Algebra Test 1 Extra Practice Problems

Writing Equations

Translate each sentence into an equation.

1. Fifty-three plus four times c is as much as 21.
2. The sum of five times h and twice g is equal to 23.
3. One fourth the sum of r and ten is identical to r minus 4.
4. Three plus the sum of the squares of w and x is 32.

14. **GEOGRAPHY** About 15% of all federally-owned land in the 48 contiguous states of the United States is in Nevada. If F represents the area of federally-owned land in these states, and N represents the portion in Nevada, write an equation for this situation.

FITNESS For Exercises 15–17, use the following information.

Deanna and Pietra each go for walks around a lake a few times per week. Last week, Deanna walked 7 miles more than Pietra.

15. If p represents the number of miles Pietra walked, write an equation that represents the total number of miles T the two girls walked.
16. If Pietra walked 9 miles during the week, how many miles did Deanna walk?
17. If Pietra walked 11 miles during the week, how many miles did the two girls walk together?

Solving Equations by Using Addition and Subtraction

Solve Using Addition If the same number is added to each side of an equation, the resulting equation is equivalent to the original one. In general if the original equation involves subtraction, this property will help you solve the equation.

Addition Property of Equality	For any numbers a, b, and c, if $a = b$, then $a + c = b + c$.

Example 1 **Solve $m - 32 = 18$.**

$m - 32 = 18$	Original equation
$m - 32 + 32 = 18 + 32$	Add 32 to each side.
$m = 50$	Simplify.

The solution is 50.

Example 2 **Solve $-18 = p - 12$.**

$-18 = p - 12$	Original equation
$-18 + 12 = p - 12 + 12$	Add 12 to each side.
$p = -6$	Simplify.

The solution is -6.

Exercises

Solve each equation. Then check your solution.

1. $h - 3 = -2$
2. $m - 8 = -12$
3. $p - 5 = 15$
4. $20 = y - 8$
5. $k - 0.5 = 2.3$
6. $w - \frac{1}{2} = \frac{5}{8}$
7. $h - 18 = -17$
8. $-12 = -24 + k$
9. $j - 0.2 = 1.8$
10. $b - 40 = -40$
11. $m - (-12) = 10$
12. $w - \frac{3}{2} = \frac{1}{4}$

Lesson 3-2

Write an equation for each problem. Then solve the equation and check the solution.

13. Twelve subtracted from a number equals 25. Find the number.

14. What number decreased by 52 equals -12?

15. Fifty subtracted from a number equals eighty. Find the number.

16. What number minus one-half is equal to negative one-half?

17. The difference of a number and eight is equal to 14. What is the number?

18. A number decreased by fourteen is equal to eighteen. What is the number?

HISTORY For Exercises 28 and 29, use the following information.

Galileo Galilei was born in 1564. Many years later, in 1642, Sir Isaac Newton was born.

28. Write an addition equation to represent the situation.

29. How many years after Galileo was born was Isaac Newton born?

HURRICANES For Exercises 30 and 31, use the following information.

The day after a hurricane, the barometric pressure in a coastal town has risen to 29.7 inches of mercury, which is 2.9 inches of mercury higher than the pressure when the eye of the hurricane passed over.

30. Write an addition equation to represent the situation.

31. What was the barometric pressure when the eye passed over?

Solving Equations by Using Multiplication and Division

Solve Using Multiplication If each side of an equation is multiplied by the same number, the resulting equation is equivalent to the given one. You can use the property to solve equations involving multiplication and division.

Multiplication Property of Equality	For any numbers a, b, and c, if $a = b$, then $ac = bc$.

Example 1 **Solve $3\frac{1}{2}p = 1\frac{1}{2}$.**

$3\frac{1}{2}p = 1\frac{1}{2}$	Original equation
$\frac{7}{2}p = \frac{3}{2}$	Rewrite each mixed number as an improper fraction.
$\frac{2}{7}\left(\frac{7}{2}p\right) = \frac{2}{7}\left(\frac{3}{2}\right)$	Multiply each side by $\frac{2}{7}$.
$p = \frac{3}{7}$	Simplify.

The solution is $\frac{3}{7}$.

Example 2 **Solve $-\frac{1}{4}n = 16$.**

$-\frac{1}{4}n = 16$	Original equation
$-4\left(-\frac{1}{4}n\right) = -4(16)$	Multiply each side by -4.
$n = -64$	Simplify.

The solution is -64.

Solve each equation. Then check your solution.

1. $\frac{h}{3} = -2$
2. $\frac{1}{8}m = 6$
3. $\frac{1}{5}p = \frac{3}{5}$
4. $5 = \frac{y}{12}$
5. $-\frac{1}{4}k = -2.5$
6. $-\frac{m}{8} = \frac{5}{8}$
7. $-1\frac{1}{2}h = 4$
8. $-12 = -\frac{3}{2}k$
9. $\frac{j}{3} = \frac{2}{5}$
10. $-3\frac{1}{3}b = 5$
11. $\frac{7}{10}m = 10$
12. $\frac{p}{5} = -\frac{1}{4}$

Write an equation for each problem. Then solve the equation.

