14. A wheel with a radius of 22.0 cm rolls without slipping along a horizontal floor (Fig. 3-21). At time t_1, the dot *P* painted on the rim of the wheel is at the point of contact between the wheel and the floor. At a later time t_2, the wheel has rolled through one-half of a revolution. What are (a) the magnitude and (b) the angle (relative to the floor) of the displacement of *P*?

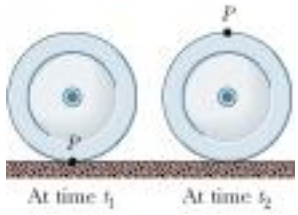

Figure 3-21 Problem 14.

17. Rock *faults* are ruptures along which opposite faces of rock have slid past each other. In Fig. 3-22, points *A* and *B* coincided before the rock in the foreground slid down to the right. The net displacement $\vec{AB}$ is along the plane of the fault. The horizontal component of $\vec{AB}$ is the *strike-slip AC*. The component of $\vec{AB}$ that is directed down the plane of the fault is the *dip-slip AD*. (a) What is the magnitude of the net displacement $\vec{AB}$ if the strike-slip is 18.0 m and the dip-slip is 13.0 m? (b) If the plane of the fault is inclined at angle ϕ = 48.0° to the horizontal, what is the vertical component of $\vec{AB}$?

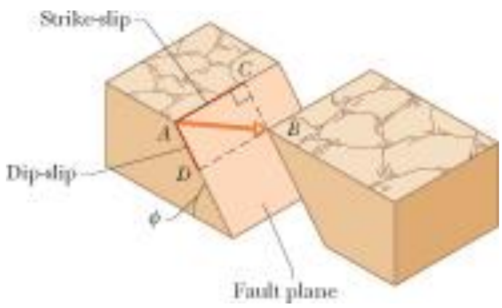

Figure 3-22 Problem 17.

18. Vectors $\vec{A}$ and $\vec{B}$ lie in an *xy* plane. $\vec{A}$ has magnitude 11.0 and angle 100°; $\vec{B}$ has components $B_x = -6.50$ and $B_y = -8.40$. (a) What is $5\vec{A} \cdot \vec{B}$? What is $4\vec{A} \times 3\vec{B}$ in (b) unit-vector notation and (c) magnitude-angle notation with spherical coordinates (see Fig. 3-23)? (d) What is the angle between the directions of $\vec{A}$ and $4\vec{A} \times 3\vec{B}$? (*Hint:* Think a bit before you resort to a calculation.) What is $\vec{A} + 3.00\hat{k}$ in (e) unit-vector notation and (f) magnitude-angle notation with spherical coordinates?

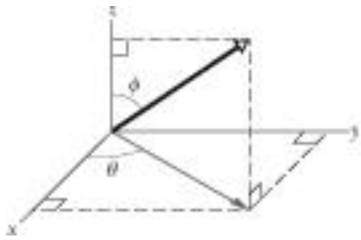

Figure 3-23 Problem 18.