# Constant of Proportionality ($k$)

| Name: _____ | Date: _____ | Score: _____ / 18 |
|---|---|---|

Every proportional relationship has a magic number hiding inside it: the **constant of proportionality**, $k$. It tells you how many units of $y$ you get for each $1$ unit of $x$, so $k = \frac{y}{x}$. Once you know $k$, you can write the equation $y = kx$ and predict *any* value in the relationship—that is real mathematical power! The best part is that $k$ always has a concrete meaning, like dollars per item or miles per gallon, so it connects the math to the real world.

## Key Concepts & Quick Review

**From a table:** $k = \frac{y}{x}$ (same for every row). **From an equation:** $y = kx \Rightarrow k$ is the coefficient of $x$.

**Given $k$, find $y$:** multiply $k \times x$. **Given $k$, find $x$:** divide $y \div k$. Larger $k$ means a steeper graph.

| $x$ | $y$ |
|---|---|
| 2 | 6 |
| 4 | 12 |
| | |

$\xrightarrow{y \div x}$ $k = 6 \div 2 = 3$, $y = 3x$

*$k$ tells how much $y$ there is for each 1 unit of $x$.*

## Examples

① A table shows: $(2, 7)$, $(4, 14)$, $(6, 21)$, $(8, 28)$. Find $k$ and write the equation.

**Think It Through:** To find the constant of proportionality, divide $y$ by $x$ in the table. Each pair gives the same value: $\frac{7}{2} = 3.5$, $\frac{14}{4} = 3.5$, $\frac{21}{6} = 3.5$, and $\frac{28}{8} = 3.5$. Since the ratio is always $3.5$, that is the constant $k$. A proportional relationship with constant $k$ is written as $y = kx$, so the equation is $y = 3.5x$.

**Answer:** $k = 3.5$; $y = 3.5x$

② A car's fuel economy is proportional: it uses $2.5\,gal$ for every $50\,mi$ driven. Find $k$ (miles per gallon), write the equation for total miles $y$ given gallons $x$, and find how far the car travels on $11\,gal$.

**Think It Through:** The constant of proportionality here is miles per gallon, so divide miles by gallons: $\frac{50}{2.5} = 20$. That means the car travels $20\,mi$ for each gallon of gas. Using $y = kx$, the equation becomes $y = 20x$, where $x$ is gallons and $y$ is miles. For $11\,gal$, substitute $x = 11$ and get $y = 20 \times 11 = 220$ miles. The units help you decide which quantity goes on top when finding $k$.

**Answer:** $k = 20$ *mpg;* $220\,mi$ *on* $11\,gal$

## Practice Problems

*Find the constant of proportionality $k$, or use the given $k$ to find the missing value.*

1. In the proportional relationship $y = kx$, _____ use $y = 12$ and $x = 3$ to find $k$.
2. In the proportional relationship $y = kx$, _____ use $y = 35$ and $x = 5$ to find $k$.
3. In the proportional relationship $y = kx$, _____ use $y = 48$ and $x = 8$ to find $k$.
4. In the proportional relationship $y = kx$, _____ use $y = 2.4$ and $x = 4$ to find $k$.
5. In the proportional relationship $y = kx$, _____ use $y = \frac{3}{2}$ and $x = 3$ to find $k$.
6. In the proportional relationship $y = kx$, _____ use $y = 9$ and $x = 6$ to find $k$.
7. In the proportional relationship $y = kx$, _____ use $k = 4$ and $x = 7$ to find $y$.
8. In the proportional relationship $y = kx$, _____ use $k = 2.5$ and $x = 6$ to find $y$.
9. In the proportional relationship $y = kx$, _____ use $k = \frac{1}{3}$ and $x = 9$ to find $y$.
10. In the proportional relationship $y = kx$, _____ use $k = 5$ and $y = 40$ to find $x$.
11. In the proportional relationship $y = kx$, _____ use $k = 0.6$ and $y = 4.8$ to find $x$.
12. In the proportional relationship $y = kx$, _____ use $k = \frac{3}{4}$ and $y = 9$ to find $x$.
13. In the proportional relationship $y = kx$, _____ use $y = 7.2$ and $x = 9$ to find $k$.
14. In the proportional relationship $y = kx$, _____ use $y = 100$ and $x = 25$ to find $k$.
15. In the proportional relationship $y = kx$, _____ use $k = 1.5$ and $x = 10$ to find $y$.

## Study Tips

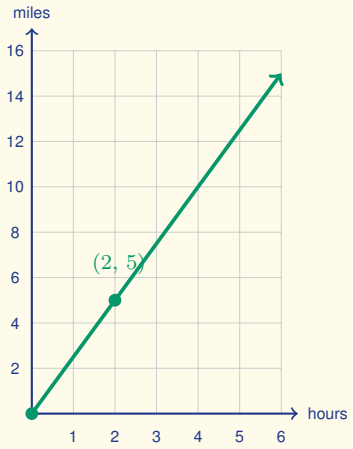
- $k$ is always $\frac{y}{x}$ — **dependent over independent**. Put the output quantity on top.
- On a graph, $k$ is the **slope** of the line through the origin. A steeper line means a larger $k$.
- The unit of $k$ tells you the **real-world rate**: if $x$ is hours and $y$ is miles, then $k$ is miles per hour.

