

Name: Key

Date: _____ Period: _____

1-6: Write an equation for each relationship described using either the variables given or variables related to the statement. Use k as a constant or proportionality. DO NOT use x and y as general variables. (2 pts ea)

1. m varies directly as n

$$m = kn \text{ OR } k = \frac{m}{n}$$

2. g varies inversely as h

$$g = \frac{k}{h} \text{ OR } gh = k$$

3. a varies jointly as b and c

$$a = kbc \text{ OR } k = \frac{a}{bc}$$

4. d varies directly as e and inversely as f .

$$d = \frac{ke}{f} \text{ OR } df = ke$$

5. The stretch of a spring is directly proportional to the force applied to it.

$$s = kf \text{ OR } k = \frac{s}{f}$$

6. The frequency of a pendulum is inversely proportional to the square root of its length.

$$f = \frac{k}{\sqrt{L}} \text{ OR } f\sqrt{L} = k$$

7. d is directly proportional to e . When e is 5, d is 9. What is e when d is 12? (4 points)A) Relationship: $d = ke \text{ OR } k = \frac{d}{e}$

B) Solution:

$$\frac{d_1}{e_1} = \frac{d_2}{e_2}$$

~~9~~

$$\frac{9}{5} = \frac{12}{e_2}$$

$$\frac{9e}{9} = \frac{60}{9} = \boxed{6.\overline{6}} \text{ OR } \boxed{\frac{20}{3}}$$

8. a is jointly proportional to b and c . When b is 10 and c is 5, a is 15. What is a when b is 25 and c is 3? (4 points)A) Relationship: $a = kbc \text{ OR } k = \frac{a}{bc}$

B) Solution:

$$15 = k(10)(5)$$

$$\frac{15}{50} = \frac{50k}{50}$$

$$k = .3 \text{ OR } \frac{3}{10}$$

$$a = (.3)(25)(3)$$

$$a = \boxed{22.5} \text{ OR } \boxed{\frac{45}{2}}$$

9. The power produced by a wind turbine varies directly as the cube of the wind speed. A wind speed of 27 mph produces a power of 750 kilowatts (kW). **Find the power produced for a wind speed of 40 mph.**

A) Write the equation of the direct relationship using variables related to this problem:

$$P = kS^3 \quad (2 \text{ pts}) \quad \text{OR} \quad k = \frac{P}{S^3}$$

B) Setup and solution: (2 pts)

$$S_1 = 27 \text{ mph} \quad S_2 = 40 \text{ mph}$$

$$P_1 = 750 \text{ kW} \quad P_2 = ?$$

$$\frac{P_1}{S_1^3} = \frac{P_2}{S_2^3} \quad \frac{750}{(27)^3} = \frac{P_2}{(40)^3}$$

$$\frac{19683 P_2}{19683} = \frac{(40^3)(750)}{19683}$$

$$P_2 = 2439 \text{ kW} \quad \text{OR} \quad 2440 \text{ kW}$$

* write a sentence "

10. The work done when lifting an object varies jointly with its mass and the height it is lifted. When a 100 kg object is lifted 1.5 m, the work is 1470 joules (J). **How much work is done when lifting a 120 kg object by 1.8 m?**

A) Write the equation of the joint relationship using variables related to this problem:

$$W = kmh \quad (2 \text{ pts}) \quad \text{OR} \quad k = \frac{W}{mh}$$

B) Setup and solution: (2 pts)

$$\frac{1470}{(100)(1.5)} = \frac{W}{(120)(1.8)}$$

$$\frac{317520}{150} = \frac{150 W}{150} \quad W = 2116.8$$

$$= 2117$$

The work done is 2117 J.

11. The resistance of a wire varies directly as its length and inversely as the square of its diameter. A wire with diameter 4.8 mm and length 80 m has resistance of 15 ohms. A second wire is 100 m long and has a resistance of 12 ohms. **What is the diameter of the second wire?** (4 points)

$$R = \frac{kl}{d^2} \quad \text{OR} \quad Rd^2 = kl \quad \text{OR} \quad k = \frac{Rd^2}{l}$$

$$k = \frac{(15)(4.8)^2}{80}$$

$$k = 4.32$$

$$d^2 = \frac{kl}{R}$$

$$d^2 = \frac{(4.32)(100)}{12}$$

$$d^2 = 36$$

$$d = 6$$

The diameter of the second wire is 6 mm.