

# EQUATIONS SKETCH

Name \_\_\_\_\_

Variables and Equations

## Solving Equations with Variables on Both Sides

$$\begin{aligned}6x - 7 &= x + 23 \\6x - x - 7 &= x - x + 23 \\5x - 7 &= 23 \\5x &= 30 \\x &= 6\end{aligned}$$

Solve each equation for the given variable.

1.  $2x - 7 = 3x + 4$

11.  $9a + 5 = 3a - 1$

2.  $-7c + 9 = c + 1$

12.  $6(x - 9) = 4(x - 5)$

3.  $4(2y - 4) = 5y + 2$

13.  $2(x - 4) + 8 = 3x - 8$

4.  $-6 - 2n = 3n - (6 + 5)$

14.  $3x - 3 = -3x + -3$

5.  $4(t + 5) - 3 = 6t - 13$

15.  $-10x + 6 = -7x + -9$

6.  $2(r - 4) = 5(r + -7)$

16.  $5 + 3x = 7(x + 3)$

7.  $7 - 6a = 6 - 7a$

17.  $\frac{5}{2}x + 3 = \frac{1}{2}x + 15$

8.  $12m - 9 = 4m + 15$

18.  $2x + 6 = 5x - 9$

9.  $8(x - 3) + 8 = 5x - 22$

19.  $4e - 19 = -3(e + 4)$

10.  $3c - 12 = 14 + 5c$

20.  $5t + 7 = 4t - 9$

## Solving Fractional Equations

$$\frac{3}{6} + \frac{8x}{12} = \frac{5}{2} \longrightarrow \text{Multiply both sides of equation by LCD to eliminate all denominators.}$$

$$\rightarrow 12\left(\frac{3}{6} + \frac{8x}{12}\right) = 12\left(\frac{5}{2}\right) \longrightarrow \frac{36}{6} + \frac{96x}{12} = \frac{60}{2}$$

$$\rightarrow 6 + 8x = 30 \longrightarrow 6 - 6 + 8x = 30 - 6 \longrightarrow 8x = 24 \longrightarrow x = 3$$

Solve.

1.  $\frac{x}{2} + \frac{5}{6} = \frac{x}{3}$

8.  $\frac{3}{4} = \frac{x+2}{x-8}$

2.  ~~$\frac{6}{x} - \frac{2}{8} = \frac{x}{8}$~~

9.  $\frac{x-2}{x+6} = \frac{1}{9}$

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

10.  $\frac{2}{17} = \frac{x-6}{x+9}$

4.  $1 - \frac{4}{y} = 5$

11.  $\frac{x+7}{x-9} = \frac{28}{12}$

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

12.  $\frac{x+1}{x+5} = \frac{5}{9}$

6.  $\frac{x-2}{10} = \frac{1}{5}$

13.  ~~$\frac{6}{x+4} = \frac{x-3}{22-x}$~~

7.  $\frac{x-5}{x-1} = \frac{1}{5}$

14.  $\frac{x+2}{x+7} = \frac{7}{12}$

## Proportions

Solve the following ratio for x.

$$\frac{x}{5} = \frac{4}{10} \rightarrow \text{Take cross products and solve.} \rightarrow \begin{array}{c} \cancel{x} \cdot 10 = 10x \\ 5 \cdot \cancel{4} = 20 \end{array}$$

$$10x = 20 \rightarrow \frac{10x}{10} = \frac{20}{10} \rightarrow x = 2$$

Solve.

1.  $\frac{x}{30} = \frac{3}{10}$

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

2.  $\frac{5}{15} = \frac{x}{9}$

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

3.  $\frac{x}{15} = \frac{5}{75}$

10.  $\frac{x}{6} = \frac{x-3}{12}$

4.  $\frac{2}{x} = \frac{6}{30}$

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

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

12.  $\frac{x+1}{7} = \frac{6}{14}$

6.  $\frac{x-1}{10} = \frac{2}{5}$

13.  $\frac{6}{x+5} = \frac{18}{24}$

7.  $\frac{x}{20} = \frac{2}{10}$

14.  $\frac{4}{x-3} = \frac{28}{49}$

**Solving Fractional Equations**

$\frac{3}{6} + \frac{8x}{12} = \frac{5}{2}$  → Multiply both sides of equation by LCD to eliminate all denominators.