## Word Problems

**16.** A baker uses $\frac{3}{2}$ cups of sugar for every $2$ dozen cookies baked. Find $k$ (cups per dozen), write the equation, and determine how many cups of sugar are needed to bake $10$ dozen cookies. _____

**17.** Two painters work at proportional rates. Painter A completes $\frac{3}{4}$ of a room per hour. Painter B completes $45$ square feet per hour, and each room is $90\ sq\ ft$. Find $k$ for each painter in rooms per hour and determine who paints faster. _____

**18.** This graph shows distance versus time for a runner. Read the marked lattice point off the graph, find the constant of proportionality $k$ (the runner's speed), state the equation $y = kx$, and use it to predict the distance after $7$ hours.


miles
16
14
12
10
8
6
4
2
(2, 5)
hours
1
2
3
4
5
6

# Answer Keys

**1)** 4
**2)** 7
**3)** 6
**4)** 0.6
**5)** $\frac{1}{2}$
**6)** 1.5
**7)** 28
**8)** 15
**9)** 3
**10)** 8
**11)** 8
**12)** 12
**13)** 0.8
**14)** 4
**15)** 15
**16)** $k = \frac{3}{4}$ cup/dozen; $y = \frac{3}{4}x$; 7.5 cups
**17)** Painter A: $0.75$ room/hr; Painter B: $0.5$ room/hr; Painter A
**18)** Point $(2, 5)$; $k = 2.5\ mph$; $y = 2.5x$; $17.5\ mi$

## Step-by-Step Explanations

**Strategy:** For Solving Real-World Problems with Rational Numbers, sort the quantities by what they mean before choosing operations. A labeled setup helps students see which numbers are being combined and why.

**Practice 1:** $\frac{3}{4} \times (-8) + \frac{1}{2} =$ **Answer:** $-\frac{11}{2}$

For the first worked item, choose the rule named by the topic, substitute carefully, and simplify one line at a time.

**Practice 15:** $-1\frac{2}{3} \div \frac{5}{9} + (-0.2) =$ **Answer:** $-\frac{16}{5}$

Near the end of this topic, choose the rule named by the topic, substitute carefully, and simplify one line at a time.

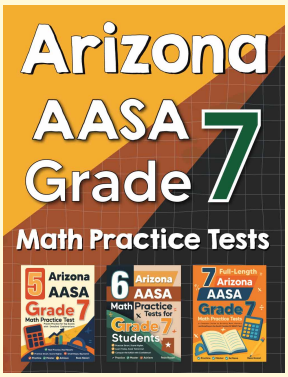
**Word-problem notes:**

**16. Answer:** Week 2 loss: $-\$168.20$; week 3: $\$630.75$; total: $\$883.05$; overall profit.
Week 1 is a profit of \$420.50. Week 2 is a loss equal to $\frac{2}{5}$ of that, so compute $420.50 \times \frac{2}{5} = 168.20$ and record it as $-\$168.20$. Week 3 is $1\frac{1}{2} = \frac{3}{2}$ times week 1, so $420.50 \times \frac{3}{2} = 630.75$. Now combine the three weeks: $420.50 - 168.20 + 630.75 = 883.05$. Because the total is positive, the business made an overall profit of \$883.05. The signs tell the story of profit versus loss.

**17. Answer:** $8$ intervals; change $= 8 \times (-\frac{3}{8}) = -3°$C; final $= -6.5°$C; yes, still above $-8°$C.
First count how many quarter-minute intervals fit into $2\ min$: $2 \div \frac{1}{4} = 8$. Each interval changes the temperature by $-\frac{3}{8}°$C, so the total change is $8 \times \left(-\frac{3}{8}\right) = -3°$C. Add that change to the starting temperature: $-3.5 + (-3) = -6.5°$C. Finally, compare $-6.5°$C to the lower limit of $-8°$C. Since $-6.5 > -8$, the reaction is still within bounds. This last comparison step matters just as much as the arithmetic.

# Want Even More Practice?

## Check Out Our Other Arizona AASA Test Books!




### Arizona AASA Grade 7 Math Preparation Bundle

18 full-length practice tests across three books (5 + 6 + 7)

No repeated questions—maximum practice value!

**18 Tests!**
**3 Books**
**One Bundle**

**Important:** All our test books contain **unique, completely different tests** from each other! Each book offers fresh practice questions—no repeats!

### 5 Practice Tests

- ✓ 5 complete practice tests with detailed explanations
- ✓ Perfect foundation for AASA test preparation
- ✓ Builds confidence and test-taking skills
- ✓ High-quality questions aligned with state standards

**Start your practice journey!**

### 6 Practice Tests

- ✓ 6 complete practice tests with detailed explanations
- ✓ **Unique tests**—different from the 5 tests book
- ✓ Perfect for more practice after mastering 5 tests
- ✓ Builds even more confidence and test-taking skills
- ✓ Same high-quality questions aligned with standards

**Take your practice to the next level!**

### 7 Practice Tests

- ✓ 7 complete practice tests for maximum preparation
- ✓ **Unique tests**—different from 5 and 6 tests books
- ✓ The most comprehensive practice for Grade 7
- ✓ Ideal for students aiming for top scores
- ✓ Extensive practice builds mastery and confidence

**Go all the way with comprehensive practice!**