13. One-fifth of a number equals 25. Find the number.

14. What number divided by 2 equals -18?

15. A number divided by eight equals 3. Find the number.

16. One and a half times a number equals 6. Find the number.

27. **PUBLISHING** Two units of measure used in publishing are the *pica* and the *point*. A pica is one sixth of an inch. There are 12 points in a pica, so Points = 12 · Picas. How many picas are equivalent to 108 points?

ROLLER COASTERS For Exercises 28 and 29, use the following information.

Superman the Escape in California is the fastest roller coaster in the world. Riders fall 415 feet in 7 seconds. Speeds reach a maximum of 100 miles per hour.

28. If x represents the average rate of fall of the roller coaster, write an expression to represent the situation (*Hint:* Use the distance formula $d = rt$.)

29. What is the average rate that riders fall in feet per second?

Work Backward

Working backward is one of many problem-solving strategies that you can use to solve problems. To work backward, start with the result given at the end of a problem and undo each step to arrive at the beginning number.

Example 1 **A number is divided by 2, and then 8 is subtracted from the quotient. The result is 16. What is the number?**

Solve the problem by working backward.

The final number is 16. Undo subtracting 8 by adding 8 to get 24. To undo dividing 24 by 2, multiply 24 by 2 to get 48.

The original number is 48.

Example 2 **A bacteria culture doubles each half hour. After 3 hours, there are 6400 bacteria. How many bacteria were there to begin with?**

Solve the problem by working backward.

The bacteria have grown for 3 hours. Since there are 2 one-half hour periods in one hour, in 3 hours there are 6 one-half hour periods. Since the bacteria culture has grown for 6 time periods, it has doubled 6 times. Undo the doubling by halving the number of bacteria 6 times.

$$6{,}400 \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = 6{,}400 \times \frac{1}{64}$$

$$= 100$$

There were 100 bacteria to begin with.

Exercises

Solve each problem by working backward.

1. A number is divided by 3, and then 4 is added to the quotient. The result is 8. Find the number.

2. A number is multiplied by 5, and then 3 is subtracted from the product. The result is 12. Find the number.

3. Eight is subtracted from a number, and then the difference is multiplied by 2. The result is 24. Find the number.

4. Three times a number plus 3 is 24. Find the number.

5. **CAR RENTAL** Angela rented a car for \$29.99 a day plus a one-time insurance cost of \$5.00. Her bill was \$124.96. For how many days did she rent the car?

6. **MONEY** Mike withdrew an amount of money from his bank account. He spent one fourth for gasoline and had \$90 left. How much money did he withdraw?

7. **TELEVISIONS** In 1999, 68% of households with TV's subscribed to cable TV. If 8,000 more subscribers are added to the number of households with cable, the total number of households with cable TV would be 67,600,000. How many households were there with TV in 1999? **Source:** *World Almanac*

Solve Multi-Step Equations

To solve equations with more than one operation, often called **multi-step equations**, undo operations by working backward. Reverse the usual order of operations as you work.

Example **Solve $5x + 3 = 23$.**

$5x + 3 = 23$	Original equation.
$5x + 3 - 3 = 23 - 3$	Subtract 3 from each side.
$5x = 20$	Simplify.
$\frac{5x}{5} = \frac{20}{5}$	Divide each side by 5.
$x = 4$	Simplify.

Exercises

Solve each equation. Then check your solution.

1. $5x + 2 = 27$
2. $6x + 9 = 27$
3. $5x + 16 = 51$
4. $14n - 8 = 34$
5. $0.6x - 1.5 = 1.8$
6. $\frac{7}{8}p - 4 = 10$
7. $16 = \frac{d - 12}{14}$
8. $8 + \frac{3n}{12} = 13$
9. $\frac{g}{-5} + 3 = -13$
10. $\frac{4b + 8}{-2} = 10$
11. $0.2x - 8 = -2$
12. $3.2y - 1.8 = 3$
13. $-4 = \frac{7x - (-1)}{-8}$
14. $8 = -12 + \frac{k}{-4}$
15. $0 = 10y - 40$

Write an equation and solve each problem.

16. Find three consecutive integers whose sum is 96.

17. Find two consecutive odd integers whose sum is 176.

18. Find three consecutive integers whose sum is −93.

Solving Equations with the Variable on Each Side

Variables on Each Side To solve an equation with the same variable on each side, first use the Addition or the Subtraction Property of Equality to write an equivalent equation that has the variable on just one side of the equation. Then solve the equation.

