13.1. Advanced Algebra

DATE: 4/29

Right Δ Trigonometry (Part 3)

Target 9A. Solve right triangles and extend knowledge of sine, cosine, and tangent ratios to their respective reciprocals.

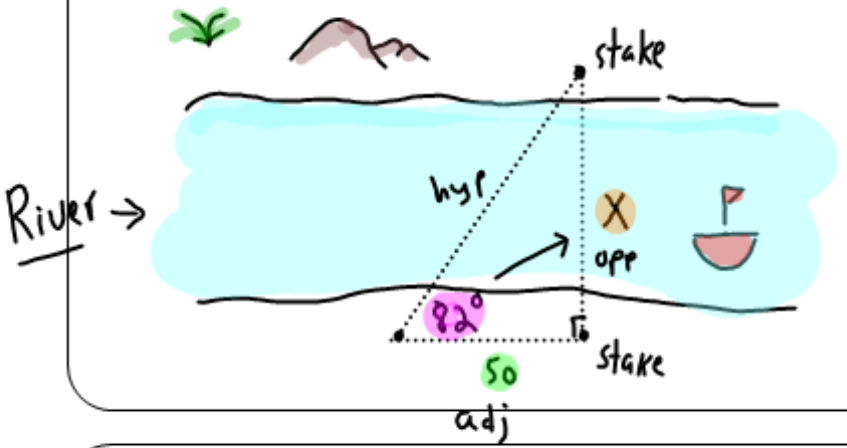
Trigonometry has many practical applications. Among the most important is the ability to find distances or lengths that either cannot be measured directly or are not easily measured directly.

Indirect Measurement

1. In order to construct a bridge across a river, the width of the river at the location must be determined. Suppose a stake is planted on one side of the river directly across from a second stake on the opposite side. At a distance 50 meters to the left of the stake, an angle of 82°

Indirect Measurement

1. In order to construct a bridge across a river, the width of the river at the location must be determined. Suppose a stake is planted on one side of the river directly across from a second stake on the opposite side. At a distance 50 meters to the left of the stake, an angle of 82° is measured between the two stakes. Find the width of the river.



So $\tan 82° = \frac{x}{50}$

$x = 50 \cdot \tan 82°$

$= 356$ m (to nearest meter)

2. Suppose, in a situation similar to that of problem 1, the angle was measured at a distance of 30 meters away from the stake and found to be 55°. Find the width of the river.

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Same picture as #1 $\Rightarrow$ $\tan 55^\circ = \frac{x}{30}$

$\Rightarrow$ $x = 30 \cdot \tan 55^\circ$

≈ 43 meters

Angles of Elevation and Depression

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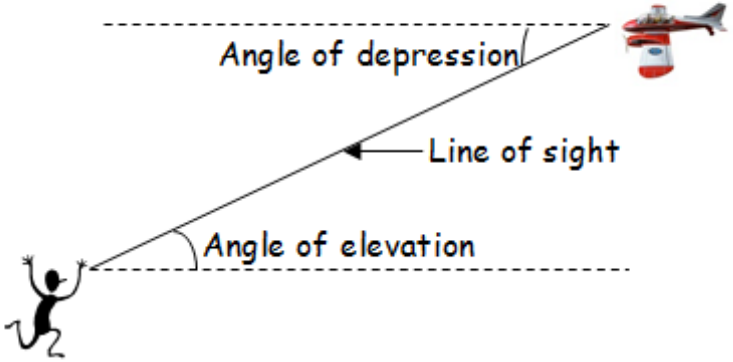
1) <u>Angle of elevation</u> — the angle formed by the line of sight from the observer and a line parallel to the ground
2) <u>Angle of depression</u> — the angle formed by the line of sight from the plane and a line parallel to the ground



3. A cable extends to the top of a tower from an anchor point on the ground. If the angle of elevation is 23° and the distance from the anchor to the bottom of the tower is 105 feet, find the length of the

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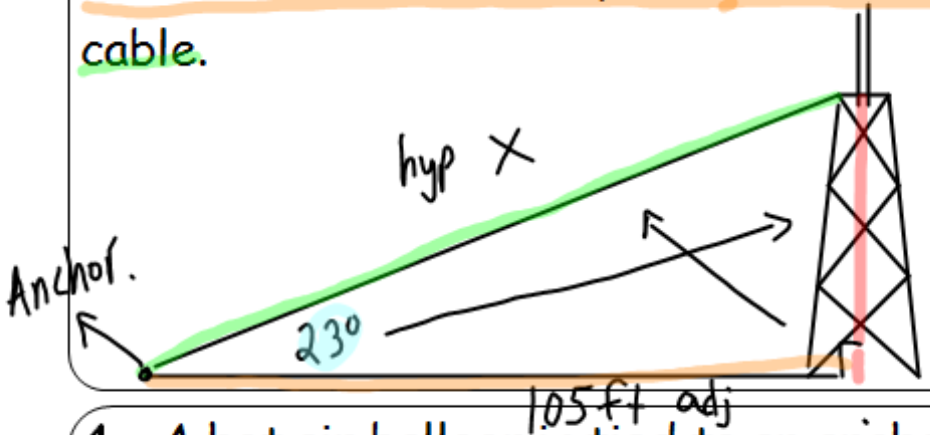


$\cos 23° = \frac{105}{x}$

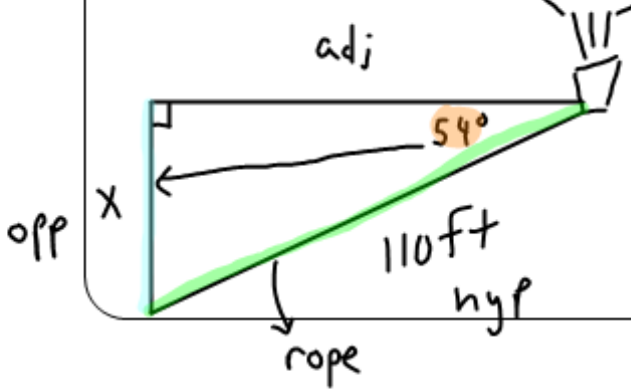
$x \cdot \cos 23° = 105$

$\frac{x \cdot \cos 23°}{\cos 23°} = \frac{105}{\cos 23°}$

$x = 114$ ft

4. A hot air balloon is tied to an anchor on the ground with rope that is 110 feet long. The wind is blowing the balloon away, which completely extends the rope. This creates an angle of depression of 54° between the balloon and the anchor. How many feet off the ground is the hot air balloon?

4. A hot air balloon is tied to an anchor on the ground with rope that is 110 feet long. The wind is blowing the balloon away, which completely extends the rope. This creates an angle of depression of 54° between the balloon and the anchor. How many feet off the ground is the hot air balloon?



$$\frac{\sin 54^\circ}{1} = \frac{X}{110}$$

$$X = 110 \cdot \sin 54^\circ$$

$$X = 89 \text{ ft}$$