LESSON 9.5

NAME _____ DATE _____

Reteaching with Practice

For use with pages 558–565

GOAL **Find the sine, the cosine, and the tangent of an acute angle and use trigonometric ratios to solve real-life problems**

VOCABULARY

A **trigonometric ratio** is a ratio of the lengths of two sides of a right triangle. The three basic trigonometric ratios are **sine, cosine,** and **tangent,** which are abbreviated as *sin*, *cos*, and *tan*, respectively.

The angle that your line of sight makes with a line drawn horizontally is called the **angle of elevation.**

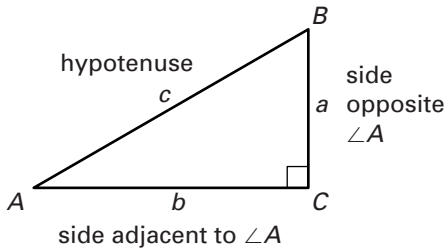
Trigonometric Ratios

Let ΔABC be a right triangle. The sine, the cosine, and the tangent of the acute angle $\angle A$ are defined as follows.

$$\sin A = \frac{\text{side opposite } \angle A}{\text{hypotenuse}} = \frac{a}{c}$$

$$\cos A = \frac{\text{side adjacent } \angle A}{\text{hypotenuse}} = \frac{b}{c}$$

$$\tan A = \frac{\text{side opposite } \angle A}{\text{side adjacent } \angle A} = \frac{a}{b}$$

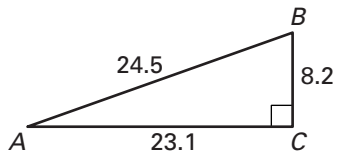


EXAMPLE 1 Finding Trigonometric Ratios

Find the sine, the cosine, and the tangent of the indicated angle.

a. $\angle A$

b. $\angle B$



SOLUTION

a. The length of the hypotenuse is 24.5. For $\angle A$, the length of the opposite side is 8.2, and the length of the adjacent side is 23.1.

$$\sin A = \frac{\text{opp.}}{\text{hyp.}} = \frac{8.2}{24.5} \approx 0.3347$$

$$\cos A = \frac{\text{adj.}}{\text{hyp.}} = \frac{23.1}{24.5} \approx 0.9429$$

$$\tan A = \frac{\text{opp.}}{\text{adj.}} = \frac{8.2}{23.1} \approx 0.3550$$

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b. The length of the hypotenuse is 24.5. For $\angle B$, the length of the opposite side is 23.1 and the length of the adjacent side is 8.2.

$$\sin B = \frac{\text{opp.}}{\text{hyp.}} = \frac{23.1}{24.5} \approx 0.9429$$

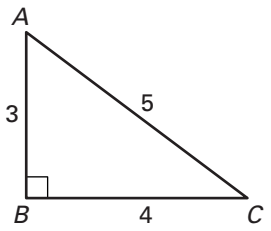
$$\cos B = \frac{\text{adj.}}{\text{hyp.}} = \frac{8.2}{24.5} \approx 0.3347$$

$$\tan B = \frac{\text{opp.}}{\text{adj.}} = \frac{23.1}{8.2} \approx 2.8171$$

Exercises for Example 1

Find the sine, cosine, and tangent of $\angle A$.

1.



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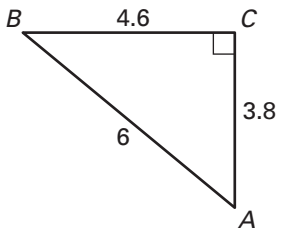

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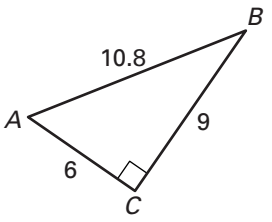
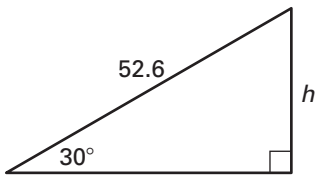


EXAMPLE 2 *Estimating a Distance*

It is known that a hill frequently used for sled riding has an angle of elevation of 30° at its bottom. If the length of a sledder's ride is 52.6 feet, estimate the height of the hill.



SOLUTION

Use the sine ratio for the 30° angle, because you have the value of the hypotenuse and you are looking for the value of the side opposite the 30° angle.

$$\sin 30° = \frac{h}{52.6}$$

$$h = (52.6) \cdot \sin 30° = (52.6) \cdot (0.5) = 26.3 \text{ feet}$$

Exercises for Example 2

4. In the sled-riding example, find the height of the hill if the angle of elevation of the hill is 42°.

5. If the angle of elevation from your position on the ground to the top of a building is 67° and you are standing 30 meters from the foot of the building, approximate the height of the building.