

Course Description

In 7th Grade Mathematics students will focus on developing understanding of and applying proportional relationships; developing understanding of operations with rational numbers and working with expressions and linear equations; solving problems involving scale drawings and informal geometric constructions, and working with two and three dimensional shapes to solve problems involving area, surface area, and volume; and drawing inferences about populations based on samples.

Scope and Sequence

Timeframe	Unit	Instructional Topics
29 Day(s)	Number Sense and Operations	<ol style="list-style-type: none"> 7.NS.1 Adding and Subtracting Rational Numbers 7.NS.2 Multiplying and Dividing Rational Numbers 7.NS.3 Percent Change
30 Day(s)	Ratios and Proportions	<ol style="list-style-type: none"> 7.RP.1 7.RP.3 7.RP.2 Recognize and Represent Proportional Relationships between quantities.
32 Day(s)	Expression and Equations	<ol style="list-style-type: none"> 7.EE.A.1 7.EE.4 7.EE.A.2 7.EE.B.3
33 Day(s)	Geometry	<ol style="list-style-type: none"> Scale Factor (7.G.1) 7.GM.A.2 Use a variety of tools to construct geometric shapes. 7.GM.A.3 7.GM.A.4 Angle Relationships (7.GM.5) Volume and Surface Area (7.GM.6)
34 Day(s)	Statistics and Probability	<ol style="list-style-type: none"> Random Sampling (7.DS.1) Use Data from Samples. (7.DS.2) Measures of Center and variability (7.DS.3 and 7.DS.4) Probability (7.DS.5) Probability (7.DS.6) Probability Models (7.DS.7) Compound Probability

Prerequisites

A successful completion of 6th grade mathematics class.

Course Instructional Resources/Textbook

Khanacademy.com as well as the 2016 Missouri Learning Standards.

Course Details**UNIT: Number Sense and Operations** -- 29 Day(s)**Unit Description**

Apply and extend previous understandings of operations to add, subtract, multiply, and divide rational numbers.

Enduring Understandings/Essential Learner Outcomes

Add, Subtract, Divide, and Multiply

Represent operations on a numberline

Prove additive inverses have a sum of zero

Understand the connection between subtraction and addition with additive inverses.

Determine that the difference between two numbers on the number line is their absolute value.

Interpret sums and differences of rational numbers.

Understand every quotient of integers (with a non zero divisor) is a rational number.

Academic Vocabulary

Rational numbers
Number line
Additive inverse
Absolute value
Interpret
Reciprocal
Terminate

TOPIC: 7.NS.1 Adding and Subtracting Rational Numbers -- 10 Day(s)**Description**

Apply and extend previous understandings of numbers to add and subtract rational numbers.

Academic Vocabulary (What terms will students need to know?)

Rational numbers
Number line
Additive inverse
Absolute value
Interpret

Learning Targets

I can describe real world situations where opposite quantities have a sum of zero.
I can use a number line or positive/negative chips to show that an integer and its opposite will always have a sum of zero.
I can interpret the addition of integers by relating the values to real-world situations.
I can rewrite a subtraction problem as an addition problem by using the additive inverse.
I can show the distance between two integers on a number line is the absolute value of their difference.
I can describe real-world situations represented by the subtraction of integers.
I can use the properties of operations to add and subtract rational numbers.

MA.7.NS.A.1

TOPIC: 7.NS.2 Multiplying and Dividing Rational Numbers -- 10 Day(s)**Description**

Apply and extend previous understandings of numbers to multiply and divide rational numbers.

Academic Vocabulary (What terms will students need to know?)

Rational numbers
Integers
Non-zero divisor
Interpret products and quotients
Multiplicative inverse
Reciprocal

Learning Targets

I can understand that all rational numbers can be written as fractions or decimal numbers that terminate or repeat.
I can convert a rational number to a decimal.
I can multiply rational numbers.
I can divide rational numbers.
I can interpret rational numbers by describing real-world contexts.

Assessment: Quiz

MA.7.NS.A.2

TOPIC: 7.NS.3 -- 6 Day(s)**Description**

Solve problems involving the four arithmetic operations with rational numbers.

Academic Vocabulary (What terms will students need to know?)

Addition

Subtraction

Multiplication

Division

Learning Targets

I can describe real world situations where opposite quantities have a sum of zero.
I can use a number line or positive/negative chips to show that an integer and its opposite will always have a sum of zero.
I can interpret the addition of integers by relating the values to real-world situations.
I can rewrite a subtraction problem as an addition problem by using the additive inverse.
I can show the distance between two integers on a number line is the absolute value of their difference.
I can describe real-world situations represented by the subtraction of integers.
I can use the properties of operations to add and subtract rational numbers.

