

Missouri Mathematics Grade-Level Expectations	Boardworks Middle School Math Presentations
Grade 6	
Number and Operations	
1. Understand numbers, ways of representing numbers, relationships among numbers and number systems	
apply and understand whole numbers to millions, fractions and decimals to the thousandths (including location on the number line)	Place value Ordering integers Ordering decimals Ordering fractions
recognize and generate equivalent forms of fractions, decimals and benchmark percents	Equivalent fractions Fractions and decimals Equivalent fractions, decimals and percentages Introducing percentages Calculating percentages mentally
recognize equivalent representations for the same number and generate them by decomposing and composing numbers	Mental addition and subtraction Mental division Mental multiplication Properties of numbers
2. Understand meanings of operations and how they relate to one another	
describe the effects of multiplication and division on fractions and decimals apply properties of operations (including order of operations) to positive rational numbers	Multiplying fractions Dividing by fractions Finding a fraction of an amount Multiplying and dividing by 0.1 and 0.01 Multiplying by numbers between 0 and 1 Mental math and place value
identify square and cubic numbers and determine whole number roots and cubes	Order of operations and PEMDAS Square and triangular numbers Square roots Cubes and cube roots

3. Compute fluently and make reasonable estimates	
multiply and divide positive rational numbers	Multiplying and dividing integers Mental multiplication Mental division Written methods for multiplication Written methods for division Multiplying fractions Dividing by fractions Finding a fraction of an amount
estimate and justify the results of multiplication and division of positive rational numbers	Estimation and approximation Using a calculator
solve problems using ratios and rates	Ratio and rate Dividing in a given ratio Ratio and proportion problems
Algebraic Relationships	
1. Understand patterns, relations and functions	
represent and describe patterns with tables, graphs, pictures, symbolic rules or words	Function machines Mapping functions Graphs of functions Introducing sequences Generating sequences from flow charts Sequences from geometrical patterns
compare various forms of representations to identify patterns	Mapping functions
identify functions as linear or nonlinear from tables or graphs	Graphs of functions Graphs of nonlinear functions
2. Represent and analyze mathematical situations and structures using algebraic symbols	
use symbolic algebra to represent unknown quantities in expressions or equations and solve one-step equations	Writing expressions
use the commutative, distributive and associative properties to generate equivalent forms for simple algebraic expressions	Properties of numbers Multiplying algebraic terms Factoring expressions
3. Use mathematical models to represent and understand quantitative relationships	
model and solve problems, using multiple representations such as tables, expressions and one-step equations	Writing expressions Introducing formulas Direct variations

construct and analyze representations to compare situations with constant or varying rates of change	Distance-time graphs Interpreting graphs
Geometric and Spatial Relationships	
1. Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships	
identify similar and congruent shapes	Congruence
2. Specify locations and describe spatial relationships using coordinate geometry and other representational systems	
use coordinate systems to construct geometric shapes	Quadrilaterals on a coordinate grid
3. Apply transformations and use symmetry to analyze mathematical situations	
describe the transformation from a given pre-image using the terms reflection/flip, rotation/turn, and translation/slide	Reflection Rotation Translation
create polygons and designs with rotational symmetry	Rotational symmetry
4. Use visualization, spatial reasoning and geometric modeling to solve problems	
use spatial visualization to identify isometric representations of mat plans	2-D representations of 3-D shapes Views of 3-D shapes
draw or use visual models to represent and solve problems	2-D representations of 3-D shapes Views of 3-D shapes
Measurement	
1. Understand measurable attributes of objects and the units, systems and processes of measurement	
identify and justify the unit of measure for area and volume (customary and metric)	Converting metric units Customary unit conversions
solve problems involving elapsed time (hours and minutes)	Using a calculator
2. Apply appropriate techniques, tools and formulas to determine measurements	
identify and justify an angle as acute, obtuse, straight, or right	Measuring angles
solve problems involving the area or perimeter of polygons	Area Area problems Perimeter
convert from one unit to another within a system of measurement (mass and weight)	Converting metric units Customary unit conversions

Data and Probability	
1. 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	Collecting data Population and sampling
interpret circle graphs; create and interpret stem-and-leaf plots	Circle graphs Appropriate graphs
2. Select and use appropriate statistical methods to analyze data	
find the range and measures of center, including median, mode and mean	Finding the range Finding the median Finding the mode Calculating the mean
3. Develop and evaluate inferences and predictions that are based on data	
use observations about differences between 2 samples to make conjectures about the populations from which the samples were taken	-
4. Understand and apply basic concepts of probability	
use a model (diagrams, list, sample space, or area model) to illustrate the possible outcomes of an event	Probability diagrams
Grade 7	
Number and Operations	
1. Understand numbers, ways of representing numbers, relationships among numbers and number systems	
compare and order all positive rational numbers and find their approximate location on a number line	Ordering integers Ordering decimals Ordering fractions Equivalent fractions, decimals and percentages
recognize and generate equivalent forms of fractions, decimals and percents	Equivalent fractions Fractions and decimals Equivalent fractions, decimals and percentages Introducing percentages
recognize equivalent representations for the same number and generate them by decomposing and composing numbers, including exponential notation	Mental addition and subtraction Mental division Mental multiplication Properties of numbers Powers

