Direct Variation Word Problems

Algebra Worksheet · Grade 7–9

Name: _____ Date: _____

Learning Objectives

- Identify direct variation relationships from verbal descriptions and write the equation y = kx
- Find the constant of variation (k) given a pair of values
- Use the direct variation equation to solve for unknown quantities in real-world contexts

Problems

1. If y varies directly as x, and y = 12 when x = 3, find the constant of variation k.

$$y = kx$$

2. If y varies directly as x, and y = 20 when x = 5, find y when x = 9.

$$y = kx$$

3. The number of cupcakes you can bake varies directly with the amount of flour you have. You can bake 24 cupcakes with 3 cups of flour. How many cupcakes can you bake with 7 cups of flour?

$$c = kf$$

4. The amount you earn varies directly with the number of hours you work. You earn $45 for working 5 hours. How much will you earn if you work 8 hours?

$$E = kh$$

5. If y varies directly as x, and y = 48 when x = 6, find y when x = 15.

$$y = kx$$

6. A car uses fuel that varies directly with the distance traveled. A car uses 4 liters of fuel to travel 60 km. How many liters of fuel are needed to travel 225 km?

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$F = kd$

7. The table below shows values of x and y. Determine whether the data represents a direct variation. If it does, state the constant of variation and write the equation.

x	y	y/x
2	10	
4	20	
6	30	
8	40	

8. The distance a spring stretches varies directly with the force applied. A force of 12 Newtons stretches the spring 8 cm. What force is needed to stretch the spring 22.5 cm?

$d = kF$

9. The scatter plot below shows the relationship between hours worked per day and daily earnings for several employees. Based on the graph, does the data suggest a direct variation? Identify the approximate constant of variation from the data points.

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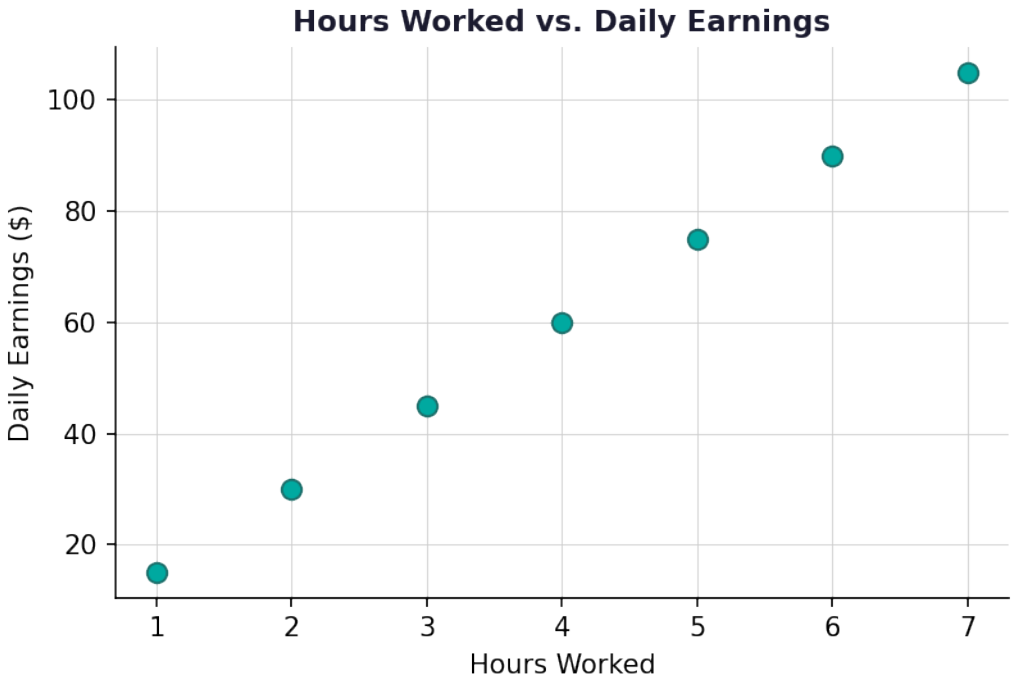

10. At a factory, the number of units produced varies directly with the number of workers. With 8 workers, the factory produces 200 units per day. The factory wants to increase daily production to 325 units. However, each additional worker costs $80 per day. If the current daily wage cost for 8 workers is $480, what will be the new total daily wage cost after hiring the additional workers needed to meet the production goal?

