1.2 Solving Multi-Step Equations

Do Now: Solve the following:

1) $\frac{-x}{7} = 56$ 2) $\frac{30}{x} = 5$ 3) $\frac{1}{3} - x = \frac{4}{9}$

Example 1: Solving a Two-Step Equation
Solve:

$$2.5x - 13 = 2$$

Example 2: Combining Like Terms to Solve an Equation
Solve:

$$-12 = 9x - 6x + 15$$

Try on your own!
Solve the equation. Check your solutions!

1. $-2n + 3 = 9$ **2.** $-21 = \frac{1}{2}c - 11$ **3.** $-2x - 10x + 12 = 18$

Example 3: Using Structure to Solve a Multi-Step Equation
Solve:

$$2(1 - x) + 3 = -8$$

Try on your own:
Solve the equation.

4. $3(x + 1) + 6 = -9$

5. $15 = 5 + 4(2d - 3)$

6. $13 = -2(y - 4) + 3y$

7. $2x(5 - 3) - 3x = 5$

8. $-4(2m + 5) - 3m = 35$

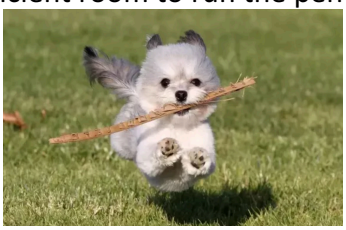
9. $5(3 - x) + 2(3 - x) = 14$

Example 4: Modeling with Mathematics
Use the table to find the number of miles x you need to bike on Friday so that the mean number of miles biked per day is 5.

Day	Miles
Monday	3.5
Tuesday	5.5
Wednesday	0
Thursday	5
Friday	x

Example 5: Solving a Real-Life Problem
ATHS drama club charges $4 per person for admission for their play. The club borrowed $400 to pay for costumes and props. After paying back the load, the club has a profit of $100. How many people attended the play?

Critical Thinking!
You have 96ft of fencing to enclose a rectangular pen for your dog. To provide sufficient room to run the pen should be three times as long as it is wide. Find the dimensions of the pen.



Homework:
3-13odd, 16, 17-23odd, 26, 27*, 29-33odd, 35, 36, 43*, 46*

1.2 Exercises

Dynamic Solutions available at *BigIdeasMath.com*

Vocabulary and Core Concept Check

1. **COMPLETE THE SENTENCE** To solve the equation $2x + 3x = 20$, first combine $2x$ and $3x$ because they are _____.

2. **WRITING** Describe two ways to solve the equation $2(4x - 11) = 10$.

Monitoring Progress and Modeling with Mathematics

In Exercises 3–14, solve the equation. Check your solution. *(See Examples 1 and 2.)*

3. $3w + 7 = 19$

4. $2g - 13 = 3$

5. $11 = 12 - q$

6. $10 = 7 - m$

7. $5 = \frac{z}{-4} - 3$

8. $\frac{a}{3} + 4 = 6$

9. $\frac{h + 6}{5} = 2$

10. $\frac{d - 8}{-2} = 12$

11. $8y + 3y = 44$

12. $36 = 13n - 4n$

13. $12v + 10v + 14 = 80$

14. $6c - 8 - 2c = -16$

15. **MODELING WITH MATHEMATICS** The altitude a (in feet) of a plane t minutes after liftoff is given by $a = 3400t + 600$. How many minutes after liftoff is the plane at an altitude of 21,000 feet?

16. **MODELING WITH MATHEMATICS** A repair bill for your car is \$553. The parts cost \$265. The labor cost is \$48 per hour. Write and solve an equation to find the number of hours of labor spent repairing the car.

In Exercises 17–24, solve the equation. Check your solution. *(See Example 3.)*

17. $4(z + 5) = 32$

18. $-2(4g - 3) = 30$

19. $6 + 5(m + 1) = 26$

20. $5h + 2(11 - h) = -5$

21. $27 = 3c - 3(6 - 2c)$

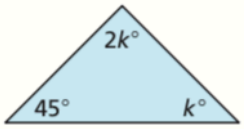
22. $-3 = 12y - 5(2y - 7)$

23. $-3(3 + x) + 4(x - 6) = -4$

24. $5(r + 9) - 2(1 - r) = 1$

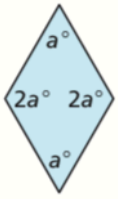
USING TOOLS In Exercises 25–28, find the value of the variable. Then find the angle measures of the polygon. Use a protractor to check the reasonableness of your answer.

25.



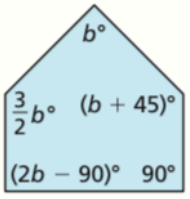
Sum of angle measures: 180°

26.



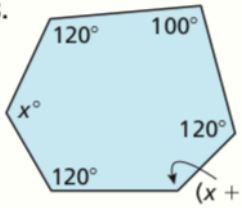
Sum of angle measures: 360°

27.



Sum of angle measures: 540°

28.



Sum of angle measures: 720°

In Exercises 29–34, write and solve an equation to find the number.

29. The sum of twice a number and 13 is 75.

30. The difference of three times a number and 4 is −19.

31. Eight plus the quotient of a number and 3 is −2.

32. The sum of twice a number and half the number is 10.

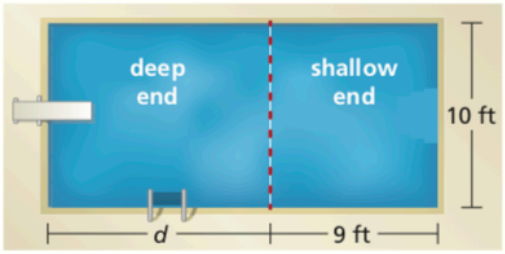
33. Six times the sum of a number and 15 is −42.

