac{7.2}{\tan 42^\circ}$

$W = 8.0\text{ cm}$

Homework

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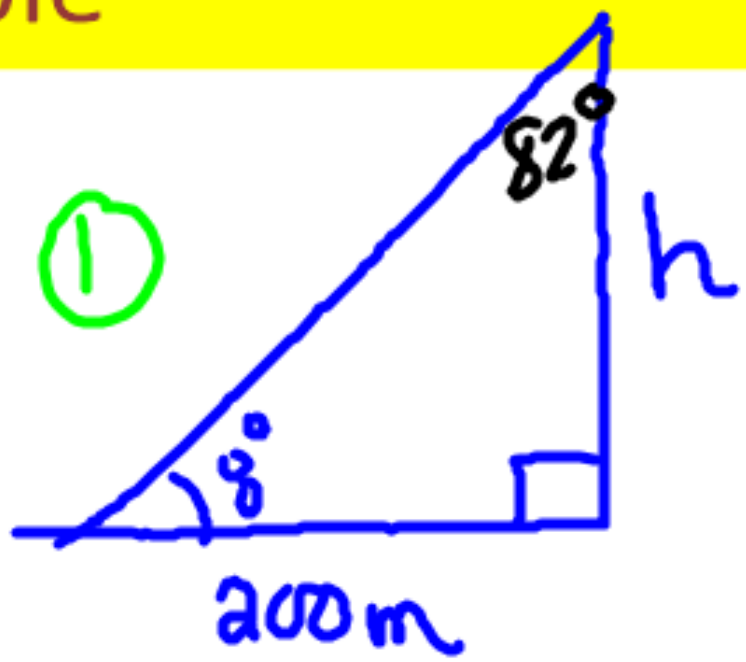
 # 3, 4, 5

Example

At a horizontal distance of 200 m from the base of an observation tower, the angle between the ground and the line of sight to the top of the tower is 8°. How high is the tower to the nearest metre?



(1) $\tan 8^\circ = \frac{h}{200}$

$200(\tan 8^\circ) = h$

(1) $28.1 \text{ m} = h$

The tower is 28 m tall.

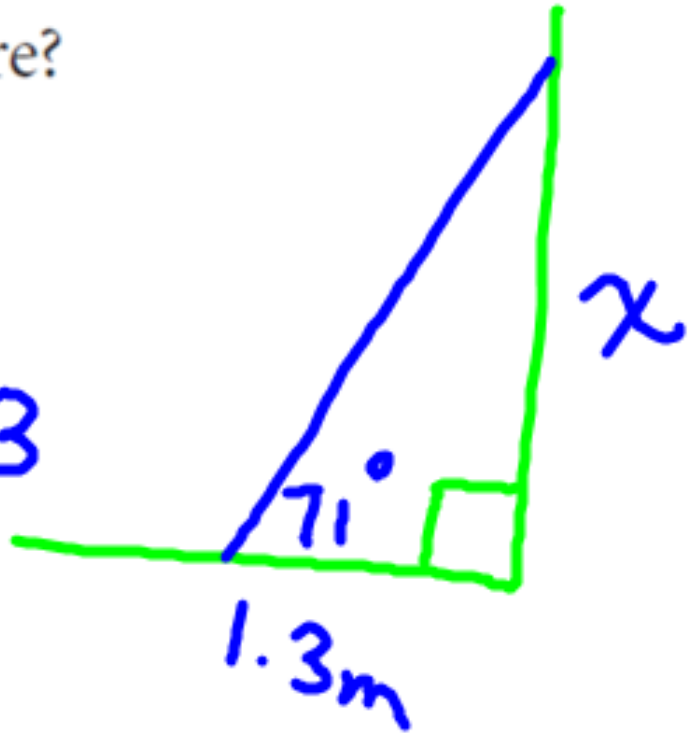
(1)

Example – Your Turn

The base of a ladder is on level ground 1.3 m from a wall. The ladder leans against the wall. The angle between the ladder and the ground is 71°. How far up the wall does the ladder reach to the nearest tenth of a metre?

The ladder is 3.8m up the wall.

Draw a picture!



1.3

$(\tan 71^\circ) = \left(\frac{x}{1.3}\right) 1.3$

$3.8\text{m} = x$

Homework

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 # 6, 10, 13,14,