

# Constant of Proportionality

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

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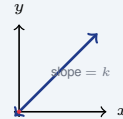
## Quick Review and Helpful Hints

In a proportional relationship  $y = kx$ , the number  $k$  is the *constant of proportionality* – it equals  $\frac{y}{x}$  (the unit rate). Find  $k$  by dividing any  $y$  by its  $x$ . The graph is a straight line through the origin.

▷ **Example:** If  $y = 12$  when  $x = 3$ , find  $k$ . **Work:** Divide  $y$  by  $x$ :

$$k = \frac{12}{3} = 4.$$

★ **Answer:**  $k = 4$



$y = kx$  through the origin.

## ◆ Practice Problems

Find the constant of proportionality  $k$ .

1.  $y = 12, x = 3$

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2.  $y = 20, x = 4$

\_\_\_\_\_

3.  $y = 15, x = 5$

\_\_\_\_\_

4.  $y = 10, x = 2$

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5.  $y = 9, x = 3$

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6.  $y = 24, x = 6$

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7.  $y = 7, x = 1$

\_\_\_\_\_

8.  $y = 100, x = 20$

\_\_\_\_\_

9.  $y = 18, x = 9$

\_\_\_\_\_

10.  $y = 8, x = 4$

\_\_\_\_\_

11.  $y = 30, x = 5$

\_\_\_\_\_

12. Table  $x: 1, 2, 3, y: 2, 4, 6$

\_\_\_\_\_

13. Table  $x: 2, 4, y: 6, 12$

\_\_\_\_\_

14.  $y = 50, x = 10$

\_\_\_\_\_

## ◆ Word Problems

15. 3 lb of apples cost \$12. Find  $k$  (cost per pound).

\_\_\_\_\_

16. A car travels 120 mi in 2 hr. Find  $k$  (miles per hour).

\_\_\_\_\_

17.  $y = 45$  when  $x = 9$ . Find  $k$ .

\_\_\_\_\_

18. If  $y = kx$  with  $y = 16$  and  $x = 4$ , find  $k$ .

\_\_\_\_\_



## Answer Keys

1.

2.

3.

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8.

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15.

16.

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18.

### Step-by-Step Explanations

**1.** Start by naming the process: In a proportional relationship, the constant is the unit rate, so divide the matching  $y$ -value by the  $x$ -value. The setup/work is In a proportional relationship, the constant is found with  $k = \frac{y}{x}$ . Here  $y = 12$  and  $x = 3$ , so divide  $12 \div 3 = 4$ . Therefore  $k = 4$ . So the final answer is 4.

**2.** A good way to think about this is: In a proportional relationship, the constant is the unit rate, so divide the matching  $y$ -value by the  $x$ -value. The setup/work is Use the rule  $k = \frac{y}{x}$ , which means divide the  $y$ -value by the matching  $x$ -value. With  $y = 20$  and  $x = 4$ ,  $20 \div 4 = 5$ , so  $k = 5$ . So the final answer is 5.

**3.** Step by step: In a proportional relationship, the constant is the unit rate, so divide the matching  $y$ -value by the  $x$ -value. The setup/work is The constant tells how much  $y$  there is for each 1 unit of  $x$ . Divide  $y$  by  $x$ :  $15 \div 5 = 3$ , so  $k = 3$ . So the final answer is 3.

**4.** Take it one move at a time: In a proportional relationship, the constant is the unit rate, so divide the matching  $y$ -value by the  $x$ -value. The setup/work is Start with  $k = \frac{y}{x}$ . Substitute the given values:  $k = \frac{10}{2}$ . Since  $10 \div 2 = 5$ , the constant is  $k = 5$ . So the final answer is 5.

**5.** Start by naming the process: In a proportional relationship, the constant is the unit rate, so divide the matching  $y$ -value by the  $x$ -value. The setup/work is Divide the dependent value  $y$  by the input value  $x$ . Here  $9 \div 3 = 3$ , so the relationship has constant of proportionality  $k = 3$ . So the final answer is 3.

**6.** A good way to think about this is: In a proportional relationship, the constant is the unit rate, so divide the matching  $y$ -value by the  $x$ -value. The setup/work is To find  $k$ , ask how much  $y$  goes with one  $x$ . Since 24 goes with 6, divide  $24 \div 6 = 4$ . So  $k = 4$ . So the final answer is 4.

