Solve any three problems out of four:

1. A bee flies at airspeed 15 MPH (miles per hour) from the hive to a flower and then back to the hive. The flower is due South from the hive. The wind blows from South to North at speed 10 MPH.

    (a) What is the bee's groundspeed on her way to the flower?

    (b) What is her groundspeed on the way back to the hive?

2. A highway bridge was destroyed by a flood and the access road dead-ends in the air. A drunk driver didn't see this and kept driving at 56 MPH (25 m/s) until his car became airborne. The car landed in the water 50 meters beyond the road's end (50 m is the horizontal distance).

    (a) How long was the car flying through the air until it hit the water?

    (b) How high was the bridge?

3. A person swings a 100 g ball on a string in a horizontal circle. The radius of the circle is 2 meters and the speed of the ball is 20 m/s. What is the tension of the string?
   For simplicity, ignore gravity and assume that the string tension is the only force acting on the ball.

4. Bathroom scales measure person's weight but report it as mass (in kg or lb units) using $m = W/g$ for $g = 9.8$ m/s^2 = 9.8 N/kg. This works on Earth where g is indeed equal to 9.8 N/kg, but it would not work on other planets.
   On the Moon, the gravitational field is six times weaker than on Earth, $g_{\text{Moon}} = \frac{1}{6} \times g_{\text{Earth}}$. Consider a 60 kg astronaut traveling to a moon base (hopefully to be built later this century). If she steps on bathroom scales when she gets there, what would they show?