

## Section 3.5 Special Solution Sets

Equations with Special Solution Sets

1. Solve each equation and state the solution set.

$$\begin{array}{r} a. \ 7x+5=7x+5 \\ -7x \quad -7x \end{array}$$

$$5=5$$

all real numbers  $\leftarrow$  webwork  
 $(-\infty, \infty)$   
 $\{x \mid x \text{ is a real number}\}$

$$\begin{array}{r} b. \ 7x+5=7x+8 \\ -7x \quad -7x \end{array}$$

$$5=8$$

no solution  
 $\emptyset$   
 $\{\}$

$$\begin{array}{r} c. \ 7x+5=2x+5 \\ -2x \quad -2x \end{array}$$

$$5x+5=5$$

$$\{0\}$$

$$\frac{5x}{5} = \frac{0}{5} \quad x=0$$

$$d. \ -5-3(3a-1)=-a+15-8a$$

$$\underline{-5} - 9a + \underline{3} = \underline{-a} + 15 - \underline{8a}$$

$$\underline{-2} - 9a = \underline{-9a} + 15$$

$$+9a \quad +9a$$

$$\underline{-2} = 15$$

combine  
like terms

no solution

## Inequalities with Special Solution Sets

2. Solve each inequality and state the solution set.

a.  $3x - 7 < 3x + 9$

$$\begin{array}{r} -3x \quad -3x \\ 3x - 7 < 3x + 9 \end{array}$$

$$-7 < 9$$

all real numbers

$$\begin{array}{r} +7 \quad +7 \\ 3x - 7 < 3x + 9 \end{array}$$

$$3x < 3x + 16$$

$$\begin{array}{r} -3x \quad -3x \\ 3x < 3x + 16 \end{array}$$

$$0 < 16$$

b.  $7x + 10 > 7x + 10$

$$\begin{array}{r} -7x \quad -7x \\ 7x + 10 > 7x + 10 \end{array}$$

$$10 > 10$$

$$\begin{array}{r} -10 \quad -10 \\ 10 > 10 \end{array}$$

$$0 > 0$$

no solution

c.  $2x - 7 \geq 2(x - 5) + 3$

$$2x - 7 \geq 2x - 10 + 3$$

$$2x - 7 \geq 2x - 7 \quad \text{all real numbers}$$

d.  $-2(x + 4) \geq 4x - 6(x + 1)$

$$-2x - 8 \geq 4x - 6x - 6$$

$$-2x - 8 \geq -2x - 6$$

$$\begin{array}{r} +2x \\ -2x - 8 \geq -2x - 6 \end{array}$$

$$\begin{array}{r} +2x \\ -2x - 8 \geq -2x - 6 \end{array}$$

$$-8 \geq -6$$

no solution

3. Emil and Julia are saving money in their accounts. Emil starts with \$100 and saves \$60 per month. Julia starts with \$200 and saves \$60 per month. Define a variable and write an equation to determine when they will have the same amount in savings, and solve the equation.

Let  $x = \# \text{ of months}$

$$100 + 60x = 200 + 60x \quad \text{no solution}$$

$$\quad -60x \quad \quad -60x$$

$$100 = 200$$

### Section 3.4 Ratios and Proportions

4. Solve the following proportions. Check each solution and write the solution set.

18. a.  $\frac{x}{18} = -\frac{10}{6}$  LCD = 18

$$x = -30 \quad \{-30\}$$

Check:

$$\frac{-30}{18} = -\frac{10}{6}$$

$$-\frac{5}{3} = -\frac{5}{3} \checkmark$$

45. b.  $\frac{x-10}{9} = \frac{x-14}{15}$  LCD = 45

$$5(x-10) = 3(x-14)$$

$$5x - 50 = 3x - 42$$

$$\quad -3x \quad \quad -3x$$

$$2x - 50 = -42$$

$$\quad +50 \quad \quad +50$$

$$\frac{2x}{2} = \frac{8}{2} \quad x = 4 \quad \{4\}$$

$$\frac{4-10}{9} = \frac{4-14}{15}$$

$$-\frac{6}{9} = -\frac{10}{15}$$

$$-\frac{2}{3} = -\frac{2}{3} \checkmark$$

12. c.  $\frac{x+3}{4} = \frac{7}{12}$  LCD = 12

$$3(x+3) = 7$$

$$3x + 9 = 7$$

$$\quad -9 \quad -9$$

$$\frac{3x}{3} = -\frac{2}{3}$$

$$x = -\frac{2}{3}$$

$$\left\{-\frac{2}{3}\right\}$$

check:

$$\frac{-\frac{2}{3} + \frac{3 \cdot 3}{1 \cdot 3}}{4} = \frac{7}{12}$$

$$\frac{\frac{-2+9}{3}}{4} = \frac{7}{12}$$

$$\frac{7}{3} \div \frac{4}{1} = \frac{7}{12}$$

$$\frac{7}{3} \cdot \frac{1}{4} = \frac{7}{12}$$

$$\frac{7}{12} = \frac{7}{12} \checkmark$$

18. d.  $\frac{z}{9} = \frac{z-1}{6}$  LCD = 18

$$2z = 3(z-1)$$

$$2z = 3z - 3$$

$$\quad -3z \quad -3z$$

$$-z = -3$$

$$\quad -1 \quad \quad -1$$

$$z = 3$$

check:

