Q.1 A kite string exerts a 12 lb pull ($|\mathbf{F}| = 12$) on a kite and makes a 45° angle with the horizontal. Find the horizontal and vertical components of $\mathbf{F}$.
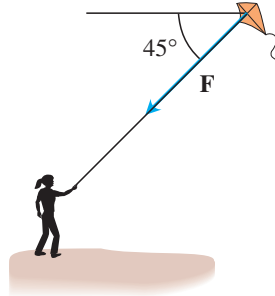

Figure 1: Configuration of force exerted by the string.

Q.2 A bird flies from its nest 5km in the direction 60° north of east, where it stops to rest on a tree. It then flies 10km in the direction due southeast and lands atop a telephone pole. Place an xy-coordinate system so that the origin is the bird's nest, the x-axis points east, and the y-axis points north. At what point is the tree located and at what point is the telephone pole?

Q.3 Suppose that a box is being towed up an inclined plane (see, Figure 2). Find the force $\mathbf{w}$ needed to make the component of the force parallel to the inclined plane equal to 2.5 lb.
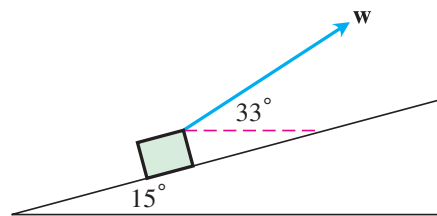

Figure 2: Torque Exerted by $\mathbf{F}$.

Q.4 How much work does it take to slide a crate 20m along a loading dock by pulling on it with a 200N force at an angle of 30° from the horizontal?

Q.5 Let $P(2, -2, 1)$, $Q(3, -1, 2)$, and $R(3, -1, 1)$ be three non-colinear points. Find the area of the triangle ΔPQR. Also find a unit vector perpendicular to the plane PQR.
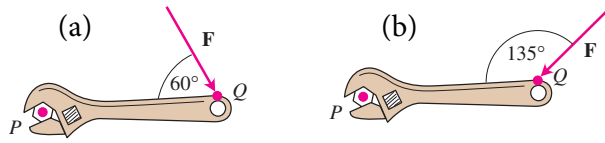
Figure 3: Torque Exerted by **F**.

Q.6 Find the magnitude of the torque exerted by the force **F** on the bolt at P if $|\vec{PQ}| = 8$ in. and $|\mathbf{F}| = 30$ lb (see, Figure 3). Answer in foot-pounds.

"Everything looks impossible to the people who never try anything."