$u = kw$

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Direct Variation Word Problems — Answer Key

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Answer Key

1. Answer: k = 4

- Use the formula y = kx
- Substitute y = 12 and x = 3: 12 = k(3)
- Divide both sides by 3: k = 12 ÷ 3 = 4

2. Answer: y = 36

- Find k: k = y/x = 20/5 = 4
- Write the equation: y = 4x
- Substitute x = 9: y = 4(9) = 36

3. Answer: 56 cupcakes

- Let c = number of cupcakes and f = cups of flour
- Find k: k = 24/3 = 8
- Write the equation: c = 8f
- Substitute f = 7: c = 8(7) = 56 cupcakes

4. Answer: $72

- Let E = earnings and h = hours worked
- Find k: k = 45/5 = 9
- Write the equation: E = 9h
- Substitute h = 8: E = 9(8) = $72

5. Answer: y = 120

- Find k: k = 48/6 = 8
- Write the equation: y = 8x
- Substitute x = 15: y = 8(15) = 120

6. Answer: 15 liters

- Let F = fuel (liters) and d = distance (km)
- Find k: k = 4/60 = 1/15
- Write the equation: F = (1/15)d
- Substitute d = 225: F = 225/15 = 15 liters

7. Answer: Yes, direct variation; k = 5; y = 5x

x	y	y/x
2	10	5
4	20	5

Scan to watch

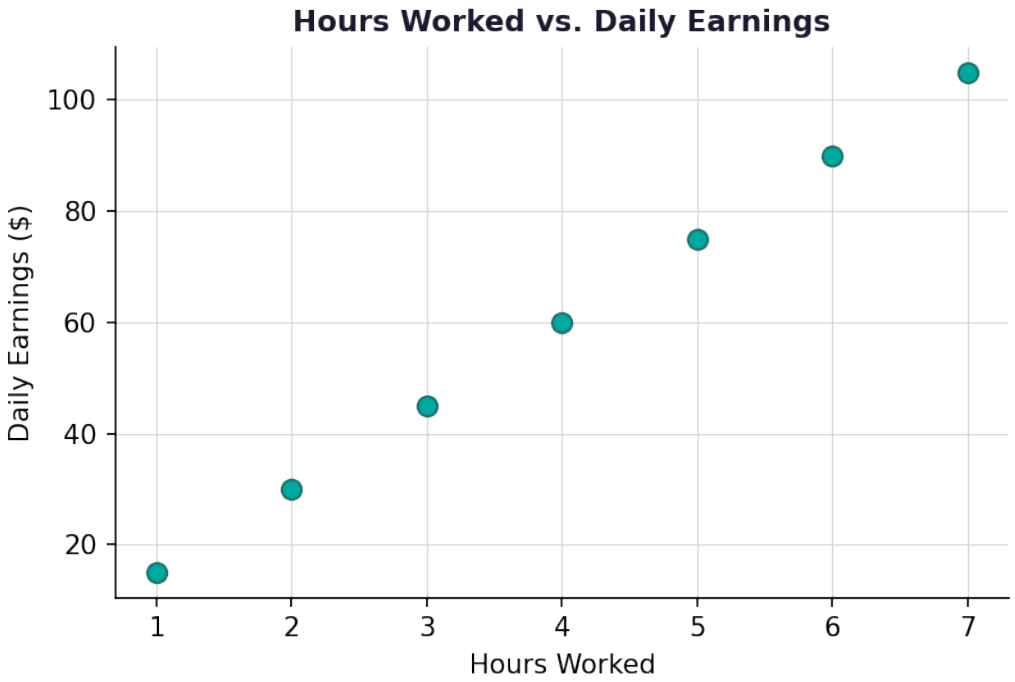
x	y	y/x
6	30	5
8	40	5

- Calculate y/x for each row: 10/2 = 5, 20/4 = 5, 30/6 = 5, 40/8 = 5
- Since y/x is constant, this is a direct variation
- The constant of variation is k = 5
- The equation is y = 5x

8. Answer: 33.75 Newtons

- Let d = distance stretched (cm) and F = force (Newtons)
- Find k: k = d/F = 8/12 = 2/3
- Write the equation: d = (2/3)F
- Substitute d = 22.5: 22.5 = (2/3)F
- Solve for F: F = 22.5 × (3/2) = 33.75 Newtons

9. Answer: Yes, direct variation; k = 15 (earning $15 per hour)



- Check whether the points lie on a straight line through the origin
- Calculate y/x for each point: 15/1=15, 30/2=15, 45/3=15, 60/4=15, 75/5=15, 90/6=15, 105/7=15
- Since y/x = 15 is constant and the line passes through (0, 0), it is a direct variation
- The constant of variation k = 15, meaning each employee earns $15 per hour
- The equation is E = 15h

10. Answer: New total daily wage cost = $1,040

- Let u = units produced and w = number of workers

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- Find k: k = 200/8 = 25 (units per worker)
- Write the equation: u = 25w
- Find the number of workers needed for 325 units: 325 = 25w → w = 13 workers
- Additional workers needed: 13 - 8 = 5 additional workers
- Additional cost: 5 × $80 = $400 per day
- New total daily wage cost: $480 + $400 = $1,040

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