

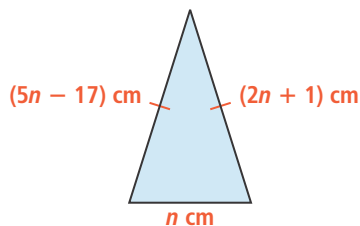


**UNDERSTAND**

- 10. Reason** Do only equations with variables on both sides ever have no solution? Or can an equation with the variable on one side have no solution? Justify your answer.
- 11. Generalize** How do you know whether an equation is an identity? How many solutions does an identity have? Explain.
- 12. Error Analysis** Describe and correct any error a student may have made when solving the equation  $0.15(y - 0.2) = 2 - 0.5(1 - y)$ .

$$\begin{aligned}
 0.15(y - 0.2) &= 2 - 0.5(1 - y) \\
 0.15y - 0.3 &= 2 - 0.5 + 0.5y \\
 0.15y - 0.3 &= 1.5 + 0.5y \\
 (100)(0.15y - 0.3) &= 100(1.5 + 0.5y) \\
 15y - 30 &= 150 + 50y \\
 15y - 30 - 15y - 150 &= 150 + 50y \\
 &\quad - 15y - 150 \\
 -180 &= 35y \\
 -\frac{180}{35} &= y
 \end{aligned}$$

- 13. Reason** When Nicky tried to solve an equation using properties of equality, she ended up with the equation  $-3 = -3$ . What equation might she have tried to solve? What is the solution of the equation?
- 14. Mathematical Connections** The triangle shown is isosceles. Find the length of each side and the perimeter.



- 15. Higher Order Thinking** The equation shown has a missing value.
- $$-2(2x - \blacksquare) + 1 = 17 - 4x$$
- For what missing value is the equation an identity?
  - For what missing value(s), if any, does the equation have exactly one solution?
  - For what missing value(s), if any, does the equation have no solution?

**PRACTICE**

Solve each equation. SEE EXAMPLES 1-3

- |   |  |
|---|--|
| <b>16.</b> $5x - 4 = 4x$                                  | <b>17.</b> $7x = 8x + 12$                      |
| <b>18.</b> $27 - 3x = 3x + 27$                            | <b>19.</b> $34 - 2x = 7x$                      |
| <b>20.</b> $5r - 7 = 2r + 14$                             | <b>21.</b> $-x = 7x - 56$                      |
| <b>22.</b> $5(n - 7) = 2(n + 14)$                         | <b>23.</b> $6w - 33 = 3(4w - 5)$               |
| <b>24.</b> $3(x - 2) = 9x$                                | <b>25.</b> $6(x + 5) = 3x$                     |
| <b>26.</b> $\frac{4x + 6}{2} = \frac{3x - 15}{3}$         | <b>27.</b> $\frac{q + 1}{2} = \frac{q - 1}{3}$ |
| <b>28.</b> $2c + 3 = 2c + 3$                              | <b>29.</b> $12b + 9 = 12b + 11$                |
| <b>30.</b> $x - 27 = -(27 - x)$                           | <b>31.</b> $4(x + 9) = x + 9$                  |
| <b>32.</b> $16(4 - 3m) = 96\left(-\frac{m}{2} + 1\right)$ |  |
| <b>33.</b> $6y - 8 = 2(3y - 4)$                           | <b>34.</b> $5(5t + 1) = 25t - 7$               |
| <b>35.</b> $-3k + 4 = -2 - 6k$                            | <b>36.</b> $\frac{1}{4}(2(x - 1) + 10) = x$    |
| <b>37.</b> $\frac{6x + 8}{2} - 4 = 3x$                    | <b>38.</b> $3y = \frac{8 - 12y}{4} + 2$        |
| <b>39.</b> $0.25t = 0.25 - t$                             | <b>40.</b> $0.625(x + 10) - 10 = 0$            |