Example 1 **Solve $5y - 8 = 3y + 12$.**

$$\begin{aligned} 5y - 8 &= 3y + 12 \\ 5y - 8 - 3y &= 3y + 12 - 3y \\ 2y - 8 &= 12 \\ 2y - 8 + 8 &= 12 + 8 \\ 2y &= 20 \\ \frac{2y}{2} &= \frac{20}{2} \\ y &= 10 \end{aligned}$$

The solution is 10.

Example 2 **Solve $-11 - 3y = 8y + 1$.**

$$\begin{aligned} -11 - 3y &= 8y + 1 \\ -11 - 3y + 3y &= 8y + 1 + 3y \\ -11 &= 11y + 1 \\ -11 - 1 &= 11y + 1 - 1 \\ -12 &= 11y \\ \frac{-12}{11} &= \frac{11y}{11} \\ -1\frac{1}{11} &= y \end{aligned}$$

The solution is $-1\frac{1}{11}$.

Exercises

Solve each equation. Then check your solution.

1. $6 - b = 5b + 30$

2. $5y - 2y = 3y + 2$

3. $5x + 2 = 2x - 10$

4. $4n - 8 = 3n + 2$

5. $1.2x + 4.3 = 2.1 - x$

6. $4.4s + 6.2 = 8.8s - 1.8$

7. $\frac{1}{2}b + 4 = \frac{1}{8}b + 88$

8. $\frac{3}{4}k - 5 = \frac{1}{4}k - 1$

9. $8 - 5p = 4p - 1$

10. $4b - 8 = 10 - 2b$

11. $0.2x - 8 = -2 - x$

12. $3y - 1.8 = 3y - 1.8$

13. $-4 - 3x = 7x - 6$

14. $8 + 4k = -10 + k$

15. $20 - a = 10a - 2$

16. $\frac{2}{3}n + 8 = \frac{1}{2}n + 2$

17. $\frac{2}{5}y - 8 = 9 - \frac{3}{5}y$

18. $-4r + 5 = 5 - 4r$

19. $-4 - 3x = 6x - 6$

20. $18 - 4k = -10 - 4k$

21. $12 + 2y = 10y - 12$

23. Two thirds of a number reduced by 11 is equal to 4 more than the number. Find the number.

24. Five times the sum of a number and 3 is the same as 3 multiplied by 1 less than twice the number. What is the number?

25. NUMBER THEORY Tripling the greater of two consecutive even integers gives the same result as subtracting 10 from the lesser even integer. What are the integers?

26. GEOMETRY The formula for the perimeter of a rectangle is $P = 2\ell + 2w$, where ℓ is the length and w is the width. A rectangle has a perimeter of 24 inches. Find its dimensions if its length is 3 inches greater than its width.

Natural Numbers	{1, 2, 3, 4, ...}
Whole Numbers	{0, 1, 2, 3, 4, ...}
Integers	{..., −3, −2, −1, 0, 1, 2, 3, ...}
Rational Numbers	{all numbers that can be expressed in the form $\frac{a}{b}$, where a and b are integers and $b \neq 0$}
Irrational Numbers	{all numbers that cannot be expressed in the form $\frac{a}{b}$, where a and b are integers and $b \neq 0$}

Example **Name the set or sets of numbers to which each real number belongs.**

a. $\frac{4}{11}$ Because 4 and 11 are integers, this number is a rational number.

b. $\sqrt{81}$ Because $\sqrt{81} = 9$, this number is a natural number, a whole number, an integer, and a rational number.

c. $\sqrt{32}$ Because $\sqrt{32} = 5.656854249...$, which is not a repeating or terminating decimal, this number is irrational.

Exercises

Name the set or sets of numbers to which each real number belongs.

1. $\frac{84}{12}$ **2.** $-\frac{6}{7}$ **3.** $\frac{2}{3}$ **4.** $\sqrt{54}$

5. 3.145 **6.** $\sqrt{25}$ **7.** 0.62626262... **8.** $\sqrt{22.51}$

for Exs. 22–34

EVALUATING EXPRESSIONS **Evaluate the expression. Show and justify each step.** In other words write proofs!

23. $45 - (-68) - 44$ **24.** $-57 - 38 - (-57)$ **25.** $(-26 + 33) + (-4)$

26. $(0.5)(45 \cdot 2)$ **27.** $\left(\frac{2}{7} + 5\right) + \frac{5}{7}$ **28.** $\left(\frac{2}{3} \cdot 7\right) \cdot 21$

29. $12 \cdot (7 \cdot 1 \cdot 5)$ **30.** $-2 \cdot (19 \cdot 15) \cdot 1$ **31.** $36 + 57 + (-36)$

32. $17 + 0 + (-19)$ **33.** $24 + (-12 - 8) + 6$ **34.** $5(7 \cdot 4)(0.25)$