MA.7.NS.A.1

I can use patterns and properties to explore the multiplication of integers.
I can use patterns and properties to develop procedures for multiplying integers.
I can describe real-world situations represented by the multiplication of integers.
I can use the relationship between multiplication and division to develop procedures for dividing integers.
I can describe real-world situations represented by the division of integers.
I can interpret the quotient in relation to the original problem.
I can generalize the procedures for multiplying and dividing integers to all rational numbers.
I can use long division to convert a rational number based on its decimal equivalent.

MA.7.NS.A.2

I can solve real-world problems that involve addition, subtraction, multiplication, and/or division of rational numbers.

MA.7.NS.A.3

TOPIC: Percent Change -- 3 Day(s)**Description**

Students will be introduced to percent for the first time in this unit. They will cover them more in depth in the Ratios and Proportions unit. Through data tracking for 2015-2016 I noticed this was a topic that my kids struggled to grasp when only seeing one time in the Ratios unit. Using the data I have added two additional lessons covering percent change. The one covered here in number sense as well as an additional lesson with our equations unit later in the year.

Academic Vocabulary (What terms will students need to know?)

Fraction

Decimal

Percent

Increase

Decrease

Learning Targets

I can use patterns and properties to explore the multiplication of integers.
I can use patterns and properties to develop procedures for multiplying integers.
I can describe real-world situations represented by the multiplication of integers.
I can use the relationship between multiplication and division to develop procedures for dividing integers.
I can describe real-world situations represented by the division of integers.
I can interpret the quotient in relation to the original problem.
I can generalize the procedures for multiplying and dividing integers to all rational numbers.
I can use long division to convert a rational number based on its decimal equivalent.
Student will also be covering parts of the state standard 7.RP.3 which covers percent change more in depth.

Assessment: Students will be assessed through a formative assessment on day 3 of this topic.

MA.7.NS.A.2

UNIT: Ratios and Proportions -- 30 Day(s)**Unit Description**

In this 30-day Grade 7 unit, students build upon sixth grade reasoning of ratios and rates to formally define proportional relationships and the constant of proportionality. Students explore multiple representations of proportional relationships by looking at tables, graphs, equations, and verbal descriptions. Students extend their understanding about ratios and proportional relationships to compute unit rates for ratios and rates specified by rational numbers. The unit concludes with students applying proportional reasoning to identify scale factor and create a scale drawing.

Enduring Understandings/Essential Learner Outcomes

A ratio is a multiplicative comparison of two quantities, or it is a joining of two quantities in a composed unit.

Forming a ratio as a measure of a real world attribute involves isolating that attribute from other attributes and understanding the effect of changing each quantity on the attribute of interest.

A number of mathematical connections link ratios and fractions.

Ratios can be meaningfully reinterpreted as quotients. A proportion is a relationship of equality between two ratios. In a proportion, the ratio of two quantities remains constant as the corresponding values of the quantities change.

A rate is a set of infinitely many equivalent ratios.

Academic Vocabulary

Ratio
Rate
Unit rate
Proportion
Proportional Relationship
Constant of proportionality
Complex fractions

TOPIC: 7.RP.1 -- 5 Day(s)**Description**

Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.

Academic Vocabulary (What terms will students need to know?)

Ratio
Rate
Unit Rate
Areas
Fractions
Lengths
Quantity

Learning Targets

Students can compute, explain, and apply unit rates.

Students can calculate the missing values in a ratio table.

Students can find the missing value of a proportion.

Students can determine whether two ratios are in a proportional relationship.

Assessment: Quiz

MA.7.RP.A.1

TOPIC: 7.RP.3 -- 10 Day(s)**Description**

Use proportional relationships to solve multi step ratio and percent problems.

Academic Vocabulary (What terms will students need to know?)

simple interest,
tax,
markups and markdowns,
gratuities and commissions,
fees,
percent increase and decrease,
percent error.

Learning Targets

I can solve problems involving rates
I can solve problems involving ratios
I can solve problems involving percentages
I can solve problems involving proportional relationships
MA.7.RP.A.3

TOPIC: 7.RP.2 Recognize and Represent Proportional Relationships between quantities. -- 15 Day(s)**Description**

The expectation of the student is to recognize and represent proportional relationships between quantities in equations, tables, graphs, diagrams and real-world situations.

Academic Vocabulary (What terms will students need to know?)

Determine when two quantities are in a proportional relationship.
Identify and/or compute the constant of proportionality (unit rate).
Recognize that the graph of any proportional relationship will pass through the origin.

