**Express the statement as a formula that involves the given variables and a constant of proportionality k, and then determine the value of k from the given conditions.**

1. u is directly proportional to v. If v = 30, then u = 12.

2. r varies directly as s and inversely as t. If s = -2 and t = 4, then r = 7.

3. y is directly proportional to the square of x and inversely proportional to the cube of z. If x = 5 and z = 3, then y = 25.

4. z is directly proportional to the product of the square of x and the cube of y. If x = 7 an y = -2, then z = 16.

5. y is directly proportional to x and inversely proportional to the square of z. If x = 4 and z = 3, then y = 16.

6. y is directly proportional to the square of x and inversely proportional to the square root of z. If x = 5 and z = 16, then y = 10.

7. The pressure P acting at a point in a liquid is directly proportional to the distance d from the surface of the liquid to the point.

(a) Express P as a function of d by means of a formula that involves a constant of proportionality k.

(b) In a certain oil tank, the pressure at a depth of 2 feet is 118 lb/ft3. Find the value of k in part (a).

(c) Find the pressure at a depth of 5 feet for the oil tank in part (b).

8. The electrical resistance R of a wire varies directly as its length l and inversely as the square of its diameter d.

(a) Express R in terms of l, d, and a constant of variation k.

(b) A wire 100 feet long of diameter 0.01 inch has a resistance of 25 ohms. Find the value of k in part (a).

(c) Find the resistance of a wire made of the same material that has a diameter of 0.015 inch and is 50 feet long.

9. The period P of a simple pendulum is directly proportional to the square root of its length l.

(a) Express P in terms of l and a constant of proportionality k.

(b) If a pendulum 2 feet long has a period of 1.5 seconds, find the value of k in part (a).

(c) Find the period of a pendulum 6 feet long.