

Pre-Algebra

I. Number and Operations

A. Whole Numbers

1. Powers and Exponents (D/R)
2. Negative-integer exponents (I/D)
3. Scientific notation (I/D)
4. Factors and Multiples (PS)
5. Prime and Composite Numbers (D/R)
6. Prime Factorization (D/R)
7. Greatest Common Factor (GCF) (R)
8. Least Common Multiple (LCM) (D/R)
9. Perfect squares, cubes, roots (D/R)

B. Fractions

1. Read and write fractions (M/A)
2. Represent fractions on a number line (M/A)
3. Compare and order fractions (R)
4. Equivalent fractions (M/A)
5. Simplify fractions (M/A)
6. Least Common Denominator (LCD) (D/R)
7. Reciprocal, multiplicative inverse (D)
8. Mixed numbers and improper fractions (D/R)
9. Relate fractions and decimals (D/R)

C. Decimals

1. Model decimals (M/A)
2. Read and write decimals (PS)
3. Represent decimals on a number line (M/A)
4. Compare and order decimals (PS)
5. Round decimals (PS)
6. Terminating and repeating decimals (D)

D. Ratio, Rate and Proportion

1. Concept of a ratio (R)
2. Model ratios (R)
3. Read and write ratios (R)
4. Relate ratios to fractions (D/R)
5. Rates (D/R)
6. Unit rate (D/R)
7. Rate of change (D)
8. Direct variation (D)
9. Ratio and probability (D/R)
10. Solve proportions (D/R)
11. Proportional reasoning (D/R)
12. Scale drawings (D)
13. Scale factor (D)
14. Similar figures (D/R)
15. Indirect measurement (D)
16. Dilations (I/D)

E. Percent

1. Concept of percent, model (R)
2. Relate fractions and decimals to percents (D/R)
3. Percent of a number (D/R)
4. Percent one number is of another (D/R)
5. Percent proportion $\frac{P}{B} = \frac{R}{100}$ (D)
6. Percent equation ($RB = P$) (D)
7. Percent of change (D)
8. Interest, profit, discount (D)

F. Integers

1. Concept of integers, negative numbers (R)
2. Read and write integers (R)
3. Represent on a number line (R)
4. Compare and order integers (R)
5. Absolute value (D/R)

G. Rational Numbers

1. Identify and simplify rational numbers (D)
2. Represent on a number line (D)
3. Relate rational numbers to decimals (D)
4. Compare and order rational numbers (D)

H. Real Numbers

1. Identify irrational numbers (D)
2. Represent irrational, real numbers on a number line (D)
3. Identify and classify real numbers (D)
4. Estimate square roots (D)

I. Operations: Whole Numbers

1. Add whole numbers
 - a. Basic facts (M/A)
 - b. Fact families (M/A)
 - c. Number line (M/A)
 - d. Algorithm (regroup), partial sums (M/A)
 - e. Three or more addends (M/A)
2. Subtract whole numbers
 - a. Basic facts (M/A)
 - b. Fact families (M/A)
 - c. Count back (M/A)
 - d. Number line (M/A)
 - e. Algorithm (regroup) (M/A)
3. Multiply whole numbers
 - a. Basic facts (M/A)
 - b. Fact families, related facts (M/A)
 - c. Multiply three numbers (M/A)
 - d. Algorithm (regroup) (M/A)
4. Divide whole numbers
 - a. Basic facts (M/A)
 - b. Fact families, related facts (M/A)
 - c. Algorithm (M/A)
 - d. Remainders (M/A)

J. Operations: Fractions

1. Add, subtract fractions, mixed numbers - like denominators (D/R)
2. Add and subtract fractions and mixed numbers - unlike Denominators (D/R)
3. Multiply and divide fractions, mixed numbers (D/R)

K. Operations: Decimals

1. Add and subtract decimals - non-money amounts (PS)
2. Multiply decimals (PS)
3. Divide decimals (PS)

L. Operations: Integers, Rational, Real Numbers

1. Add and subtract integers (D/R)
2. Multiply and divide integers (D/R)
3. Rules of exponents (D)
4. Add, subtract, multiply and divide rational numbers (D)

