

20. If the height of a cone is tripled, will the volume of the cone be tripled? Explain.
21. If the radius of a cone is tripled, will the volume of the cone be tripled? Explain.
22. There are 250 toothpicks in a standard-size box. If the height remains constant and each of the base edges is doubled, how many toothpicks will this new size box hold?
23. A marble paperweight shaped like a pyramid weighs 2 oz. How much would the paperweight weigh if the height is tripled and the base is unchanged?
24. A cylinder has a height of 12 in. and a radius of 4 in. How can you change the radius of the cylinder so that the volume of the new cylinder will be four times the volume of the original cylinder?

## Relationships Among Sine, Cosine, and Tangent (Chapter 8)

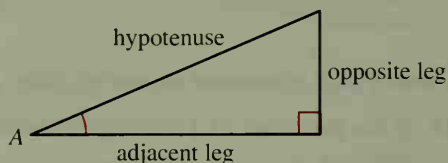
**Objective:** Understand and use relationships among trigonometric ratios.

The three trigonometric ratios, sine, cosine, and tangent are related in many different ways. You know that:

$$\sin A = \frac{\text{leg opposite } \angle A}{\text{hypotenuse}}$$

$$\cos A = \frac{\text{leg adjacent to } \angle A}{\text{hypotenuse}}$$

$$\tan A = \frac{\text{leg opposite } \angle A}{\text{leg adjacent to } \angle A}$$

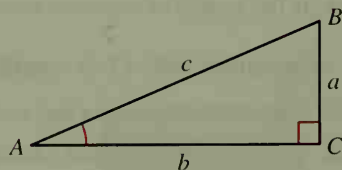


We will explore other relationships between the sine, cosine, and tangent ratios. Look at the diagram of  $\triangle ABC$  with right angle  $C$ . By the definitions of the sine, cosine, and tangent ratios:

$$\sin A = \frac{a}{c}, \cos A = \frac{b}{c}, \text{ and } \tan A = \frac{a}{b}.$$

Suppose you divide  $\sin A$  by  $\cos A$ .

$$\frac{\sin A}{\cos A} = \frac{\frac{a}{c}}{\frac{b}{c}} = \frac{a}{c} \div \frac{b}{c} = \frac{a}{c} \cdot \frac{c}{b} = \frac{a}{b} = \tan A.$$



For any acute  $\angle A$ ,  $\frac{\sin A}{\cos A} = \tan A$ .