$$\frac{3}{9} = \frac{3-1}{6}$$

$$\frac{1}{3} = \frac{2}{6}$$

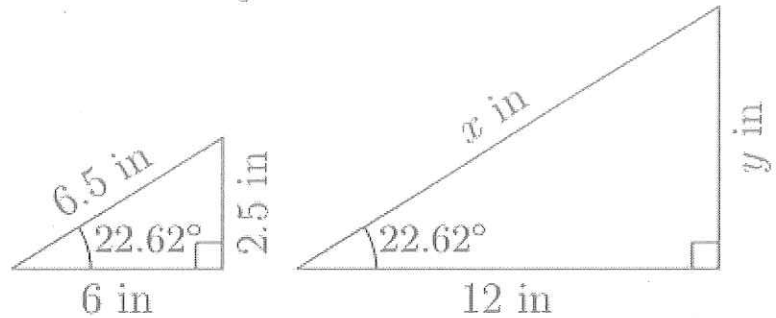
$$\frac{1}{3} = \frac{1}{3} \checkmark$$

5. A car is driving 60 mph. Set up and solve a proportion to find out how long will it take the car to travel 132 miles? Remember to define your variable.

*Same as  
class prep  
good practice  
though*

Similar triangles have the same angles and their sides are proportional.

6. Write and solve proportions for the similar triangles to find  $x$  and  $y$ .



7. An 8-ounce can of soda contains 36 milligrams of caffeine. How much caffeine is contained in a 20-ounce bottle?

*ounces*  $\frac{8}{36} = \frac{20}{x}$   
*mg*

$$\frac{8x}{8} = \frac{36 \cdot 20}{8}$$

$$x = 90$$

*There would be 90mg  
of caffeine in a 20-oz  
bottle*

More Practice

8. The annual property taxes for a house assessed at \$250,000 were \$2,463. Find the property taxes for a house assessed at \$325,000.

$$\begin{array}{l} \text{Value} \\ \text{tax} \end{array} \frac{250,000}{2,463} = \frac{325,000}{x}$$

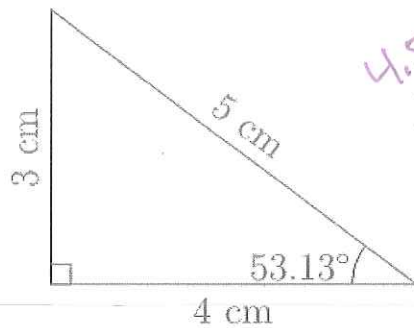
$$\frac{250,000 x}{250,000} = \frac{2463(325,000)}{250,000}$$

$$x = \$3201.90$$

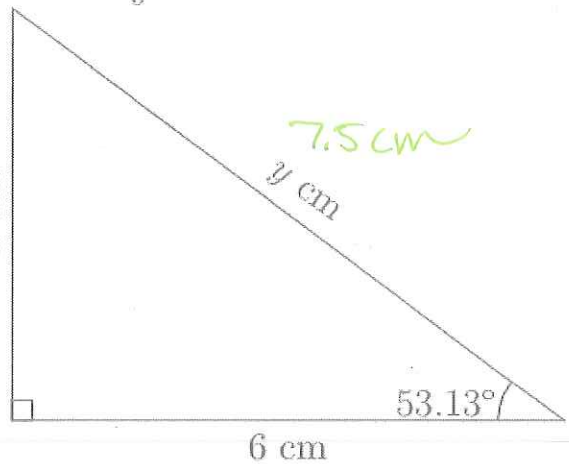
$$\text{or } \frac{800475000}{250000}$$

The taxes would be \$3201.90.

9. Write and solve proportions to find the value of x and y.



4.5 cm



7.5 cm

$$\frac{4}{6} = \frac{3}{x}$$

$$\frac{4x}{4} = \frac{18}{4} = \frac{9}{2}$$

$$x = 4.5 \text{ cm}$$

$$\frac{4}{6} = \frac{5}{y}$$

$$\frac{4y}{4} = \frac{30}{4}$$

$$y = 7.5 \text{ cm}$$

10. Solve each equation below and state the solution set.

a.  $5(t+3) \geq 2(t-3) + 3(t-7)$

$$5t + 15 \geq 2t - 6 + 3t - 21$$

$$5t + 15 \geq 5t - 27$$

$$\begin{array}{r} -5t \\ -5t \end{array}$$

$$15 \geq -27$$

All real numbers

$(-\infty, \infty)$

b.  $5(2y-1) - 5 = 12y - 2(y+3)$

$$10y - 5 - 5 = 12y - 2y - 6$$

$$10y - 10 = 10y - 6$$

$$\begin{array}{r} -10y \\ -10y \end{array}$$

$$-10 = -6$$

no solution

$\emptyset$

$\{\}$