Learning Targets

I can recognize and represent proportional relationships between quantities.
Determine when two quantities are in a proportional relationship.
Identify and/or compute the constant of proportionality.
Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation.
MA.7.RP.A.2

UNIT: Expression and Equations -- 32 Day(s)**Unit Description**

In this unit, students will ...
develop a deeper understanding of numbers
express different representations of rational numbers (e.g., fractions, decimals, and percent's)
solve multi-step equations and discuss the difference between equations and expressions

Enduring Understandings/Essential Learner Outcomes

Enduring Understandings
Variables can be used to represent numbers in any type mathematical problem.
Understand the difference in an expression and an equation.
Write and solve multi-step equations including all rational numbers.

Academic Vocabulary

Algebraic Expression - An expression consisting of at least one variable and also consisting of numbers and operations

Coefficient - The number part of a term that includes a variable. For example, 3 is the coefficient of the term $3x$.

Constant - A quantity having a fixed value that does not change or vary, such as a number. For example, 5 is the constant of $x + 5$.

Equation - A mathematical sentence formed by setting two expressions equal.

Inequality - A mathematical sentence formed by placing inequality symbol between two expressions
Term A number, a variable, or product and a number and variable

Numerical Expression - An expression consisting of numbers and operations

Variable - A symbol, usually a letter, which is used to represent one or more numbers

TOPIC: 7.EE.A.1 -- 6 Day(s)

Description

Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

Academic Vocabulary (What terms will students need to know?)

add
subtract
multiply
divide
factor
expand
linear expressions
rational
coefficients

Learning Targets

I can use properties of operations to generate equivalent expressions.

This is the only grade seven standard that explicitly requires students to add, subtract factor and expand linear expressions. In this standard, students need to apply the properties of operations.

For this seventh grade standard, students add, subtract and factor linear expressions. They must also be able to expand linear expressions.

In the sixth grade, the students learn how to generate equivalent expressions. The students do not explicitly expand the expressions. In the eighth grade, the students learn how to solve linear equations by expanding expressions and using the distributive property.

MA.7.EE.A.1

TOPIC: 7.EE.4 -- 5 Day(s)

Description

Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

Academic Vocabulary (What terms will students need to know?)

construct
equations
inequalities
reasoning

Learning Targets

I can solve multi-step problems posed with rational numbers
I can convert between equivalent forms of the same number
I can Assess the reasonableness of answers using mental computation and estimation.

MA.7.EE1.B.4

TOPIC: 7.EE1.A.2 -- 9 Day(s)

Description

Understand how to use equivalent expressions to clarify quantities in a problem.

Academic Vocabulary (What terms will students need to know?)

Equivalent expression
tax
percent
quantities

Learning Targets

I can write expressions using real world situations.
I can write multiple representations of expressions for the same situation.
I can explain and model how using the properties of equality and the properties of operations helps write multiple representations of expressions for the same situation.

MA.7.EE1.A.2

TOPIC: Scale Factor (7.G.1) -- 5 Day(s)**Description**

Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale

Academic Vocabulary (What terms will students need to know?)

Scale Drawings
Geometric Figures
Compute
lengths
areas
reproduce

Learning Targets

I can solve multi-step problems posed with rational numbers
I can convert between equivalent forms of the same number
I can Assess the reasonableness of answers using mental computation and estimation.
MA.7.EE1.B.3

I can solve multi-step problems posed with rational numbers
I can convert between equivalent forms of the same number
I can Assess the reasonableness of answers using mental computation and estimation.
MA.7.EE1.B.3

UNIT: Geometry -- 33 Day(s)**Unit Description**

In this unit, students delve further into several geometry topics they have been developing over the years. Grade 7 presents some of these topics, (e.g., angles, area, surface area, and volume) in the most challenging form students have experienced yet. This unit assumes students understand the basics. The goal is to build a fluency in these difficult problems. The remaining topics, (i.e., working on constructing triangles and taking slices (or cross-sections) of three-dimensional figures) are new to students.

Enduring Understandings/Essential Learner Outcomes

Students will understand that...

Surface areas of three-dimensional figures are derived from the concept of area.

Volumes of three-dimensional figures are derived from the area of the base of the figure and its height.

Scale drawings of geometric figures have a proportional relationship.

There are relationships between angles in figures and on planes.

The formulas for area and circumference of a circle are based on other geometric relationships

Academic Vocabulary

scale factor
area
perimeter
polygon
Area
Circumference
Pi
Volume
Surface Area

TOPIC: Scale Factor (7.G.1) -- 5 Day(s)**Description**

Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

Academic Vocabulary (What terms will students need to know?)

