

One step Equations - Addition and Subtraction - when the parentheses have been removed and the like terms on each side of the equation have been combined, this general rule can be used in all simple equations: Move the known values (the numbers) to one side of the equation and move the unknown values (the variables) to the other side by using the opposite operation. (Addition and subtraction are opposites; multiplication and division are opposites.)

Examples

$$\begin{array}{r} \text{a. } x + 23 = 10 \\ - 23 = -23 \\ \hline x = -13 \end{array}$$

$$\begin{array}{r} \text{b. } x - 15 = -12 \\ + 15 = +15 \\ \hline x = +3 \end{array}$$

Solve:

1. $x + 11 = 19$

10. $x - 97 = 3$

19. $x - 3 = -11$

28. $x - 5 = 14$

2. $x + 18 = 16$

11. $x + 20 = 18$

20. $x - 16 = 5$

29. $x + 23 = 41$

3. $x + 15 = 29$

12. $x + 19 = -35$

21. $x - 12 = 18$

30. $x - 22 = 11$

4. $x + 3 = -14$

13. $x + 6 = 20$

22. $x - 9 = -5$

31. $x + 32 = 45$

5. $x + 9 = -31$

14. $x - 9 = 16$

23. $x - 31 = 16$

32. $x - 17 = -30$

6. $x + 25 = -40$

15. $x - 12 = 7$

24. $x - 7 = 29$

33. $x - 14 = -6$

7. $x + 29 = 37$

16. $x - 13 = -5$

25. $x - 22 = -30$

34. $x + 20 = -29$

8. $x + 47 = -20$

17. $x - 20 = -11$

26. $x - 2 = -7$

35. $x - 1 = 21$

9. $x + 24 = 9$

18. $x - 15 = 21$

27. $x + 13 = -18$

36. $x + 50 = 32$

One Step Equations - Multiplication - if the equation contains multiplication, ($5a = 30$), move the known value (5) to the other side of the equation by dividing both sides by the number being moved. (5)

Examples:

a. $6x = 30$
 $\frac{6x}{6} = \frac{30}{6}$
 $x = 5$

b. $8x = 20$
 $\frac{8x}{8} = \frac{20}{8}$
 $x = 2\frac{1}{2}$

c. $-4x = 28$
 $\frac{-4x}{-4} = \frac{28}{-4}$
 $x = -7$

d. $-7x = 3$
 $\frac{-7x}{-7} = \frac{3}{-7}$
 $x = -\frac{3}{7}$

Solve:

1. $5x = 50$

9. $9x = -36$

17. $8x = 12$

25. $7x = 31$

33. $-4x = -24$

2. $2x = 16$

10. $5x = -45$

18. $4x = 18$

26. $3x = 25$

34. $-12x = 26$

3. $3x = 27$

11. $3x = 99$

19. $10x = 25$

27. $-7x = 14$

35. $-5x = 70$

4. $4x = 24$

12. $10x = -70$

20. $6x = 39$

28. $-4x = 32$

36. $-7x = -35$

5. $7x = 35$

13. $12x = -48$

21. $11x = 16$

29. $-5x = -15$

37. $-11x = 33$

6. $8x = 40$

14. $6x = -36$

22. $9x = 30$

30. $-10x = 35$

38. $6x = 5$

7. $6x = 18$

15. $3x = -33$

23. $5x = 19$

31. $-8x = -48$

39. $5x = 2$

8. $4x = -20$

16. $2x = -10$

24. $2x = 13$

32. $-6x = 60$

40. $8x = 3$

One Step Equations - Division - if there is division in the problem, ($\frac{x}{5}$ is division), move the known value (5) to the other side of the equation by multiplying both sides of the equation by that known value (5). If the division problem contains two integers (a fraction, $\frac{3x}{5}$), multiply both sides by the denominator, then divide by the numerator

Examples

a. $\frac{x}{3} = 7$
 $3(\frac{x}{3}) = (7)3$
 $x = 21$

b. $\frac{x}{7} = -4$
 $7(\frac{x}{7}) = (-4)7$
 $x = -28$

c. $\frac{3x}{4} = 15$
 $4(\frac{3x}{4}) = (15)4$
 $\frac{3x}{3} = \frac{60}{3} \rightarrow x = 20$

d. $\frac{2x}{3} = -6$
 $-3(\frac{2x}{3}) = (-6)(-3)$
 $\frac{2x}{2} = \frac{18}{2} \rightarrow x = 9$

Solve:

1. $\frac{x}{2} = 7$

7. $\frac{x}{5} = -7$

13. $\frac{5x}{2} = 20$

19. $\frac{x}{5} = -4$

25. $\frac{x}{9} = -3$

2. $\frac{x}{5} = 3$

8. $\frac{x}{11} = -4$

14. $\frac{4x}{3} = 12$

20. $\frac{x}{10} = 6$

26. $\frac{x}{7} = 4$

3. $\frac{x}{6} = 9$

9. $\frac{x}{9} = -2$

15. $\frac{4x}{7} = 20$

21. $\frac{3x}{4} = 33$

27. $\frac{6x}{7} = 24$

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

10. $\frac{2x}{5} = 6$

16. $\frac{2x}{7} = -12$

22. $\frac{2x}{7} = -18$

28. $\frac{5x}{2} = -30$

5. $\frac{x}{8} = -3$

11. $\frac{3x}{4} = 9$

17. $\frac{5x}{4} = -25$

23. $\frac{x}{10} = -5$

29. $\frac{x}{5} = -6$

6. $\frac{x}{6} = -9$

12. $\frac{5x}{6} = 15$

18. $\frac{6x}{5} = -18$

24. $\frac{4x}{5} = -16$

30. $\frac{7x}{10} = -28$

Two Step Equations - these problems have two numbers that must be moved to the other side of the equation, making two separate steps necessary. Start with addition/subtraction before multiplication/division.

