

Math

SEVENTH GRADE

Students in seventh grade display a wide range of differences in intellectual development and emotional maturity. As students mature, they experiment with new mathematical approaches and concepts. The seventh-grade mathematics classroom environment encourages communication, exploration, and risk taking that are critical as students become more confident and learn to exist in an ever-changing world.

The seventh-grade curriculum addresses a number of important mathematical concepts. One of the key topics is rational number operations. Seventh-grade students become fluent in rational number operations and establish skills needed to become successful problem solvers. Solving equations is another major focus of the curriculum as students prepare for further study of algebra. Students continue to engage in thoughtful activities, using hands-on materials and technology to explore important mathematical concepts included in the seventh-grade curriculum.

Number and Operations

Students will:

1. Understand numbers, ways of representing numbers, relationships among numbers, and number systems
 - Work flexibly with fractions, decimals, and percents to solve problems;
 - Compare and order fractions, decimals, and percents efficiently and find their approximate locations on a number line
 - Develop meaning for percents greater than 100 and less than 1
 - Understand and use ratios and proportions to represent quantitative relationships
 - Develop an understanding of large numbers and recognize and appropriately use exponential, scientific, and calculator notation
 - Use factors, multiples, prime factorization, and relatively prime numbers to solve problems
 - Develop meaning for integers and represent and compare quantities with them.
2. Understand meanings of operations and how they relate to one another
 - Understand the meaning and effects of arithmetic operations with fractions, decimals, and integers
 - Use the associative and commutative properties of addition and multiplication and the distributive property of multiplication over addition to simplify computations with integers, fractions, and decimals
 - Understand and use the inverse relationships of addition and subtraction, multiplication and division, and squaring and finding square roots to simplify computations and solve problems
3. Compute fluently and make reasonable estimates
 - Select appropriate methods and tools for computing with fractions and decimals from among mental computation, estimation, calculators or computers, and paper and pencil, depending on the situation, and apply the selected methods
 - Develop and analyze algorithms for computing with fractions, decimals, and integers and develop fluency in their use
 - Develop and use strategies to estimate the results of rational-number computations and judge the reasonableness of the results

- Develop, analyze, and explain methods for solving problems involving proportions, such as scaling and finding equivalent ratios

Algebra

4. Understand patterns, relations, and functions
 - Represent, analyze, and generalize a variety of patterns with tables, graphs, words, and, when possible, symbolic rules
 - Relate and compare different forms of representation for a relationship
 - Identify functions as linear or nonlinear and contrast their properties from tables, graphs, equations
5. Represent and analyze mathematical situations and structures using algebraic symbols
 - Develop an initial conceptual understanding of different uses of variables
 - Explore relationships between symbolic expressions and graphs of lines, paying particular attention to the meaning of intercept and slope
 - Use symbolic algebra to represent situations and to solve problems, especially those that involve linear relationships
 - Recognize and generate equivalent forms for simple algebraic expressions and solve linear equations
6. Use mathematical models to represent and understand quantitative relationships
 - Model and solve contextualized problems using various representations, such as graphs, tables, and equations
7. Analyze change in various contexts
 - Use graphs to analyze the nature of changes in quantities in linear relationships

Geometry

8. Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships
 - Precisely describe, classify, and understand relationships among types of two- and three-dimensional objects using their defining properties
 - Understand relationships among the angles, side lengths, perimeters, areas, and volumes of similar objects
 - Create and critique inductive and deductive arguments concerning geometric ideas and relationships, such as congruence, similarity, and the Pythagorean relationship
9. Specify locations and describe spatial relationships using coordinate geometry and other representational systems
 - Use coordinate geometry to represent and examine the properties of geometric shapes
 - Use coordinate geometry to examine special geometric shapes, such as regular polygons or those with pairs of parallel or perpendicular sides
10. Apply transformations and use symmetry to analyze mathematical situations
 - Describe sizes, positions, and orientations of shapes under informal transformations such as flips, turns, slides, and scaling
 - Examine congruence, similarity, line or rotational symmetry of objects using transformations
11. Use visualization, spatial reasoning, and geometric modeling to solve problems
 - Draw geometric objects with specified properties, such as side lengths or angle measures

- Use two-dimensional representations of three-dimensional objects to visualize and solve problems such as those involving surface area and volume
- Use visual tools such as networks to represent and solve problems
- Use geometric models to represent and explain numerical and algebraic relationships
- Recognize and apply geometric ideas and relationships in areas outside the mathematics classroom, such as art, science, and everyday life

Measurement

12. Understand measurable attributes of objects and the units, systems, and processes of measurement

- Understand both metric and customary systems of measurement
- Understand relationships among units and convert from one unit to another within the same system
- Understand, select, and use units of appropriate size and type to measure angles, perimeter, area, and volume

13. Apply appropriate techniques, tools, and formulas to determine measurements

- Use common benchmarks to select appropriate methods for estimating measurements
- Select and apply techniques and tools to accurately find length, area, volume, and angle measures to appropriate levels of precision
- Develop and use formulas to determine the circumference of circles and the area of triangles, parallelograms, trapezoids, and circles and develop strategies to find the area of more-complex shapes
- Solve problems involving scale factors, using ratio and proportion

Data Analysis and Probability

14. Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them

- Formulate questions, design studies, and collect data about a characteristic shared by two populations or different characteristics within one population;
- Select, create, and use appropriate graphical representations of data, including histograms, box plots, and scatterplots

15. Select and use appropriate statistical methods to analyze data

- Find, use, and interpret measures of center and spread, including mean and interquartile range
- Discuss and understand the correspondence between data sets and their graphical representations, especially histograms, stem-and-leaf plots, box plots, and scatterplots

16. Develop and evaluate inferences and predictions that are based on data

- Use observations about differences between two or more samples to make conjectures about the populations from which the samples were taken
- Make conjectures about possible relationships between two characteristics of a sample on the basis of scatterplots of the data and approximate lines of fit
- Use conjectures to formulate new questions and plan new studies to answer them

17. Understand and apply basic concepts of probability

- Understand and use appropriate terminology to describe complementary and mutually exclusive events
- Use proportionality and a basic understanding of probability to make and test conjectures about the results of experiments and simulations

- Compute probabilities for simple compound events, using such methods as organized lists, tree diagrams, and area models

Problem Solving

18. Demonstrate application of effective problem-solving skills using a variety of strategies

- Use objects
- Draw a picture
- Use guess and check
- Make an organized list
- Write an equation
- Solve a simpler problem
- Make a table or chart
- Look for a pattern
- Use logical reasoning
- Work backward

Communication

19. Interpret and express mathematical ideas orally and in writing

- Model situations using oral, written, concrete, pictorial, graphical and algebraic methods
- Reflect on and clarifying their own thinking about mathematical ideas and situations
- Develop common understandings of mathematical ideas, including the role of definitions
- Use the skills of reading, listening, and viewing to interpret and evaluate mathematical ideas
- Discuss mathematical ideas and making conjectures and convincing arguments
- Recognize the value of mathematical notations and its role in the development of mathematical ideas

Technology

20. Demonstrate the use of current technology and the ability to adapt to advances in the technological field