

EXTRA PRACTICE — Exercises

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Unit VI – Second Degree Relations and Higher - Algebraic Fractions Part C – Problem Solving with Algebraic Fractions **Lesson 6 – “Mixed Variation” Problems**

For each of the following story problems about mixed variation, use the appropriate applications of the models of variation to find the relation needed to solve. Then solve and use common sense to check your answer.

1. The safe load for a beam varies directly as the width of the beam and the square of its depth. If a beam 1.6 inches wide and 3.5 inches deep can safely support 6,300 pounds, find the safe load for a beam 1.4 inches wide and 4 inches deep.

2. Heat loss, H , per hour through a glass window varies jointly as the difference, d , between the inside and outside temperatures and the area, A , of the window. This heat loss also varies inversely as the thickness, t , of the pane of glass. If the temperature difference is 30 degrees, there is a heat loss of 9,000 calories in one hour through a window pane of area 1,500 square centimeters and thickness of 0.25 centimeters. Find the heat loss through a glass window of the same area with 0.2 centimeters thickness when the temperature difference is 15 degrees.

3. The Volume, V , of a given mass of gas varies directly as the absolute temperature, T , and inversely as the pressure, P . If V is 462 cubic centimeters when T is 42 degrees and P is 40 kilograms per square centimeter, what is the volume when T is 30 degrees and P is 30 kilograms per square centimeter?

4. The pressure on a sail varies jointly as the area of the sail and the square of the velocity of the wind. If the pressure is one pound per square foot when the wind velocity is 20 miles per hour, what is the pressure on this same sail for a wind of twice that velocity?

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5. The volume of a right circular cone varies jointly as its altitude and the square of the radius of the base. If the volume of such a cone whose altitude is 8 inches and whose radius is 6 inches is 96π cubic inches, what is the altitude of a right circular cone whose volume is 96π cubic inches and whose radius is 8 inches.

6. The centrifugal force acting on a mass traveling in a circular path varies directly as the square of its speed and inversely as the radius of the circle. If the centrifugal force is 1,200 pounds when the mass is traveling 40 feet per second along a path 6 feet in diameter, for what speed will the centrifugal force be 90 pounds on the same mass?

7. The horsepower that a shaft can safely transmit varies jointly as its speed in revolutions per minute and the cube of its diameter. If a 3 inch shaft making 120 revolutions per minute can transmit 100 horsepower, how many horsepower can a 5 inch shaft making 108 revolutions per minute transmit?

8. The area of the curved surface of a right circular cylinder varies jointly as the radius and the altitude. If the curved surface of a cylinder whose radius is 6 inches and whose altitude is 5 inches is 60π square inches, what is the area of the curved surface of a similar cylinder whose radius is 12 inches and whose altitude is 10 inches?

EXTRA PRACTICE — Answer Key

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1. 7200 pounds
2. 5625 calories
3. 440 cubic centimeters
4. 4 pounds per square foot
5. $\frac{1}{2}$ inch
6. 10.95 feet per second
7. 250 horsepower
8. 240π square inches