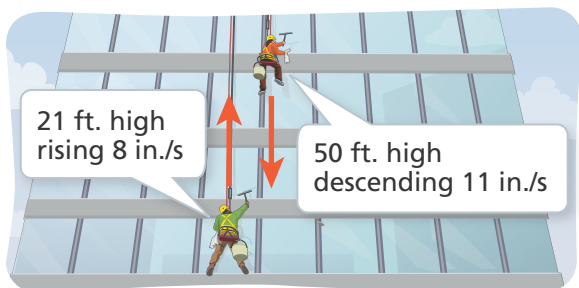
Solve each problem. SEE EXAMPLE 4

- 41.** Tavon has a \$50 gift card that loses \$2 for each 30-day period it is not used. He has a \$40 card that loses \$1.50 for each 30-day period it is not used.
- Write and solve an equation for the number of 30-day periods until the value of the gift cards will be equal.
  - What will the value of each card be when they have equal value?
- 42.** A cereal box manufacturer changes the size of the box to increase the amount of cereal it contains. The equations  $12 + 7.6n$  and  $6 + 8n$ , where  $n$  is the number of smaller boxes, are both representative of the amount of cereal that the new larger box contains. How many smaller boxes equal the same amount of cereal in the larger box?



**APPLY**

43. **Model With Mathematics** Arthur wants to buy an item that costs  $p$  dollars before tax. Using a 6% sales tax rate, write two different expressions that represent the price of the item after tax. Show that the two expressions are equal.
44. **Model With Mathematics** Two window washers start at the heights shown. One is rising, the other is descending. How long does it take for the two window washers to reach the same height? Explain.



45. **Construct Arguments** Jamie will choose between two catering companies for an upcoming party. Company A charges a set-up fee of \$500 plus \$25 for each guest. Company B charges a set-up fee of \$200 plus \$30 per guest.
- Write expressions that you can use to determine the amount each company charges for  $g$  guests.
  - Jamie learns that the \$500 set-up fee for Company A includes payment for 20 guests. The \$25 per guest charge is for every guest over the first 20. If there will be 50 guests, which company will cost the least? Explain.
46. **Construct Arguments** A one-year prepaid membership at Gym A costs \$250 plus \$19 per month for the second year. A one-year prepaid membership at Gym B costs \$195 plus \$24 per month for the second year. Leah says the cost for both gym memberships will be the same after the 11th month of the second year. Do you agree? Explain.
47. **Model With Mathematics** A red balloon is 40 feet above the ground and rising at 2 ft/s. At the same time, a blue balloon is at 60 feet above the ground and descending at 3 ft/s. What will the height of the balloons be when they are the same height above the ground?

**ASSESSMENT PRACTICE**

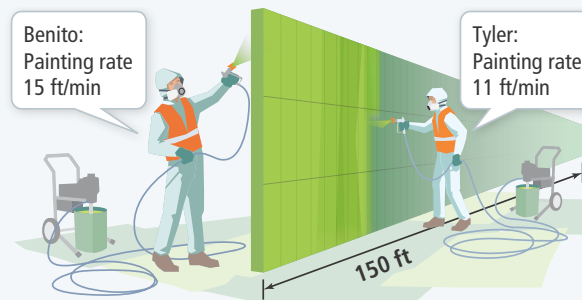
48. Which equations have no solution? Select all that apply.

- Ⓐ  $x - 9 = 2(x - 3) + 12$   
 Ⓑ  $5(-2x + 7) + 3 = -10x + 38$   
 Ⓒ  $\frac{1}{2}(6x - 4) = 3(x - 2)$   
 Ⓓ  $0.01x + 0.001 = \frac{1}{100}(x + 10)$   
 Ⓔ  $3(x + 2) + 1 = x + 2(4 + x)$

49. **SAT/ACT** Which equation is an identity?

- Ⓐ  $\frac{9x}{15} + 27 = \frac{9x}{15} + \frac{27}{15}$   
 Ⓑ  $3\left(\frac{x}{2} + 16\right) - 16 = \frac{3}{2}x$   
 Ⓒ  $-4(3 - 2x) = -12 - 8x$   
 Ⓓ  $-5\left(\frac{x}{15} - 16\right) - 30 = 50 - \frac{1}{3}x$   
 Ⓔ  $36\left(\frac{3}{4}x - 2\right) + 72 = -72 + 27x$

50. **Performance Task** Benito and Tyler are painting opposite sides of the same fence. Tyler has already painted  $19\frac{1}{2}$  feet of his side of the fence when Benito starts painting.



**Part A** How long will it take for the two sides of the fence to have an equal number of feet painted? How many feet will be painted on Benito's side of the fence when the two sides have an equal number of feet painted?

**Part B** Tyler claims that because he started painting first, he will finish painting his side of the fence before Benito finishes painting his side. Is this true? Explain.

**Part C** The painter who finishes first gets to rest while the other painter finishes. How long will the painter who finishes first get to rest? Explain.