Exercise 1.29

A spelunker is surveying a cave. She follows a passage 180 m straight west, then 210 m in a direction 45° east of south, and then 280 m at 30° east of north. After a fourth displacement, she finds herself back where she started. Use a scale drawing to determine the magnitude and direction of the fourth displacement. (See also Problem 1.61 for a different approach.)

Solution

Use a ruler to determine the unknown distance along with the following formula.

$$\frac{180}{x} = \frac{y}{z}$$

Measure and plug in the length of the 180 m-vector for x. Measure and plug in the length of the fourth displacement vector for z. Then solve the equation for y, the magnitude.

$$y = 180\left(\frac{z}{x}\right) \approx 144 \text{ m}$$

Use a protractor to measure the angle below the horizontal (41°).