2. Understand meanings of operations and how they relate to one another	
	Adding and subtracting integers Adding and subtracting integers activities Multiplying and dividing integers Adding and subtracting simple fractions Methods for adding and subtracting fractions Multiplying fractions Dividing by fractions Finding a fraction of an amount Multiplying and dividing by 0.1 and 0.01 Multiplying by numbers between 0 and 1 Mental math and place value
describe the effects of all operations on rational numbers including integers	
apply properties of operations (including order of operations) to positive rational numbers and integers	Order of operations and PEMDAS
approximate the value of square roots to the nearest whole number	Square roots Estimation and approximation
3. Compute fluently and make reasonable estimates	
	Adding and subtracting integers Adding and subtracting integers activities Multiplying and dividing integers Adding and subtracting simple fractions Methods for adding and subtracting fractions Multiplying fractions Dividing by fractions Finding a fraction of an amount Multiplying and dividing by 0.1 and 0.01 Multiplying by numbers between 0 and 1 Mental math and place value Mental addition and subtraction Mental multiplication Mental division Written methods for addition and subtraction Written methods for multiplication Written methods for division Mental math puzzles
apply all operations on rational numbers including integers	Estimation and approximation
estimate and justify the results of all operations on rational numbers	

solve problems involving proportions, such as scaling and finding equivalent ratios	Using scale factors Ratio and rate Ratio and proportion problems
Algebraic Relationships	
1. Understand patterns, relations and functions	
analyze patterns represented graphically or numerically with words or symbolic rules, including recursive notation compare and contrast various forms of representations of pattern	Function machines Mapping functions Graphs of functions Introducing sequences Sequences from geometrical patterns Describing and continuing sequences Generating sequences from flow charts Generating sequences and rules
identify functions as linear or nonlinear from tables, graphs or equations	Graphs of functions Graphs of nonlinear functions Exploring nonlinear graphs
2. Represent and analyze mathematical situations and structures using algebraic symbols	
use symbolic algebra to represent unknown quantities in expressions or equations and solve linear equations with one variable	Writing expressions Solving simple equations
use properties to generate equivalent forms for simple algebraic expressions that include positive rationals and integers	Properties of numbers Solving simple equations
3. Use mathematical models to represent and understand quantitative relationships	
model and solve problems, using multiple representations such as graphs, tables, expressions, and linear equations	Writing expressions Direct variations Sequences from practical contexts Deriving formulas
compare situations with constant or varying rates of change	Distance-time graphs Interpreting graphs
Geometric and Spatial Relationships	
1. Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships	
identify the 2-dimensional cross-section of a 3-dimensional shape	Cross sections
describe relationships between corresponding sides, corresponding angles and corresponding perimeters of similar polygons	Congruence

2. Specify locations and describe spatial relationships using coordinate geometry and other representational systems	
use coordinate geometry to construct and identify geometric shapes in the coordinate plane using their properties	Quadrilaterals on a coordinate grid
3. Apply transformations and use symmetry to analyze mathematical situations	
describe the relationship between the scale factor and the perimeter of the image using a dilation (contractions-magnifications; stretching/shrinking)	Using scale factors Dilation
determine all lines of symmetry of a polygon	Reflection symmetry Rotational symmetry
4. Use visualization, spatial reasoning and geometric modeling to solve problems	
use spatial visualizations to identify various 2-dimensional views of isometric drawings	2-D representations of 3-D shapes Views of 3-D shapes
draw or use visual models to represent and solve problems	2-D representations of 3-D shapes Views of 3-D shapes
Measurement	
1. Understand measurable attributes of objects and the units, systems and processes of measurement	
identify and justify the unit of measure for volume (customary and metric)	Converting metric units Customary unit conversions
identify the equivalent area and volume measures within a system of measurement (e.g., sq ft. to sq in, m ³ to c m ³)	Perimeter Converting metric units Customary unit conversions
solve problems involving addition and subtraction of time (hours, minutes and seconds)	-
2. Apply appropriate techniques, tools and formulas to determine measurements	
use tools to measure angles to the nearest degree and classify the angle as acute, obtuse, right, straight, or reflex	Measuring angles
solve problems involving circumference and/or area of a circle and surface area/volume of a rectangular or triangular prism, or cylinder	Circumference of a circle Area of a circle Surface area Volume Cylinders, cones and spheres
convert from one unit to another within a system of measurement (capacity) and convert square or cubic units within the same system of measurement	Converting metric units Customary unit conversions

