KNOTTY RIDDLE

KEY

The old, old rope was tied,
Tied hanging from a ring.
What did its old knot say
When a hippo asked to swing?

TO ANSWER THE RIDDLE ABOVE:
For each exercise, write an equation expressing direct or inverse variation as a square. Use k as the constant of variation. Then solve the two problems under the exercise. Find each answer at the bottom of the page and write the problem letter above it.

1. The distance, d, that a free-falling body falls varies directly as the square of the time, t, that it falls. If $d = 36$ m when $t = 3$ sec, $\quad d = Kt^2$

(D) Find the value of k. $\quad 36 = K(3)^2 \quad \underline{4}$

(A) Find d when $t = 5$ sec. $\quad d = 4(5)^2 \quad \underline{100}$ m

2. The amount of material, M, needed to cover a ball is directly proportional to the square of the radius, r. If $M = 60$ cm^2 when $r = 2$ cm, $\quad M = Kr^2$

$M = 15(7)^2$

(T) Find the value of k. $\quad 60 = K(2)^2 \quad \underline{15}$

(E) Find M when $r = 7$ cm. $\quad K = 15 \quad \underline{735}$ cm^2

3. The price, p, of a pizza varies directly as the square of its radius, r. If $p = \$6.00$ when $r = 10$ cm,

(A) Find the value of k. $\quad P = Kr^2$

$\quad 6 = K(10)^2 \quad \underline{.06}$

(O) Find p when $r = 15$ cm. $\quad \underline{\$13.50}$

$P = .06(15)^2$

4. The brightness of illumination, I, of an object varies inversely as the square of its distance, d, from the source of illumination. If $I = 18$ luxes when $d = 4$ m, $\quad I = \dfrac{288}{3^2}$

(I) Find the value of k. $\quad I = \dfrac{K}{d^2} \quad \underline{288}$

(K) Find I when $d = 3$ m. $\quad 18 = \dfrac{K}{4^2} \quad \underline{32}$ luxes

5. The time, t, needed to fill the gas tank of a car varies inversely as the square of the diameter, d, of the hose. If $t = 5$ min when $d = 3$ cm,

(M) Find the value of k. $\quad t = \dfrac{K}{d^2} \quad \underline{45}$

(F) Find t when $d = 2$ cm. $\quad 5 = \dfrac{K}{3^2} \quad \underline{11.25}$ min

$t = \dfrac{45}{2^2}$

6. The electrical resistance, R, of a wire of a certain length is inversely proportional to the square of its diameter, d. If $R = 10$ ohms when $d = 0.6$ mm,

(N) Find the value of k. $\quad R = \dfrac{K}{d^2} \quad \underline{3.6} \quad R = \dfrac{3.6}{3^2}$

(A) Find R when $d = 3$ mm. $\quad 10 = \dfrac{K}{(.6)^2} \quad \underline{.4}$ ohms

7. The price, p, of a diamond is directly proportional to the square of its weight, w. If $p = \$2000$ when $w = 1$ carat,

(Y) Find the value of k. $\quad P = Kw^2$

$\quad 2000 = K(1)^2 \quad \underline{2000}$

(R) Find p when $w = 0.7$ carat. $\quad K = 2000 \quad \underline{\$980}$

$P = 2000(.7)^2$

I	A	M	A	F	R	A	Y	E	D	K	N	O	T
288	12.75	0.4	45	0.12	100	920	11.25	980	0.06	2000	735	4	2.5	32	3.6	13.50	.15

Translate each statement into a formula. Use k as the constant of variation.

1. V varies jointly as B and h.
$$V = KBh$$

2. t varies directly as W and inversely as n.
$$t = \frac{KW}{n}$$

3. P varies directly as the square of V and inversely as R.
$$P = \frac{KV^2}{R}$$

4. h varies directly as W and inversely as the square of r.
$$h = \frac{KW}{r^2}$$

5. E varies jointly as m and the square of v.
$$E = Kmv^2$$

6. I varies jointly as A and H and inversely as T.
$$I = \frac{KAH}{T}$$

7. The mass, m, of a cement block varies jointly as the length, ℓ, width, w, and thickness, t, of the block.
$$m = K\ell wt$$

8. The volume, V, of a gas varies directly as the temperature, T, and inversely as the pressure, P.
$$V = \frac{KT}{P}$$

9. The collision impact, I, of an automobile varies jointly as the mass, m, and the square of the speed, s.
$$I = Kms^2$$

10. The intensity of a sound, i, varies directly as the amplitude, A, of the sound source, and inversely as the square of the distance, d, from the source.
$$i = \frac{KA}{d^2}$$

11. The safe load, s, for a beam, varies jointly as the breadth, b, and the square of the depth, d, and inversely as the length, ℓ, between supports.
$$S = \frac{Kbd^2}{\ell}$$

12. The gravitational force, g, between two objects varies jointly as the mass of the first, m_1, and the mass of the second, m_2, and inversely as the square of the distance, d, between them.
$$g = \frac{Km_1m_2}{d^2}$$

OBJECTIVE 1–m: To write a formula expressing joint and/or combined variation.