Inverse Variation

Algebra Worksheet · Grade 8–10

Name: _____ Date: _____

Learning Objectives

- Identify inverse variation relationships and use the formula y = k/x
- Find the constant of variation k given a pair of x and y values
- Write and use inverse variation equations to solve real-world problems

Problems

1. If y varies inversely as x, and y = 4 when x = 3, find the constant of variation k.

$$y = \frac{k}{x}$$

2. If y varies inversely as x, and y = 63 when x = 3, write the inverse variation equation.

$$y = \frac{k}{x}$$

3. Determine whether the table of values represents an inverse variation relationship. If it does, write the inverse variation equation.

x	y	xy
2	15	
3	10	
5	6	
6	5	

4. If y varies inversely as x, and y = 8 when x = 5, find y when x = 20.

$$y = \frac{k}{x}$$

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5. The speed of a moving car varies inversely with the time it takes to travel a fixed distance. If a car travels at 60 km/h and takes 3 hours, how long will it take if the speed is increased to 90 km/h?

$$t = \frac{k}{s}$$

6. If y varies inversely as x, and y = 12 when x = 7, find x when y = 4.

$$y = \frac{k}{x}$$

7. The number of workers needed to complete a project varies inversely with the number of days allowed. If 8 workers can complete the project in 15 days, how many workers are needed if the project must be completed in 6 days?

$$w = \frac{k}{d}$$

8. Determine the missing values in the table below, given that y varies inversely as x with a constant of variation k = 48.

x	y
4	
6	
8	
16	

9. The number of hours it takes to fill a tank with water varies inversely with the rate of water flow in liters per hour. At a flow rate of 25 L/h the tank fills in 12 hours. A new pump triples the flow rate. How long will the new pump take to fill the tank, and by how many hours is the filling time reduced?

$$h = \frac{k}{r}$$

10. The pressure of a gas varies inversely with its volume at a constant temperature. A gas has a pressure of 3.6 atm when its volume is 2.5 liters. If the volume is compressed to 0.9 liters, find the new pressure. Then verify your answer by confirming that the product of pressure and volume remains constant.

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$$P = \frac{k}{V}$$

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Inverse Variation — Answer Key

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Answer Key

1. Answer: k = 12

- Use the inverse variation formula: y = k/x
- Substitute y = 4 and x = 3: 4 = k/3
- Multiply both sides by 3: k = 4 × 3 = 12

2. Answer: y = 189/x

- Use the inverse variation formula: y = k/x
- Substitute y = 63 and x = 3: 63 = k/3
- Multiply both sides by 3: k = 189
- Write the equation: y = 189/x

3. Answer: Yes, inverse variation. y = 30/x

x	y	xy
2	15	30
3	10	30
5	6	30
6	5	30

- Compute xy for each row: 2×15=30, 3×10=30, 5×6=30, 6×5=30
- Since xy is constant (k = 30) for all pairs, this is inverse variation
- Write the equation: y = 30/x

4. Answer: y = 2

- Find k: k = y × x = 8 × 5 = 40
- Write the equation: y = 40/x
- Substitute x = 20: y = 40/20 = 2

5. Answer: 2 hours

- Identify the inverse variation: t = k/s
- Find k: k = t × s = 3 × 60 = 180
- Write the equation: t = 180/s
- Substitute s = 90: t = 180/90 = 2 hours

6. Answer: x = 21

- Find k: k = y × x = 12 × 7 = 84
- Write the equation: y = 84/x
- Substitute y = 4: 4 = 84/x

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- Solve for x: x = 84/4 = 21

7. Answer: 20 workers

- Identify the inverse variation: w = k/d
- Find k: k = w × d = 8 × 15 = 120
- Write the equation: w = 120/d
- Substitute d = 6: w = 120/6 = 20 workers

8. Answer: y = 12, 8, 6, 3

x	y
4	12
6	8
8	6
16	3

- Use the equation y = 48/x
- x = 4: y = 48/4 = 12
- x = 6: y = 48/6 = 8
- x = 8: y = 48/8 = 6
- x = 16: y = 48/16 = 3

9. Answer: 4 hours; reduced by 8 hours

- Find k: k = h × r = 12 × 25 = 300
- Write the equation: h = 300/r
- New flow rate: 3 × 25 = 75 L/h
- Substitute r = 75: h = 300/75 = 4 hours
- Reduction in time: 12 – 4 = 8 hours

10. Answer: P = 10 atm; k = PV = 9 (constant)

- Identify the inverse variation: P = k/V
- Find k: k = P × V = 3.6 × 2.5 = 9
- Write the equation: P = 9/V
- Substitute V = 0.9: P = 9/0.9 = 10 atm
- Verify: P × V = 10 × 0.9 = 9 ✓ (constant of variation confirmed)

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