

1. **Learning Objective:** Use properties of real numbers to evaluate expressions.

[Properties of Real Numbers](#)

[Adding and Subtracting Fractions](#)

Find the value of the following expressions:

a.  $\frac{13-4}{5-2} = \frac{9}{3} = \mathbf{3}$

b.  $\frac{2^3+7(2)}{3^2} = \frac{8+14}{9} = \frac{22}{9}$

c.  $\frac{1+5^2}{\frac{6}{3}} = \frac{26}{2} = \mathbf{13}$

2. **Learning Objective:** Perform operations on real numbers.

[Rational Expressions](#)

[Algebraic Fractions](#)

[How to simplify an Algebra Fraction](#)

Express as a single fraction: **Find common denominator**

a.  $\frac{2}{3} + \frac{1}{6} = \frac{4}{6} + \frac{1}{6} = \frac{5}{6}$

b.  $4 + \frac{5}{x} = \frac{4x}{x} + \frac{5}{x} = \frac{4x+5}{x}$

c.  $\frac{1}{2} + \frac{2}{x} - \frac{3}{7} = \frac{7x}{14x} + \frac{28}{14x} - \frac{6x}{14x} = \frac{x+28}{14x}$

d.  $\frac{2}{x-1} + \frac{3}{x-2} = \frac{2(x-2)}{(x-1)(x-2)} + \frac{3(x-1)}{(x-1)(x-2)} = \frac{2x-4+3x-3}{(x-1)(x-2)} = \frac{5x-7}{(x-1)(x-2)}$

3. **Learning Objective:** Use properties of real numbers to solve linear equations/inequalities.

[Solving Linear Equations](#)

[Solving Linear Inequalities](#)

Solve the equations. If necessary, express your solution as a fraction. **Combine Like terms and isolate variable.**

- a.  $4y + 7 = 22 + y$  **Solution:**  $4y - y = 22 - 7 \rightarrow 3y = 15 \rightarrow y = 5$
- b.  $3(x - 2) = 13 - x$  **Solution:**  $3x - 6 = 13 - x \rightarrow 3x + x = 13 + 6 \rightarrow 4x = 19 \rightarrow x = \frac{19}{4}$
- c.  $5 - x = 3(x + 1) - 2$  **Solution:**  $5 - x = 3x + 3 - 2 \rightarrow 3x + x = 5 - 1 \rightarrow 4x = 4 \rightarrow x = 1$

Solve the inequalities. Express your solution in interval notation.

- a.  $3x + 1 > 6x - 2$  **Solution:**  $6x - 3x < 1 + 2 \rightarrow 3x < 3 \rightarrow x < 1 \rightarrow (-\infty, 1)$
- b.  $3x - 4 \leq 4 - (2x + 8)$  **Solution:**  $3x - 4 \leq -2x - 4 \rightarrow 3x + 2x \leq -4 + 4 \rightarrow 5x \leq 0 \rightarrow x \leq 0 \rightarrow (-\infty, 0]$
- c.  $4 < -2(x - 4) \leq 20$  **Solution:**  $-2 > x - 4 \geq -10 \rightarrow 2 > x \geq -6 \rightarrow [-6, 2)$

4. **Learning Objective:** Find the equation of the line with given criteria.

[Finding the Equation of a Line](#)

- a. Find the equation of the line with slope 6 and y-intercept  $-2$ .  $y = 6x - 2$
- b. Find the equation of the line with slope  $\frac{1}{2}$  that contains the point  $(6,4)$ .  $y - 4 = \frac{1}{2}(x - 6)$
- c. Find the equation of the line that contains the following points:  $(5,0)$   $(0,10)$ .  $y = -2x + 10$
- d. Find the equation of the line that contains the following points:  $(4,2)$   $(-3,-5)$ .  $y = x - 2$

5. **Learning Objective:** Use mathematical symbols to create an expression or equation that represents a given context.

