

# Variables in Real-World Problems

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

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

Score: \_\_\_\_\_ / 24

## Q Quick Review

In real-world problems, a **variable** stands for a quantity that can change or that you don't know yet. The first step is to clearly define what your variable means — for example, “let  $m$  be the number of minutes.” Then you build an **expression** that describes the situation using that variable. A fixed amount that never changes becomes a **constant**, and an amount that repeats becomes a coefficient multiplied by the variable. Writing the expression carefully lets you answer the question for *any* value later.

◇ **Example:** A gym charges a \$20 sign-up fee plus \$15 each month. Write an expression for the total cost after  $m$  months.  
 ⇒ Let's decide what the variable means first:  $m$  is the number of months. The \$15 monthly fee happens once per month, so for  $m$  months that part costs  $15m$  dollars. The \$20 sign-up fee is paid only once — it's a constant. We add the two parts together to get  $15m + 20$ . Now we could find the cost for any number of months just by substituting.

**Answer:**  $15m + 20$

## PRACTICE

Write an expression for each situation using the given variable.

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|---|--|
| 1. Total apples if there are $a$ bags of 6 _____                | 13. Candies each if 36 candies split among $g$ groups _____      |
| 2. Cost of $p$ pencils at 2 dollars each _____                  | 14. Distance in $t$ hours at 55 miles per hour _____             |
| 3. Hours left in a 24-hour day after $h$ hours _____            | 15. Pencils left in a box of 30 after using $u$ _____            |
| 4. Pages read if $d$ days of 10 pages _____                     | 16. Total cost of $m$ months of streaming at 8 dollars _____     |
| 5. Total students in $c$ classes of 25 _____                    | 17. Total seats in $r$ rows of 12 plus 3 extra _____             |
| 6. Money left from 50 dollars after spending $s$ _____          | 18. Width of a rectangle with area 48 and length $\ell$ _____    |
| 7. Total wheels on $b$ bicycles _____                           | 19. Total points from $q$ questions worth 5 each _____           |
| 8. Cost of a 5-dollar ticket plus $f$ dollars for food _____    | 20. Cost of $x$ books at 7 dollars with a 10-dollar coupon _____ |
| 9. Slices of pizza each if 8 slices shared by $n$ people _____  |  |
| 10. Total legs on $s$ spiders _____                             |  |
| 11. Earnings for $h$ hours at 12 dollars per hour _____         |  |
| 12. Total cost of $t$ shirts at 9 dollars plus 4 shipping _____ |  |

## ◆ Word Problems

21. A landscaper charges a \$40 visit fee plus \$25 per hour. Let  $h$  be the number of hours. Write an expression for the total charge.  
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22. A school orders  $t$  trays of muffins with 24 muffins per tray. Write an expression for the total number of muffins, then find the total if  $t = 5$ .  
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23. A water tank holds 200 gallons and drains  $g$  gallons. Write an expression for the gallons remaining, then find the amount left if  $g = 75$ .  
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24. A pizza shop splits  $n$  pizzas equally among 4 tables. Write an expression for how many pizzas each table gets, then find the amount if  $n = 12$ .  
 \_\_\_\_\_



## Answer Keys

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|---|--|
| <p>1. <math>6a</math></p> <p>2. <math>2p</math></p> <p>3. <math>24 - h</math></p> <p>4. <math>10d</math></p> <p>5. <math>25c</math></p> <p>6. <math>50 - s</math></p> <p>7. <math>2b</math></p> <p>8. <math>f + 5</math></p> <p>9. <math>\frac{8}{n}</math></p> <p>10. <math>8s</math></p> <p>11. <math>12h</math></p> <p>12. <math>9t + 4</math></p> | <p>13. <math>\frac{36}{g}</math></p> <p>14. <math>55t</math></p> <p>15. <math>30 - u</math></p> <p>16. <math>8m</math></p> <p>17. <math>12r + 3</math></p> <p>18. <math>\frac{48}{\ell}</math></p> <p>19. <math>5q</math></p> <p>20. <math>7x - 10</math></p> <p>21. <math>25h + 40</math></p> <p>22. <math>24t</math>; 120 muffins</p> <p>23. <math>200 - g</math>; 125 gallons</p> <p>24. <math>\frac{n}{4}</math>; 3 pizzas</p> |
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### Step-by-Step Explanations

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| <p>1. Each bag has 6 apples, so <math>a</math> bags hold <math>6a</math> apples.</p> <p>2. At 2 dollars per pencil, <math>p</math> pencils cost <math>2p</math> dollars.</p> <p>3. Start with 24 hours and subtract the <math>h</math> hours used: <math>24 - h</math>.</p> <p>4. Reading 10 pages a day for <math>d</math> days gives <math>10d</math> pages.</p> <p>5. Each class has 25 students, so <math>c</math> classes have <math>25c</math> students.</p> <p>6. Begin with 50 dollars and take away <math>s</math> spent: <math>50 - s</math>.</p> <p>7. Each bicycle has 2 wheels, so <math>b</math> bicycles have <math>2b</math> wheels.</p> <p>8. The ticket is a constant 5 dollars; add the food cost <math>f</math>: <math>f + 5</math>.</p> <p>9. Sharing 8 slices equally among <math>n</math> people: <math>\frac{8}{n}</math> each.</p> <p>10. Each spider has 8 legs, so <math>s</math> spiders have <math>8s</math> legs.</p> <p>11. At 12 dollars per hour, working <math>h</math> hours earns <math>12h</math> dollars.</p> <p>12. The shirts cost <math>9t</math> dollars; shipping adds a constant 4: <math>9t + 4</math>.</p> <p>13. Dividing 36 candies into <math>g</math> equal groups: <math>\frac{36}{g}</math> each.</p> <p>14. Distance is speed times time: <math>55t</math> miles.</p> | <p>15. Start with 30 pencils and subtract the <math>u</math> used: <math>30 - u</math>.</p> <p>16. At 8 dollars per month, <math>m</math> months cost <math>8m</math> dollars.</p> <p>17. The rows hold <math>12r</math> seats; add the constant 3 extra: <math>12r + 3</math>.</p> <p>18. Width is area divided by length: <math>\frac{48}{\ell}</math>.</p> <p>19. Each question is worth 5 points, so <math>q</math> questions give <math>5q</math> points.</p> <p>20. The books cost <math>7x</math> dollars; the coupon subtracts a constant 10: <math>7x - 10</math>.</p> <p>21. The hourly part is <math>25h</math> dollars, and the \$40 visit fee is a constant added once. The total is <math>25h + 40</math>.</p> <p>22. Each tray has 24 muffins, so <math>t</math> trays give <math>24t</math>. When <math>t = 5</math>: <math>24 \times 5 = 120</math> muffins.</p> <p>23. Start with 200 gallons and subtract the <math>g</math> drained: <math>200 - g</math>. When <math>g = 75</math>: <math>200 - 75 = 125</math> gallons.</p> <p>24. Dividing <math>n</math> pizzas among 4 tables gives <math>\frac{n}{4}</math> each. When <math>n = 12</math>: <math>\frac{12}{4} = 3</math> pizzas per table.</p> |
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