Examples

$$\begin{aligned} \text{a. } 3x - 5 &= 16 \\ 3x - 5 + 5 &= 16 + 5 \\ 3x &= 21 \\ \frac{3x}{3} &= \frac{21}{3} \\ x &= 7 \end{aligned}$$

$$\begin{aligned} \text{b. } \frac{x}{4} - 6 &= 3 \\ \frac{x}{4} - 6 + 6 &= 3 + 6 \\ \frac{x}{4} &= 9 \\ 4\left(\frac{x}{4}\right) &= (9)4 \\ x &= 36 \end{aligned}$$

Solve:

1. $2x + 3 = 11$

8. $8x + 27 = 67$

15. $\frac{x}{7} - 6 = -8$

22. $\frac{6x}{5} + 5 = 23$

2. $2x - 8 = 6$

9. $\frac{x}{5} + 3 = 8$

16. $\frac{x}{2} + 10 = 14$

23. $\frac{4x}{7} + 7 = +3$

3. $3x + 8 = 17$

10. $\frac{x}{3} + 4 = -2$

17. $\frac{2x}{5} + 9 = -1$

24. $\frac{5x}{6} - 3 = -28$

4. $4x - 10 = 18$

11. $\frac{x}{8} - 7 = 3$

18. $\frac{4x}{3} - 2 = 10$

25. $4x + 16 = 36$

5. $5x + 15 = 40$

12. $\frac{x}{10} - 6 = -10$

19. $\frac{2x}{7} - 8 = -4$

26. $\frac{x}{4} - 6 = -10$

6. $6x - 5 = 55$

13. $\frac{x}{6} + 9 = 6$

20. $\frac{5x}{3} + 4 = 24$

27. $10x - 4 = -24$

7. $4x + 32 = 48$

14. $\frac{x}{4} - 5 = 1$

21. $\frac{4x}{7} - 6 = 10$

28. $8x - 7 = 33$

4.1 Solve Simple Equations

Part 1

Principles of Mathematics 9, pages 186-195

A

1. Solve

- a) $x + 4 = 7$
- b) $y - 3 = 5$
- c) $4m = 12$
- d) $\frac{c}{3} = 2$

2. Solve

- a) $x + 2 = 6$
- b) $y - 2 = 4$
- c) $3a = 15$
- d) $\frac{b}{4} = 5$

3. Solve

- a) $x + 5 = 8$
- b) $g - 5 = -3$
- c) $2 + h = 9$
- d) $-3 + c = -5$

4. Solve using opposite operations.

- a) $d + 5 = -2$
- b) $k - 4 = -1$
- c) $5u = -20$
- d) $\frac{w}{5} = -2$

B

Solve

5. Find the root of each equation using paper and pencil. Apply opposite operations. Check each root.

- a) $5x + 3 = 13$
- b) $7w - 3 = 11$
- c) $-2p + 3 = -5$
- d) $-4h - 5 = -1$

Solve

6. Use a Computer Algebra System (CAS) to solve. Apply opposite operations. Check each solution.

- a) $q + 3 = 5$
- b) $a - 6 = 7$
- c) $3m + 5 = 11$
- d) $-4b + 3 = -1$

7. Solve using the method of your choice. Check your answers.

- a) $a + 8 = -2$
- b) $c - 4 = 3$
- c) $-6d = -30$
- d) $\frac{h}{5} = -3$

8. Solve using the method of your choice. Check your answers.

- a) $5r + 7 = 42$
- b) $-3v + 5 = 8$
- c) $8 + 7g = 15$
- d) $-2j - 8 = 0$

Solve Simple Equations Part 2

4

9. At a computer store, packages of DVDs sell for \$15 each. One customer buys \$120 worth of DVDs.

a) Write an equation to model the number of packages of DVDs the customer bought.

b) Solve the equation.

10. Solve each equation. Express fraction answers in lowest terms. Check each solution.

a) $3h + 4 = 6$

b) $5k - 3 = -2$

c) $-7w + 2 = -3$

11. Solve each equation. Express fraction answers in lowest terms. Check each solution.

a) $-4d - 3 = -1$

b) $3r + \frac{2}{5} = -4$

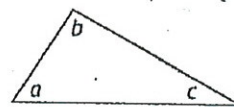
c) $5t - 4 = \frac{2}{3}$

12. Copy the following solution. Write a short explanation beside each step. The first step has been done for you.

Step	Explanation
$5x - 4 = 6$	
$5x - 4 + 4 = 6 + 4$	Add 4 to both sides.
$5x = 10$	
$\frac{5x}{5} = \frac{10}{5}$	
$x = 2$	

C

13. The equation $a + b + c = 180^\circ$ describes the sum of the angles in a triangle.



a) Use this formula to find the values of a , b , and c when $b = 2a$ and $c = 3a$.

b) Use this formula to find the values of a , b , and c when $b = 3a$ and $c = 5a$.

14. The publicity committee of the organizing committee of a mathematics conference has \$2000 to buy T-shirts for the student volunteers. Reflexx Services, a T-shirt supplier, charges \$15 per T-shirt plus a \$250 logo design fee.

a) Write an equation that models the number of T-shirts the publicity committee can afford.

b) Solve the equation. Write a conclusion to the problem.

15. Margaret is buying a new boat. The fuel tank of the boat has a mass of 2000 g. Each litre of gasoline has a mass of 840 g. The total mass of the gasoline plus the tank cannot exceed 10 400 g.

a) Write an equation that models the number of litres of gasoline that the tank may hold.

b) Solve the equation to determine the number of litres of gasoline in a full tank.