Data and Probability	
1. Formulate questions that can be addressed with data and collect, organize and display relevant data to answer them	
select, create and use appropriate graphical representation of data, including circle graphs, histograms	Appropriate graphs Circle graphs Histograms
2. Select and use appropriate statistical methods to analyze data	
find, use and interpret measures of center and spread, including ranges	Finding the range Calculating the mean Finding the median Finding the mode Quartiles and box plots
3. Develop and evaluate inferences and predictions that are based on data	
use observations about differences between samples to make conjectures about the populations from which the samples were taken	Comparing data
4. Understand and apply basic concepts of probability	
use models to compute the probability of an event and make conjectures (based on theoretical probability) about the results of experiments	Experimental probability
Grade 8	
Number and Operations	
1. Understand numbers, ways of representing numbers, relationships among numbers and number systems	
compare and order all rational numbers including percents, and find their approximate location on a number line	Ordering integers Ordering decimals Ordering fractions Equivalent fractions, decimals and percentages Introducing percentages

use fractions, decimals and percents to solve problems	Calculating percentages mentally Calculating percentages on paper Calculating percentages with a calculator Comparing proportions Percentage change Percentages and inverse operations Mental math puzzles Finding a fraction of an amount Written methods for addition and subtraction
recognize equivalent representations for the same number and generate them by decomposing and composing numbers, including scientific notation	Mental addition and subtraction Mental division Mental multiplication Properties of numbers Powers Scientific notation
2. Understand meanings of operations and how they relate to one another	
apply properties of operations to all rational numbers including order of operations and inverse operations	Order of operations and PEMDAS Percentages and inverse operations
Algebraic Relationships	
1. Understand patterns, relations and functions	
generalize patterns represented graphically or numerically with words or symbolic rules, using explicit notation	Function machines Mapping functions Graphs of functions Introducing sequences Sequences from geometrical patterns Describing and continuing sequences Generating sequences from flow charts Generating sequences and rules
compare and contrast various forms of representations of patterns	-
identify functions as linear or nonlinear from tables, graphs or equations	Graphs of functions Graphs of nonlinear functions Exploring nonlinear graphs
2. Represent and analyze mathematical situations and structures using algebraic symbols	
use symbolic algebra to represent and solve problems that involve linear relationships	Writing expressions Solving simple equations Direct variations

use properties to generate equivalent forms for simple algebraic expressions that include all rationals	Properties of numbers
3. Use mathematical models to represent and understand quantitative relationships	
model and solve problems, using multiple representations such as graphs, tables, and linear equations	Writing expressions Direct variations Sequences from practical contexts Deriving formulas
4. Analyze change in various contexts	
analyze the nature of changes (including slope and intercepts) in quantities in linear relationships	The equation of a straight line Conversion graphs
Geometric and Spatial Relationships	
1. Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships	
describe, classify and generalize relationships between and among types of a) 2-dimensional objects and b) 3-dimensional objects using their defining properties including Pythagorean Theorem	Polygons Quadrilaterals Triangles Angles in a triangle Angles in polygons Pythagorean Theorem Identifying right triangles Calculating sides of right triangles
2. Specify locations and describe spatial relationships using coordinate geometry and other representational systems	
use coordinate geometry to analyze properties of right triangles and quadrilaterals (including the use of the Pythagorean Theorem)	-
3. Apply transformations and use symmetry to analyze mathematical situations	
reposition shapes under formal transformations such as reflection, rotation and translation	Reflection Rotation Translation
describe the relationship between the scale factor and the area of the image using a dilation (stretching/ shrinking)	Dilation
identify the number of rotational symmetries of regular polygons	Rotational symmetry
4. Use visualization, spatial reasoning and geometric modeling to solve problems	
create isometric drawings from a given mat plan	2-D representations of 3-D shapes Views of 3-D shapes
draw or use visual models to represent and solve problems	2-D representations of 3-D shapes Views of 3-D shapes

Measurement	
2. Apply appropriate techniques, tools and formulas to determine measurements	
solve problems of angle measure, including those involving triangles and parallel lines cut by a transversal	Angles in a triangle Angles made with parallel lines
analyze precision and accuracy in measurement situations and determine number of significant digits	Rounding Reading scales
Data and Probability	
1. Formulate questions that can be addressed with data and collect, organize and display relevant data to answer them	
select, create and use appropriate graphical representation of data (including scatter plots) and box plots (box and whiskers)	Appropriate graphs Scatter plots Quartiles and box plots Bar graphs Line graphs Circle graphs Histograms
2. Select and use appropriate statistical methods to analyze data	
find, use and interpret measures of center, outliers and spread, including range and interquartile range	Calculating the mean Finding the median Finding the mode Finding the range Interquartile range Calculating statistics
compare different representations of the same data and evaluate how well each representation shows important aspects of the data	-
3. Develop and evaluate inferences and predictions that are based on data	
make conjectures about possible relationships between 2 characteristics of a sample on the basis of scatter plots of the data and approximate lines of fit	-