34. Four times the difference of a number and 7 is 12.

USING EQUATIONS **In Exercises 35–37, write and solve an equation to answer the question. Check that the units on each side of the equation balance.** *(See Examples 4 and 5.)*

35. During the summer, you work 30 hours per week at a gas station and earn \$8.75 per hour. You also work as a landscaper for \$11 per hour and can work as many hours as you want. You want to earn a total of \$400 per week. How many hours must you work as a landscaper?

36. The area of the surface of the swimming pool is 210 square feet. What is the length d of the deep end (in feet)?



37. You order two tacos and a salad. The salad costs \$2.50. You pay 8% sales tax and leave a \$3 tip. You pay a total of \$13.80. How much does one taco cost?

JUSTIFYING STEPS **In Exercises 38 and 39, justify each step of the solution.**

38.

$-\frac{1}{2}(5x - 8) - 1 = 6$ — Write the equation.

$-\frac{1}{2}(5x - 8) = 7$ — _____

$5x - 8 = -14$ — _____

$5x = -6$ — _____

$x = -\frac{6}{5}$ — _____

39.

$2(x + 3) + x = -9$ — Write the equation.

$2(x) + 2(3) + x = -9$ — _____

$2x + 6 + x = -9$ — _____

$3x + 6 = -9$ — _____

$3x = -15$ — _____

$x = -5$ — _____

ERROR ANALYSIS **In Exercises 40 and 41, describe and correct the error in solving the equation.**

40.

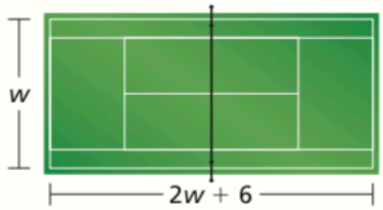
$$-2(7 - y) + 4 = -4$$
$$-14 - 2y + 4 = -4$$
$$-10 - 2y = -4$$
$$-2y = 6$$
$$y = -3$$

41.

$$\frac{1}{4}(x - 2) + 4 = 12$$
$$\frac{1}{4}(x - 2) = 8$$
$$x - 2 = 2$$
$$x = 4$$

MATHEMATICAL CONNECTIONS **In Exercises 42–44, write and solve an equation to answer the question.**

42. The perimeter of the tennis court is 228 feet. What are the dimensions of the court?



43. The perimeter of the Norwegian flag is 190 inches. What are the dimensions of the flag?

44. The perimeter of the school crossing sign is 102 inches. What is the length of each side?

45. COMPARING METHODS Solve the equation $2(4 - 8x) + 6 = -1$ using (a) Method 1 from Example 3 and (b) Method 2 from Example 3. Which method do you prefer? Explain.

46. PROBLEM SOLVING An online ticket agency charges the amounts shown for basketball tickets. The total cost for an order is \$220.70. How many tickets are purchased?

Charge	Amount
Ticket price	\$32.50 per ticket
Convenience charge	\$3.30 per ticket
Processing charge	\$5.90 per order

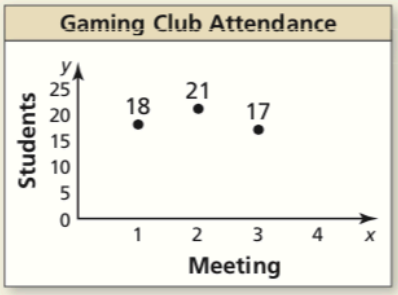
47. MAKING AN ARGUMENT You have quarters and dimes that total \$2.80. Your friend says it is possible that the number of quarters is 8 more than the number of dimes. Is your friend correct? Explain.

48. THOUGHT PROVOKING You teach a math class and assign a weight to each component of the class. You determine final grades by totaling the products of the weights and the component scores. Choose values for the remaining weights and find the necessary score on the final exam for a student to earn an A (90%) in the class, if possible. Explain your reasoning.

Component	Student's score	Weight	Score × Weight
Class Participation	92%	0.20	92% × 0.20 = 18.4%
Homework	95%		
Midterm Exam	88%		
Final Exam			
Total		1	

49. REASONING An even integer can be represented by the expression $2n$, where n is any integer. Find three consecutive even integers that have a sum of 54. Explain your reasoning.

50. HOW DO YOU SEE IT? The scatter plot shows the attendance for each meeting of a gaming club.



a. The mean attendance for the first four meetings is 20. Is the number of students who attended the fourth meeting greater than or less than 20? Explain.

b. Estimate the number of students who attended the fourth meeting.

c. Describe a way you can check your estimate in part (b).

REASONING In Exercises 51–56, the letters a, b, and c represent nonzero constants. Solve the equation for x.

51. $bx = -7$

52. $x + a = \frac{3}{4}$

53. $ax - b = 12.5$

54. $ax + b = c$

55. $2bx - bx = -8$

56. $cx - 4b = 5b$

Maintaining Mathematical Proficiency

Reviewing what you learned in previous grades and lessons

Simplify the expression. *(Skills Review Handbook)*

57. $4m + 5 - 3m$

58. $9 - 8b + 6b$

59. $6t + 3(1 - 2t) - 5$

Determine whether (a) $x = -1$ or (b) $x = 2$ is a solution of the equation. *(Skills Review Handbook)*

60. $x - 8 = -9$

61. $x + 1.5 = 3.5$

62. $2x - 1 = 3$

63. $3x + 4 = 1$

64. $x + 4 = 3x$

65. $-2(x - 1) = 1 - 3x$