Scale Drawings
Geometric Figures
Compute
lengths
areas
reproduce
scale

Learning Targets

I can enlarge and reduce figures by a given scale.
I can describe the impact of a scale on the side lengths of scaled figures.
I can describe the impact of a scale on the area of scaled figures.
I can find unknown side lengths of similar figures.
I can find the areas of similar figures.

MA.7.GM.A.1

TOPIC: 7.GM.A.2 Use a variety of tools to construct geometric shapes. -- 5 Day(s)**Description**

Students must be able to decide if a triangle can be constructed with given constraints. Additionally, students should be able to construct special quadrilaterals given specific parameters about angles or sides.

Academic Vocabulary (What terms will students need to know?)

Triangle
Construct
Unique
Parameters
Geometric Shapes

Learning Targets

I can use a variety of tools to construct geometric shapes.
I can determine if a unique triangle can be created.
I can construct special quadrilaterals given specific parameters.
Students need to be able to use protractors to see if the geometric shapes can be created. The struggle to make angles with protractors, but they make the Triangle Inequality Theorem more meaningful.

Assessment: Students will be given rulers and protractors to see how many of the shapes they construct.

Lab

MA.7.GM.A.2

TOPIC: 7.GM.A.3 -- 4 Day(s)**Description**

Students will learn to describe two-dimensional cross sections of pyramids, prisms, cones and cylinders.

Academic Vocabulary (What terms will students need to know?)

pyramids
cones
cylinders
prisms
cross-sections

Learning Targets

I can define and identify right, supplementary, complementary, vertical, and adjacent angles.
I can give specific characteristics, compare and contrast the types of angles.

MA.7.GM.A.3

TOPIC: 7.GMA.4 -- 4 Day(s)**Description**

Students must understand the concepts of circles.

Academic Vocabulary (What terms will students need to know?)

Area
circumference
radius
Pi

Learning Targets

I can identify the radius and diameter of a circle.
I can find the circumference of a circle.
I can find the area of a circle.
The expectation is for the student to understand the concept of circles as well as the relationships between area, perimeter, radius and circumference.

Assessment: Quiz

MA.7.GM.A.4

TOPIC: Angle Relationships (7.GM.5) -- 5 Day(s)**Description**

Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

Academic Vocabulary (What terms will students need to know?)

Supplementary
Vertical
Adjacent
Complementary

Learning Targets

I can define and identify right, supplementary, complementary, vertical, and adjacent angles.
I can give specific characteristics, compare and contrast the types of angles.
I can find unknown angle measurements by using characteristics of supplementary, complementary, vertical, and adjacent angles.

MA.7.GM.B.5

TOPIC: Volume and Surface Area (7.GM.6) -- 10 Day(s)**Description**

Solve real-world and mathematical problems involving area, volume and surface area of two- and three dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Academic Vocabulary (What terms will students need to know?)

Supplementary
Vertical
Adjacent
Complementary
Inscribed
Circumference
Radius
Diameter
Pi π
Pyramids
Face
Base

Learning Targets

I can model and explain how to find the perimeter of any polygon.
I can model and explain why the formulas for finding the area of triangles, squares, rectangles, parallelograms, and trapezoids works
I can construct, draw, and give characteristics of triangular and rectangular prisms and pyramids.
I can name, draw, identify, and construct nets from triangular and rectangular prisms and pyramids.
I can use nets to find the surface area of triangular and rectangular prisms, and pyramids
I can model and explain why the formula for finding the volume of triangular and rectangular prisms and pyramids works.
I can model and explain why volume of prisms is calculated by multiplying the area of the base times the height.
I can construct 2- and 3- dimensional composite shapes.
I can model and explain how to find the area, surface area, and volume of composite 2- and 3-dimensional shapes.
I can find missing dimensions of 2- and 3- dimensional composite shapes.
I can model and explain the effect of the perimeter, area, surface area, and volume of changing the dimensions of 2- and 3-dimensional shapes.
MA.7.GM.B.6

UNIT: Statistics and Probability -- 34 Day(s)**Unit Description**

Students will use random sampling to draw inferences about a population as well as Investigate chance processes and develop, use, and evaluate probability models.

Enduring Understandings/Essential Learner Outcomes

How can samples be used to make inferences about a population?
What sampling techniques can we use to increase validity of population inferences?
How can we use data displays, measures of center and measures of variability from random samples to draw informal comparative inferences about two populations?
What is probability and how can I use it to describe the likelihood of an event occurring?
What is the difference between experimental and theoretical probability and how can I use these ideas to make predictions?
How can I develop and compare probability models and use them to find probabilities of events?
How can I find probabilities of compound events using sample spaces represented by organized lists, tables, tree diagrams, and simulation?