$12\left(\frac{3}{6} + \frac{8x}{12}\right) = 12\left(\frac{5}{2}\right) \rightarrow \frac{36}{6} + \frac{96x}{12} = \frac{60}{2}$

$-6 + 8x = 30 \rightarrow 6 - 6 + 8x = 30 - 6 \rightarrow 8x = 24 \rightarrow x = 3$

- Solve.
- $\frac{x}{2} + \frac{5}{6} = \frac{4}{3} \quad x = -5$
  - $\frac{8}{x} - \frac{2}{6} = \frac{4}{6} \quad x = -8, 6$
  - $\frac{8}{2x-4} = \frac{2}{x} \quad x = -2$
  - $1 - \frac{4}{y} = 5 \quad y = -1$
  - $5 - \frac{3}{x} = 8 \quad x = -1$
  - $\frac{x-2}{10} - \frac{1}{5} = x \quad x = 4$
  - $\frac{x-5}{x-1} = \frac{1}{5} \quad x = 6$
  - $\frac{3}{4} - \frac{x+2}{x-8} = x = -32$
  - $\frac{x-2}{x+6} = \frac{1}{9} \quad x = 3$
  - $\frac{2}{17} - \frac{x-8}{x+9} = x = 8$
  - $\frac{x+7}{x-9} = \frac{28}{12} \quad x = 21$
  - $\frac{x+1}{x+5} = \frac{5}{9} \quad x = 4$
  - $\frac{6}{x+4} = \frac{x-1}{22-x} \quad x = -16$
  - $\frac{x+9}{x+7} = \frac{7}{12} \quad x = 5$

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**Solving Equations with Variables on Both Sides**

$6x - 7 = x + 23$   
 $6x - x - 7 = x - x + 23$   
 $5x - 7 = 23$   
 $5x = 30$   
 $x = 6$

Solve each equation for the given variable.

- $2x - 7 = 3x + 4 \quad x = -11$
- $-7c + 9 = c + 1 \quad c = 1$
- $4(2y - 4) = 5y + 2 \quad y = 6$
- $-6 - 2n = 3n - (6 + 5) \quad n = 5$
- $4(t + 5) - 3 = 6t - 13 \quad t = 15$
- $2(r - 4) = 5(r - 7) \quad r = 9$
- $7 - 6a = 6 - 7a \quad a = -1$
- $12m - 9 = 4m + 15 \quad m = 3$
- $8(x - 3) + 6 = 5x - 22 \quad x = -2$
- $3c - 12 = 14 + 6c \quad c = -13$
- $9a + 5 = 3a - 1 \quad a = -1$
- $6(x - 9) = 4(x - 5) \quad x = 17$
- $2(x - 4) + 8 = 3x - 8 \quad x = 8$
- $3x - 3 = 3x + 3 \quad x = 0$
- $-10x + 6 = -7x + -9 \quad x = 5$
- $5 + 3x = 7(x + 3) \quad x = -4$
- $\frac{3}{2}x + 3 = \frac{1}{2}x + 15 \quad x = 6$
- $2x + 6 = 6x - 9 \quad x = 5$
- $4e - 19 = -3(e + 4) \quad e = 1$
- $5t + 7 = 4t - 9 \quad t = -16$

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# ANSWERS

**Proportions**

Solve the following ratio for x.

$\frac{x}{5} = \frac{4}{10}$  → Take cross products and solve. →  $\frac{x}{5} = \frac{4}{10} \rightarrow 5 \cdot 4 = 10x$

$10x = 20 \rightarrow \frac{10x}{10} = \frac{20}{10} \rightarrow x = 2$

- Solve.
- $\frac{x}{30} = \frac{3}{10} \quad x = 9$
  - $\frac{5}{15} = \frac{8}{9} \quad x = 3$
  - $\frac{x}{15} = \frac{5}{75} \quad x = 1$
  - $\frac{2}{x} = \frac{6}{30} \quad x = 10$
  - $\frac{5+x}{10} = \frac{5}{2} \quad x = 20$
  - $\frac{x-1}{10} = \frac{2}{5} \quad x = 5$
  - $\frac{x}{20} = \frac{2}{10} \quad x = 4$
  - $\frac{x}{5} = \frac{12}{6} \quad x = 10$
  - $\frac{x-2}{8} = \frac{4}{4} \quad x = -2$
  - $\frac{x}{8} = \frac{-1}{12} \quad x = -3$
  - $\frac{x}{3} = \frac{6}{6} \quad x = 2$
  - $\frac{x+1}{7} = \frac{6}{14} \quad x = 2$
  - $\frac{6}{x+5} = \frac{18}{24} \quad x = 3$
  - $\frac{4}{x+3} = \frac{28}{49} \quad x = 10$

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