

Name: \_\_\_\_\_

Block: \_\_\_\_\_ Date: \_\_\_\_\_

**Combined Variation Problems:**

1. If  $y$  varies directly as  $x$  and inversely as  $z$ , and  $y = 22$  when  $x = 4$  and  $z = 6$ , find  $y$  when  $x = 10$  and  $z = 25$ .
2. If  $f$  varies directly as  $g$  and inversely as the square of  $h$ , and  $f = 20$  when  $g = 50$  and  $h = 5$ , find  $f$  when  $g = 18$  and  $h = 6$ .
3. If  $a$  varies jointly as  $b$  and  $c$  and inversely as the square of  $d$ , and  $a = 120$  when  $b = 5$ ,  $c = 2$ , and  $d = 9$ , find  $a$  when  $b = 12$ ,  $c = 9$ , and  $d = 9$ .
4. The number of minutes needed to solve an exercise set of variation problems varies directly as the number of problems and inversely as the number of people working on the solutions. It takes 4 people 36 minutes to solve 18 problems. How many minutes will it take 6 people to solve 42 problems?
5. To build a sound wall along the highway, the amount of time  $T$  needed varies directly with the number of cement blocks  $C$  needed and inversely with the number of workers  $W$ . A sound wall made of 2400 blocks, using six workers takes 18 hours to complete. How long would it take to build a wall of 4500 blocks with 10 workers?
6. The time needed to paint a fence varies directly with the length of the fence and indirectly with the number of painters. If it takes five hours to paint 200 feet of fence with three painters, how long will it take five painters to paint 500 feet of fence?
7. The time to prepare a field for planting is inversely proportional to the number of people who are working. A large field can be prepared by five workers in 24 days. In order to finish the field sooner, the farmer plans to hire additional workers. How many workers are needed to finish the field in 15 days?
8. The number of hours needed to assemble computers varies directly as the number of computers and inversely as the number of workers. If 4 workers can assemble 12 computers in 9 hours, how many workers are needed to assemble 48 computers in 8 hours?
9. The time  $T$  that it takes to frame a house varies directly with the size of the house  $S$  in square feet and inversely with the number of framers  $N$  working on the job. If three framers can complete a 2,500 square foot house in 6 days, then how long will it take six framers to complete a 4,500 square foot house?
10. One's intelligence quotient, or IQ, varies directly as a person's mental age and inversely as that person's chronological age. A person with a mental age of 25 and a chronological age of 20 has an IQ of 125. What is the chronological age of a person with a mental age of 40 and an IQ of 80?

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11. The electrical resistance of a wire varies directly as its length and inversely as the square of its diameter. A wire with a length of 200 inches and a diameter of one-quarter of an inch has a resistance of 20 ohms. Find the electrical resistance in a 500 inch wire with the same diameter.
12. The maximum load that a cylindrical column with a circular cross section can hold varies directly as the fourth power of the diameter and inversely as the square of the height. A 9 meter column 2 meters in diameter will support 64 metric tons. How many metric tons can be supported by a column 9 meters high and 3 meters in diameter?
13. The volume of gas varies directly as the temperature and inversely as the pressure. If the volume is 230 cubic centimeters when the temperature is 300 K and the pressure is 20 pounds per square centimeter, what is the volume when the temperature is 270 K and the pressure is 30 pounds per square centimeter?
14. The average number of phone calls per day between two cities has found to be jointly proportional to the populations of the cities, and inversely proportional to the square of the distance between the two cities. The population of Charlotte is about 1,500,000 and the population of Nashville is about 1,200,000, and the distance between the two cities is about 400 miles. The average number of calls between the cities is about 200,000.
  - a. Find the  $k$  and write the equation of variation.
  - b. The average number of daily phone calls between Charlotte and Indianapolis (which has a population of about 1,700,000) is about 134,000. Find the distance between the two cities.
15. The force needed to keep a car from skidding on a curve varies jointly as the weight of the car and the square of the speed, and inversely as the radius of the curve. It takes 3800 pounds of force to keep an 1800 pound car from skidding on a curve with radius 425 feet at a speed of 45mph. What force is needed to keep the same car from skidding when it takes a similar curve with radius 450 feet at 55 mph?