Looking Ahead

Now that you have reviewed solving linear equation of the form $ax+b=cx+d$, you will be able to apply your skills to solving multi-step problems involving multiple equations like the following example.

Example Preview

Express the following equations in slope-intercept form and determine if the two lines are perpendicular.

$$8-(3y+4x)=6(x-y) \quad \text{and} \quad 3y+2=8+10x$$

Solution

$$\begin{aligned} 8-(3y+4x)&=6(x-y) \\ 8-3y-4x&=6x-6y \\ -3y+6y&=6x+4x-8 \\ 3y&=10x-8 \\ y&=\frac{10}{3}x-\frac{8}{3} \end{aligned} \qquad \begin{aligned} 3y+2&=8+10x \\ 3y&=10x+8-2 \\ 3y&=10x+6 \\ y&=\frac{10}{3}x+2 \end{aligned}$$

These two lines have slopes of $\frac{10}{3}$ and $\frac{10}{3}$, respectively. Since both of these lines have the same slope, these two lines are parallel and not perpendicular.

3.R.7 Exercises

Concept Check

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

1. Every linear equation has exactly one solution.

2. If a linear equation simplifies to a statement that is always true, then the original equation is called an identity.

3. If an equation has no solution, it is called an identity.

4. The most general form of a linear equation is $ax + b = cx + d$.

Practice

Solve each equation.

5. $3x + 2 = x - 8$

6. $2(z + 1) = 3z + 3$

7. $x - 0.1x + 0.8 = 0.2x + 0.1$

8. $0.6x - 22.9 = 1.5x - 18.4$

Determine whether each equation is a conditional equation, an identity, or a contradiction.

9. $-2x + 13 = -2(x - 7)$

10. $3x + 9 = -3(x - 3) + 6x$

Applications

Solve.

11. ***Event Planning:*** Caitlyn and Steve are planning their wedding reception and must decide between two catering halls. The first site, A Wedding Space, rents for \$800 for one day and charges \$50 per person for dinner. The second venue, A Wedding Place, costs \$1000 to rent for one day and charges \$40 per person for the same dinner. Solve the equation $800 + 50x = 1000 + 40x$ to determine how many guests they can invite so that the cost they pay will be the same at both wedding catering halls.

12. ***Personal Finance:*** The value of a new car depreciates at a rate of about \$250 per month. Suppose a car originally costs \$30,000. The car was bought with a \$1000 down payment and a loan with 0% financing for 60 months with payments of \$200 a month. Solve the equation $30{,}000 - 250t = 29{,}000 - 200t$ to determine how many months it will take for the value of the vehicle to equal the amount owed on the loan?

Writing & Thinking

13. Answer each question.

a. Simplify the expression $3(x+5)+2(x-7)$.

b. Solve the equation $3(x+5)+2(x-7)=31$.

c. How are the methods you used to answer questions **a.** and **b.** similar? How are they different?