Academic Vocabulary

Variation / Variability
Distribution
Measures of Center
Measures of Variability
Sample Spaces

TOPIC: Random Sampling (7.DS.1) -- 4 Day(s)

Description

Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

Academic Vocabulary (What terms will students need to know?)

Random Sampling
Population
Representative Sample
Inferences

Learning Targets

I can explain that information can be obtained by performing a survey.
I can explain why entire populations may not always be surveyed.
I can identify an appropriate sample of population for a specified statistical question that is representative of the population in question.
I can make inferences about populations based on data obtained.
MA.7.DSP.A.1

TOPIC: Use Data from Samples. (7.DS.2) -- 3 Day(s)

Description

Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.

Learning Targets

I can make inferences about a population based on data.
I can collect and use multiple samples of data to make generalizations.
I can gauge, explain, and discuss issues of variation in samples of data.
MA.7.DSP.A.2

TOPIC: Measures of Center and variability (7.DS.3 and 7.DS.4) -- 10 Day(s)**Description**

Students can Informally assess the degree of visual overlap of two numerical data distributions with similar variability's, measuring the difference between the centers by expressing it as a multiple of a measure of variability.

Students can use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.

Academic Vocabulary (What terms will students need to know?)

Variation / Variability

Distribution

Measures of Center

Measures of Variability

Learning Targets

I can graph and interpret data in dot plots, histograms, and box plots.
I can explain that measures of center are mean and median.
I can explain that measures of variability are MAD and IQR.
I can describe how to and find the mean and MAD of given data.
I can describe how to and find the median and IQR of given data.
I can compare and contrast 2 sets of data.
I can define and give uses of measures of center and measures of variability.
I can model, explain, compare, and contrast the overlap of two sets of data.
I can model and explain that an increase in variability can increase the overlap of two sets of data.

MA.7.DSP.B.4

I can graph and interpret data in dot plots, histograms, and box plots.
I can explain that measures of center are mean and median.
I can explain that measures of variability are MAD and IQR.
I can describe how to and find the mean and MAD of given data.
I can describe how to and find the median and IQR of given data.
I can compare and contrast 2 sets of data.
I can define and give uses of measures of center and measures of variability.
I can model, explain, compare, and contrast the overlap of two sets of data.
I can model and explain that an increase in variability can increase the overlap of two sets of data.

MA.7.DSP.B.3

TOPIC: Probability (7.DS.5) -- 4 Day(s)**Description**

Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around $\frac{1}{2}$ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event

Academic Vocabulary (What terms will students need to know?)

Sample Space

Learning Targets

I can order rational numbers by identifying points on number line.
I can use the vocabulary impossible, unlikely, likely, or certain to describe the probability of an event.
I can relate this probability to the number line where 0 is impossible and 1 is certain.
I can prove that the sum of all possible outcomes of a probability scenario is 1.
I can recognize that the probability of any single event can be expressed in terms such as impossible, unlikely, likely, or certain or as a number between 0 and 1, inclusive, as illustrated on the number line below.

MA.7.DSP.C.5

TOPIC: Probability (7.DS.6) -- 6 Day(s)**Description**

Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability

Academic Vocabulary (What terms will students need to know?)

Sample space

Long-run relative frequency

Learning Targets

I can change fractions to decimals.

I can give the probability of a chance event. Define relative frequency.

I can predict the approximate relative frequency given the probability.

I can use a calculator or web-based simulations to collect data. Conduct multiple probability experiments, collecting a very large number of trials to make a conjecture about the long-run relative frequency of each.

I can recognize that as the number of trials increase in a probability experiment, the experimental probability approaches the theoretical probability.

I can make conjectures about the relationship between theoretical probability and experimental probability related to the number of trials to justify relative frequency.

MA.7.DSP.C.6

TOPIC: Probability Models (7.DS.7) -- 4 Day(s)**Description**

Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.

Academic Vocabulary (What terms will students need to know?)

Sample space

Learning Targets

I can develop a probability model.

I can conduct multiple probability experiments.

I can compare and contrast theoretical probability and experimental probability related to sample size.

I can explain possible sources of discrepancy between theoretical and experimental probability.

MA.7.DSP.C.7

TOPIC: Compound Probability -- 3 Day(s)**Description**

Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

Academic Vocabulary (What terms will students need to know?)

Sample Spaces

Learning Targets

I can model compound events using organized lists, tables, and tree diagrams.

I can design and use a simulation to generate frequencies for compound events.

I can model compound events using organized lists, tables, and tree diagrams.

I can design and use a simulation to generate frequencies for compound events.

MA.7.DSP.C.8