**7.** Step by step: In a proportional relationship, the constant is the unit rate, so divide the matching  $y$ -value by the  $x$ -value. The setup/work is Use  $k = \frac{y}{x}$ . Because  $x = 1$ , the constant is the same as the  $y$ -value:  $7 \div 1 = 7$ , so  $k = 7$ . So the final answer is 7.

**8.** Take it one move at a time: In a proportional relationship, the constant is the unit rate, so divide the matching  $y$ -value by the  $x$ -value. The setup/work is The pair is  $x = 20$  and  $y = 100$ . Divide  $y$  by  $x$ :  $100 \div 20 = 5$ . This means  $y$  increases by 5 for every 1 increase in  $x$ , so  $k = 5$ . So the final answer is 5.

**9.** Start by naming the process: In a proportional relationship, the constant is the unit rate, so divide the matching  $y$ -value by the  $x$ -value. The setup/work is Use the matching values  $y = 18$  and  $x = 9$ . The constant is  $18 \div 9 = 2$ , so each 1 unit of  $x$  corresponds to 2 units of  $y$ . So the final answer is 2.

**10.** A good way to think about this is: In a proportional relationship, the constant is the unit rate, so divide the matching  $y$ -value by the  $x$ -value. The setup/work is Find the unit rate by dividing  $y$  by  $x$ . Here  $8 \div 4 = 2$ , so the constant of proportionality is  $k = 2$ . So the final answer is 2.

**11.** Step by step: In a proportional relationship, the constant is the unit rate, so divide the matching  $y$ -value by the  $x$ -value. The setup/work is Substitute into  $k = \frac{y}{x}$ :  $k = \frac{30}{5}$ . Dividing gives  $30 \div 5 = 6$ , so  $k = 6$ . So the final answer is 6.

**12.** Take it one move at a time: In a proportional relationship, the constant is the unit rate, so divide the matching  $y$ -value by the  $x$ -value. The setup/work is From the table, use one matching pair such as  $x = 1$  and  $y = 2$ . Divide  $2 \div 1 = 2$ ; the other pairs give the same result, so  $k = 2$ . So the final answer is 2.

**13.** Start by naming the process: In a proportional relationship, the constant is the unit rate, so divide the matching  $y$ -value by the  $x$ -value. The setup/work is Choose a matching pair from the table, for example  $x = 2$  and  $y = 6$ . Then  $k = \frac{6}{2} = 3$ ; the pair  $x = 4$ ,  $y = 12$  also gives  $12 \div 4 = 3$ , so  $k = 3$ . So the final answer is 3.

**14.** A good way to think about this is: In a proportional relationship, the constant is the unit rate, so divide the matching  $y$ -value by the  $x$ -value. The setup/work is Apply  $k = \frac{y}{x}$  with  $y = 50$  and  $x = 10$ . Dividing 50 by 10 gives 5, so the constant is  $k = 5$ . So the final answer is 5.

**15.** Step by step: In a proportional relationship, the constant is the unit rate, so divide the matching  $y$ -value by the  $x$ -value. The setup/work is Here  $k$  means cost per pound. Divide the total cost by the number of pounds:  $12 \div 3 = 4$ . So the constant is  $k = 4$  dollars per pound. So the final answer is 4.

**16.** Take it one move at a time: In a proportional relationship, the constant is the unit rate, so divide the matching  $y$ -value by the  $x$ -value. The setup/work is Here  $k$  means miles per hour, or miles for one hour. Divide distance by time:  $120 \div 2 = 60$ . So  $k = 60$  miles per hour. So the final answer is 60.

**17.** Start by naming the process: In a proportional relationship, the constant is the unit rate, so divide the matching  $y$ -value by the  $x$ -value. The setup/work is Use the same proportional rule: divide  $y$  by  $x$ . With  $y = 45$  and  $x = 9$ ,  $45 \div 9 = 5$ , so  $k = 5$ . So the final answer is 5.

**18.** A good way to think about this is: In a proportional relationship, the constant is the unit rate, so divide the matching  $y$ -value by the  $x$ -value. The setup/work is In  $y = kx$ , dividing both sides by  $x$  gives  $k = \frac{y}{x}$ . Substitute  $y = 16$  and  $x = 4$ :  $16 \div 4 = 4$ , so  $k = 4$ . So the final answer is 4.



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