M. Mental Arithmetic and Estimation Strategies

1. Estimate sums (PS)
2. Estimate differences (PS)
3. Estimate products (PS)
4. Estimate quotients (PS)
5. Estimate with fractions (PS)
6. Estimate percents (D/R)
7. Estimate square roots (D)

II. Algebra

A. Properties

1. Associative and Commutative Properties (R)
2. Identity Properties (R)
3. Zero Property of Multiplication (R)
4. Distributive Property (D/R)
5. Order of operations (R)
6. Addition and Subtraction Properties of Equality (D)
7. Multiplication and Subtraction Properties of Equality (D)

8. Additive Inverse Property (D)
9. Multiplicative Inverse Property (D)

B. Algebraic Representations

1. Variable, expressions, equations (R)
2. Order of operations (R)
3. Evaluate algebraic expressions (R)
4. Write algebraic expressions and equations (R)
5. Use formulas (D/R)
6. Inequalities with variables (D)
7. Equivalent expressions; simplify expressions (D/R)
8. Monomials (D)
9. Operations with monomials (D)
10. Polynomials, definition (I/D)
11. Operations with polynomials (I/D)
12. Pythagorean Theorem (D)
13. Distance Formula (D)
14. Rational expressions, algebraic fractions (I/D)

C. Solve Equations and Inequalities

1. Addition and subtraction equations (D/R)
2. Multiplication and division equations (D/R)
3. Multiple-step equations (D/R)
4. Equations with variables on both sides (D)
5. Solving inequalities (I/D)
6. Graphing inequalities (D)
7. Multiple-step inequalities (I/D)

D. Graph Linear and Nonlinear Equations and Inequalities

1. Relationship between equations and their graphs (D)
2. Linear equations (D)
3. Rate of change (D)
4. Slope (D)
5. Intercepts (D)
6. Slope-intercept form (I/D)
7. Point-slope form (I)
8. Systems of linear equations and inequalities, graph and solve (I/D)

E. Functions and Relations

1. Function tables (D/R)
2. Function rules (D/R)
3. Definition of a function (D)
4. Domain and range of a function (D/R)
5. Vertical-line tests for functions (I/D)
6. Identify linear and nonlinear functions, relationships (D)
7. Graph ordered pairs (R)
8. Graph functions (D/R)
9. Graph relationships (D/R)
10. Model real-world data (D)
11. Proportional relationships, direct variation (D)
12. Inverse variations (I/D)
13. Quadratic functions (I/D)
14. Exponential functions (I)
15. Families of linear functions (I/D)
16. Families of nonlinear functions (I/D)
17. Arithmetic sequences (R/D)

III. Measurement

A. Length, Weight, Mass, Area, Capacity, Volume

1. Customary Units (M/A)
2. Metric units (M/A)
3. Convert units within a system (PS)

B. Temperature

1. Temperature (Celsius, Fahrenheit) (M/A)

C. Measurement Formulas and Techniques

1. Use formulas (R)

D. Length

1. Perimeter of a rectangle (R)
2. Circumference of a circle (D)

E. Area and Surface Area

1. Area of a rectangle, square (R)
2. Area of a parallelogram (D/R)
3. Area of a triangle (D/R)
4. Area of a trapezoid (D/R)
5. Area of a circle (D)
6. Area of composite figures (D)
7. Surface area of cube, rectangular prism (D)
8. Surface area of a cylinder (D)
9. Surface area of cone, pyramid, sphere (D)

F. Volume

1. Volume of cube, rectangular prism (D)
2. Volume of cylinder (D)
3. Volume of cone, pyramid, sphere (D)
4. Angle measurement in degrees (D)
5. Indirect measurement (D)

IV. Geometry

A. Plane and Solid Shapes

1. Identify attributes of plane shapes (D/R)
2. Identify attributes of solid shapes (D/R)
3. Classify and describe properties of plane shapes (D/R)
4. Classify and describe properties of solid shapes (D/R)
5. Relate plane and solid figures (D/R)
6. Lines, line segments, rays (D/R)
7. Parallel, perpendicular lines (D)
8. Classify and measure angles (PS)
9. Angle relationships (D/R)
10. Identify and define polygons (D/R)
11. Classify quadrilaterals (D/R)
12. Classify triangles (D/R)
13. Sum of angles in a triangle (D/R)
14. Sum of angles of polygons (D/R)
15. Parts of circles (D)
16. Congruent figures (D)
17. Similar figures (D)

