Compression Ratio Lesson 2 Worksheet **Name** Key

Solve the following using the cubic inch displacement formula and the convert to the indicated unit. Show work and use appropriate units.

1. A driver wants to rebuild the engine in a car with a piston displacement of 625.60 cc and a chamber volume of 50 cc. If the driver changes the piston displacement to 675.70 cc, would the compression ratio increase or decrease?

$CR = \frac{PD + CV}{CV}$

$CR = \frac{625.60 + 50}{50}$

$CR = \frac{675.60}{50}$

$CR = 13.5$ to 1

$CR = \frac{675.70 + 50}{50}$

$CR = \frac{725.70}{50}$

$CR = 14.5$ to 1

Increase

2. A driver wants to rebuild the engine in a car with a piston displacement of 618.60 cc and a chamber volume of 50 cc. If the driver changes the piston displacement to 650.55 cc, would the compression ratio increase or decrease?

$CR = \frac{618.60 + 50}{50}$

$CR = \frac{668.60}{50}$

$CR = 13.4$ to 1

$CR = \frac{650.55 + 50}{50}$

$CR = \frac{700.55}{50}$

$CR = 14.0$ to 1 Increase

3. A driver wants to rebuild the engine in a car with a piston displacement of 618.60 cc and a chamber volume of 50 cc. If the driver changes the chamber volume to 35 cc, would the compression ratio increase or decrease?

$CR = \frac{618.60 + 50}{50}$

$CR = \frac{668.60}{50}$

$CR = 13.4$ to 1

$CR = \frac{618.60 + 35}{35}$

$CR = \frac{653.6}{35}$

$CR = 18.7$ to 1 Increase

4. A driver wants to rebuild the engine in a car with a piston displacement of 618.60 cc and a chamber volume of 45 cc. If the driver changes the chamber volume to 55 cc, would the compression ratio increase or decrease?

$CR = \frac{618.60 + 45}{45}$

$CR = \frac{663.6}{45}$

$CR = 14.7$ to 1

$CR = \frac{618.60 + 55}{55}$

$CR = \frac{673.6}{55}$

$CR = 12.2$ to 1 Decrease

5. If y varies directly as x and inversely as z with a constant of variation of 4, write the model. What would y be if x = 10 and z = 25.

$$y = \frac{4x}{z}$$

$$y = \frac{4(10)}{25} = \frac{40}{25} = 1.6$$

6. If y varies directly as x and z and inversely as w with a constant of variation of 3, write the model. What would y be if x = 16, z = 11, and w = 4.

$$y = \frac{3xz}{w}$$

$$y = \frac{3(16)(11)}{4} = 132$$

7. The volume of a cylinder varies jointly with the radius squared and height. The constant of variation is π. Write the model and determine the volume of a cylinder if the radius is 5.5 inches and the height is 4.25 inches.

$$V = \pi r^2 h$$

$$V = \pi (5.5)^2 (4.25)$$

$$V = 403.9 \text{ in}^3$$

8. The area of a circle varies directly with the radius squared. The constant of variation is π. Write the model and determine the area of a circle if the radius is 3.5 inches.

$$A = \pi r^2$$

$$A = \pi (3.5)^2$$

$$A = 38.5 \text{ in}^2$$

9. The circumference of a circle varies directly with diameter of the circle. The constant of variation is π. Write the model and determine the circumference of the circle if the diameter is 18 centimeters.

$$C = \pi d$$

$$C = \pi 18$$

$$C = 56.5 \text{ cm}$$

10. The horsepower (h) needed for a water pump varies jointly with the depth of the well (d in feet) and the rate (r in gallons per minute). If an 80 horsepower motor pumps 1200 gallons per minute at a depth of 125 feet, find the constant of variation k. Estimate the horsepower needed to pump 1500 gallons per minute at a depth of 150 feet.

$h = kdr$

$80 = K(125)(1200)$

$80 = K\ 150000$

$K = \frac{80}{150000} = \frac{1}{1875}$

$h = \frac{1}{1875}(150)(1500)$

$h = 120$ horsepower

11. The horsepower (h) needed for a water pump varies jointly with the depth of the well (d in feet) and the rate (r in gallons per minute). If a 75 horsepower motor pumps 500 gallons per minute at a depth of 225 feet, find the constant of variation k. Estimate the horsepower needed to pump 750 gallons per minute at a depth of 250 feet.

$h = kdr$

$75 = K(225)(500)$

$75 = K\ 112500$

$K = \frac{75}{112500} = \frac{1}{1500}$

$h = \frac{1}{1500}(250)(750)$

$h = 125$ horsepower

12. Horsepower (Hp) varies jointly as the distance traveled (d in feet) and the weight (w in pounds) with a constant of variation of $\frac{1}{33000}$. Write the model for horsepower and use it to calculate the horsepower needed to move a 2500-pound object a 1250 feet.

$Hp = \frac{dw}{33000}$

$Hp = \frac{1250(2500)}{33000} = \frac{3125000}{33000} = 94.7$ Horsepower

13. Horsepower (Hp) varies jointly as the distance traveled (d in feet) and the weight (w in pounds) with a constant of variation of $\frac{1}{33000}$. Write the model for horsepower and use it to calculate the horsepower needed to move a 1750-pound object a 1500 feet.

$Hp = \frac{dw}{33000}$

$Hp = \frac{1500(1750)}{33000} = \frac{2625000}{33000} = 79.5$ horsepower