Rearrange the equations to isolate the unknowns:

$$d = \sqrt{\Delta x^2 + \Delta y^2}$$

$$\theta = \tan^{-1}\left(\frac{\Delta y}{\Delta x}\right)$$

3. CALCULATE **Substitute the values into the equations and solve:**

$$d = \sqrt{(115 \text{ m})^2 + (136 \text{ m})^2}$$

$$\boxed{d = 178 \text{ m}}$$

$$\theta = \tan^{-1}\left(\frac{136 \text{ m}}{115 \text{ m}}\right)$$

$$\boxed{\theta = 49.8°}$$

TIP *Be sure your calculator is set to calculate angles measured in degrees. Some calculators have a button labeled "DRG" that, when pressed, toggles between degrees, radians, and grads.*

4. EVALUATE Because *d* is the hypotenuse, the archaeologist's displacement should be less than the sum of the height and half of the width. The angle is expected to be more than 45° because the height is greater than half of the width.

PRACTICE A

Finding Resultant Magnitude and Direction

1. A truck driver is attempting to deliver some furniture. First, he travels 8 km east, and then he turns around and travels 3 km west. Finally, he turns again and travels 12 km east to his destination.

   a. What distance has the driver traveled?

   b. What is the driver's total displacement?

2. While following the directions on a treasure map, a pirate walks 45.0 m north and then turns and walks 7.5 m east. What single straight-line displacement could the pirate have taken to reach the treasure?

3. Emily passes a soccer ball 6.0 m directly across the field to Kara. Kara then kicks the ball 14.5 m directly down the field to Luisa. What is the ball's total displacement as it travels between Emily and Luisa?

4. A hummingbird, 3.4 m above the ground, flies 1.2 m along a straight path. Upon spotting a flower below, the hummingbird drops directly downward 1.4 m to hover in front of the flower. What is the hummingbird's total displacement?