

\* Boyle's Law In 1-3 use the following information. \* Product Demand In 4-6 use the following information.

Boyle's Law states that for a constant temperature, the pressure,  $P$ , of a gas varies inversely with its volume,  $V$ . A sample of hydrogen gas has a volume of 8.56 liters at a pressure of 1.5 atmospheres.

1. Find the constant of variation,  $k$ .
2. Write an equation that relates  $P$  and  $V$ .
3. Find the volume of the hydrogen gas if the temperature remains constant and the pressure changes to 1.2 atmospheres.

A company has found that the monthly demand for one of its products varies inversely with the price of the product. When the price is \$12.50, the demand is 12,000 units.

4. Find the constant of variation,  $k$ .
5. Write an equation that relates the demand,  $x$ , and the price,  $p$ .
6. Find the demand if the price is reduced to \$12.00.

\* Simple Interest In 7-9 use the following information.

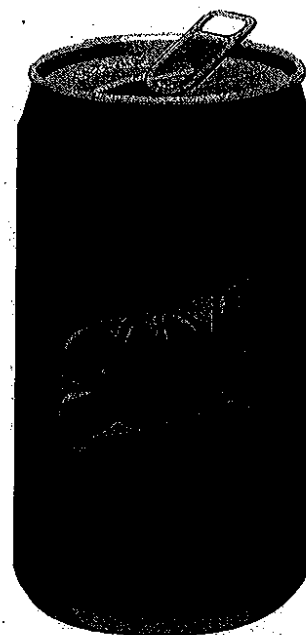
The simple interest,  $I$  (in dollars), for a savings account is jointly proportional to the product of the time,  $t$  (in years), and the principal,  $P$  (in dollars). After six months, the interest on a principal of \$2000 is \$55.

7. Find the constant of variation,  $k$ .
8. Write an equation that relates  $I$ ,  $t$ , and  $P$ .
9. What will the interest be after two years?

\* Specific Heat In 10-12 use the following information.

The amount of heat,  $H$  (in kilocalories), necessary to change the temperature of an aluminum can is jointly proportional to the product of the mass,  $m$  (in kilograms), of the can and the temperature change desired,  $T$  (in degrees Celsius). It takes 1.54 kilocalories of heat to change the temperature of a 0.028 kilogram aluminum can 250 degrees Celsius.

10. Find the constant of variation,  $k$ .
11. Write an equation that relates  $H$ ,  $m$ , and  $T$ .
12. How much heat is required to melt the can if its current temperature is  $20^\circ\text{C}$ ? (The melting point of aluminum is approximately  $660^\circ\text{C}$ .)



13

The weight of a body on or above Earth's surface varies inversely as the square of its distance from Earth's center. Earth's radius is about 4,000 miles. If an astronaut weighs 185 pounds on Earth's surface, how much will he weigh in orbit 22,000 miles above Earth's surface?

14

In a classroom in Gastonia, the number of boys varies directly as the number of girls. There are 8 boys and 2 girls in this classroom. If this same relationship exists in another classroom where there are 5 girls, how many boys are in this room?

15

The speed of an object falling from rest varies directly as the square root of the distance it has fallen. When an object has fallen 36 feet, its speed is 48 feet per second. Find the object's speed when it has fallen 121 feet.

16

**GASES** The volume  $V$  of a gas varies inversely as its pressure  $P$ . If  $V = 80$  cubic centimeters when  $P = 2000$  millimeters of mercury, find  $V$  when  $P = 320$  millimeters of mercury.

17

**SPRINGS** The length  $S$  that a spring will stretch varies directly with the weight  $F$  that is attached to the spring. If a spring stretches 20 inches with 25 pounds attached, how far will it stretch with 15 pounds attached?

18

**GEOMETRY** The area  $A$  of a trapezoid varies jointly as its height and the sum of its bases. If the area is 480 square meters when the height is 20 meters and the bases are 28 meters and 20 meters, what is the area of a trapezoid when its height is 8 meters and its bases are 10 meters and 15 meters?

19

When a seesaw is balanced, the distance in feet each person is sitting from the pivot (or fulcrum) is inversely proportional to that person's weight in pounds. Sarah and Kelli are trying to balance on a seesaw at a park in Durham. Sarah weighs 95 pounds and is sitting 6 feet from the fulcrum. If Kelli weighs 80 pounds, how far away from the fulcrum must she sit?

20

The amount that a beam bends downward when it is supported at each end and centrally loaded varies jointly as the mass of the load and the cube of the length, and varies inversely as the cube of the depth of the beam. A beam 4 meters long that has a depth of 15 centimeters bends 0.7 centimeter downward when loaded with a mass of 1,000 kilograms. To the nearest tenth, what is the maximum load that a beam 5 meters long and with a depth of 10 centimeters can carry at its center without bending more than 3.2 centimeters?

21

Newton's Law of Gravitation states that the force of attraction ( $F$ ) between two spherical bodies varies jointly as their masses ( $m_1$  and  $m_2$ ), and varies inversely as the square of the distance  $\textcircled{r}$  between their centers. Write an equation with this relationship.

22

The electrical resistance of a wire varies inversely as the square of its diameter and directly as its length. If 225 meters of wire with a diameter of 0.5 centimeters has a resistance of 3.4 ohms, what is the resistance, to the nearest tenth, of 380 meters of wire whose diameter is 0.6 centimeters.