18. Corresponding parts (D)
19. Scale drawings (D)
20. Right triangles and parts (D)
21. Pythagorean Theorem (D)

B. Coordinate Geometry

1. Graph ordered pairs (R)
2. Horizontal, vertical distance on a grid (M/A)
3. Distance formula (D)
4. Graph linear equations (D/R)
5. Slope (D)
6. Slope-intercept form of a line (D)

C. Transformations and Symmetry

1. Translations (slide) (D)
2. Reflections (flip) (D)
3. Rotations (turn) (D)
4. Dilations (I/D)
5. Transformations on coordinate plane (D)
6. Symmetry (line and rotation) (D)
7. Tessellations (D)

D. Spatial Reasoning

1. Draw angles, lines, polygons (D)
2. Constructions (I/D)
3. Draw 3-dimensional objects (D)
4. Nets (D)

V. Data Analysis

A. Sort, Classify

1. Use Venn diagrams (D/R)

B. Collect, Organize, and Display Data

1. Collect data (D/R)
2. Organize data with a table (R)
3. Organize data with a graph (D/R)
4. Frequency tables; tally charts (R)
5. Surveys (R)
6. Samples (D)
7. Random samples (D)
8. Use sampling to predict (D)

C. Represent Data

1. Bar graphs; double bar graphs (D)
2. Line plots (D/R)
3. Circle graphs (D/R)
4. Line graphs (D/R)
5. Stem-and-leaf plots (D/R)
6. Box-and-whisker plots (I/D)
7. Histograms (D)
8. Scatter plots (D/R)
9. Fitted lines on a scatter plot (D)
10. Choose an appropriate graph/display (D)

D. Make Inferences and Predictions

1. Use data (M/A)
2. Mode (R)
3. Median (D/R)
4. Mean (D/R)
5. Range (D/R)
6. Outliers (D/R)
7. Quartiles (D)
8. Misleading graphs and statistics (D)
9. Make predictions from graphs (D)
10. Make predictions from a sample (D)

E. Probability

1. Predict Outcomes (D)
2. Outcomes and sample space (D)
3. Probability of a simple event (D)
4. Complementary events (M/A)
5. Composite events: independent, dependent (D)
6. Mutually exclusive or inclusive events, disjoint (I/D)
7. Experimental probability (D)
8. Theoretical probability (D)
9. Probability and ratio (R)
10. Simulations (D)
11. Tree diagrams (D/R)
12. Fundamental Counting Principle (D)
13. Combinations (D)
14. Permutations (D)

VI. Problem Solving

A. Strategies and Skills

1. Look for a pattern (D/R)
2. Act it out, use objects, use simulation (D/R)
3. Guess and draw (D/R)
4. Draw a picture or diagram (D/R)
5. Make a table (D/R)
6. Make a graph (D/R)
7. Make a list (D/R)
8. Make a model (D/R)
9. Work backward (D/R)
10. Use logical reasoning (D/R)
11. Use a four-step plan (R)
12. Choose a strategy (R)
13. Choose an operation (M/A)
14. Check for reasonableness (M/A)
15. Write an equation (R)
16. Use formulas (D/R)
17. Decide whether to estimate or compute (M/A)
18. Solve multi-step problems (R)
19. Conduct a poll or survey (D/R)
20. Solve a simpler problem (D/R)

B. Mathematical Reasoning and Justification

1. Use mathematical reasoning (D/R)
2. Use Venn diagrams (D/R)
3. Explain, justify and defend reasoning (D/R)
4. Check validity of calculated results (R)
5. Create problems (R)
6. Write informal mathematical arguments (D)
7. Make and test conjectures, counterexamples (D)
8. Inductive reasoning (D)
9. Deductive reasoning (D)

I - Introduce

D - Develop

R - Reinforce

M/A - Maintain and Apply

PS - Prerequisite Skills