[Evaluate Simplify and Translate Expressions](#)

[Word Problems for Linear Equations](#)

- a. John is knitting a scarf. It takes him 5 minutes to knit a row. Write an expression that represents the number of rows in John's scarf after  $t$  minutes.  **$R = \frac{1}{5}t$  where  $R$  is number of rows knitted in  $t$  minutes.**
- b. Jane goes to the arcade with 75 tokens. She plays 4 games every hour. If each game uses one token, write an expression that represents the number of tokens that Jane has after  $x$  hours.  **$T = 75 - 4x$  where  $T$  is the number of tokens left after  $x$  hours.**
- c. Jane and John are selling bird houses for \$10 each. They have paid \$100 to rent a stall at the flea market. Write an expression that represents the amount of money they will take home if they sell  $h$  bird houses.  **$P = 10h - 100$  where  $P$  is their profit in dollars and  $h$  is the number of bird houses sold.**
6. **Learning Objective:** Factor expressions or be able to determine if an expression is not factorable. Factor the following expressions completely.

[Factoring Methods](#)

[Factoring Trinomials](#)

- a.  $x^2 + 5x + 6 = (x + 3)(x + 2)$
- b.  $5x^2 - 14x - 3 = (5x + 1)(x - 3)$
- c.  $u^2 - 25 = (u - 5)(u + 5)$
- d.  $3x^3 - 6x^2 + 3x = 3x(x^2 - 2x + 1) = 3x(x - 1)(x - 1)$
- e.  $(y - 1)^2 - (y - 1) - 12 = ((y - 1) - 4)((y - 1) + 3) = (y - 5)(y + 2)$

7. **Learning Objective:** Solve quadratic equations by factoring.

[Solving Quadratic Equations by Factoring](#)

[Quadratic Equations and Solving by Factoring](#)

Solve the following equations **by factoring**.

- a.  $7r^2 - 14r = -7$  **Solution:**  $7r^2 - 14r + 7 = 0 \rightarrow 7(r^2 - 2r + 1) = 0 \rightarrow 7(r - 1)(r - 1) = 0 \rightarrow r = 1$
- b.  $6n^2 - 18n - 18 = 6$  **Solution:**  $6n^2 - 18n - 24 = 0 \rightarrow 6(n^2 - 3n - 4) = 0 \rightarrow 6(n - 4)(n + 1) = 0 \rightarrow n = 4, n = -1$
- c.  $10b^2 = 27b - 18$  **Solution:**  $10b^2 - 27b + 18 = 0 \rightarrow (2b - 3)(5b - 6) = 0 \rightarrow b = \frac{3}{2}, b = \frac{6}{5}$

8. **Learning Objective:** Use properties of exponents to expand binomial expressions.

[Squaring a Binomial](#)

[Binomial Expansion](#)

Expand the expressions.

- a.  $(a - 2b)^2 = (a - 2b)(a - 2b) = a^2 - 4ab + 4b^2$
- **Note that**  $(x + y)^2 \neq x^2 + y^2$  **rather**  $(x + y)^2 = (x + y)(x + y) = x^2 + 2xy + y^2$
- b.  $(3r + 1)^2 = (3r + 1)(3r + 1) = 9r^2 + 6r + 1$
- c.  $(1 - 7x)^2 = (1 - 7x)(1 - 7x) = 1 - 14x + 49x^2$

9. **Learning Objective:** Evaluate functions with function notation (for numbers and parameters).

[Evaluating Functions](#)

[Evaluate and Solving Functions](#)

Given  $f(x) = -x^2 + 2x + 3$

Evaluate:

- a.  $f(0) = -(0)^2 + 2(0) + 3 = 3$
- b.  $f(2) = -(2)^2 + 2(2) + 3 = 3$
- c.  $f(-2) = -(-2)^2 + 2(-2) + 3 = -5$
- d.  $f(a) = -(a)^2 + 2(a) + 3 = -a^2 + 2a + 3$
- e.  $f(-a) = -(-a)^2 + 2(-a) + 3 = -a^2 - 2a + 3$

10. **Learning Objective:** Perform indicated operations on polynomials (addition/subtraction with distribution focus on quadratic).

[Operations with Polynomials \(see Addition/Subtraction/Multiplying\)](#)

[Operations with Polynomials](#)

[Multiplying Polynomials](#)

Simplify the expression.

- a.  $3(x + 4) - 4(x^2 + 3x - 1) = 3x + 12 - 4x^2 - 12x + 4 = -4x^2 - 9x + 16$
- b.  $x^2 + xy + 2 - (xy + y^2 - 4) = x^2 + xy + 2 - xy - y^2 + 4 = x^2 - y^2 + 6$
- c.  $4(x^2 + x) - 3(2 + 3x - 6x^2) = 4x^2 + 4x - 6 - 9x + 18x^2 = 22x^2 - 5x - 6$