

New Jersey Student Learning Standards for Mathematics and Student Learning Objectives

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Grade 7 – Operations with Rational Numbers – Unit 1

Rationale

Unit 1 focuses on operations with rational numbers and algebraic expressions. Learners extend previous understandings of addition and subtraction to add and subtract rational numbers. Similarly, they extend previous understandings of multiplication and division of fractions to multiply and divide rational numbers. They solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. They apply properties of operations to calculate with numbers in any form and convert between forms as appropriate.

Note: Double asterisks (**) indicate that the example(s) included within the New Jersey Student Learning Standard may be especially informative when considering the Student Learning Objective.

Grade 7 – Unit 1, Module A

Standard	Student Learning Objectives We are learning to ... / We are learning that ...
■ 7.NS.A.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. a. Describe situations in which opposite quantities combine to make 0. <i>For example, in the first round of a game, Maria scored 20 points. In the second round of the same game, she lost 20 points. What is her score at the end of the second round?</i>	▪ apply previous understandings of addition to add rational numbers ▪ describe situations in which opposites combine to make zero ▪ show by modeling, a number and its opposite have a sum of zero (additive inverse)

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Standard	Student Learning Objectives We are learning to ... / We are learning that ...
■ 7.NS.A.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. b. Understand $p + q$ as the number located a distance q from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.	▪ $p + q$ is the number located a distance q from p, in the positive or negative direction depending on whether q is positive or negative (e.g. $5 + -4$ is 4 units in the negative direction from 5 and, similarly, $5 + 4$ is also 4 units away in the positive direction) ▪ represent addition and subtraction of signed rational numbers on a vertical or horizontal number line ▪ interpret sums of rational numbers in real world situations
■ 7.NS.A.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. c. Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference and apply this principle in real-world contexts.	▪ apply previous understandings of subtraction to subtract rational numbers ▪ subtraction of rational numbers is the same as adding the additive inverse, $p - q = p + (-q)$ ▪ show by modeling on a number line that the distance between two rational numbers is the absolute value of their differences and apply the concept in real world contexts
■ 7.NS.A.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. d. Apply properties of operations as strategies to add and subtract rational numbers.	▪ apply properties of operations as strategies to add and subtract rational numbers

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Standard	Student Learning Objectives We are learning to ... / We are learning that ...
■ 7.NS.A.2 Apply and extend previous understandings of multiplication and division of fractions to multiply and divide rational numbers. a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.	▪ apply previous understandings of multiplication of fractions to multiply signed rational numbers ▪ operations on signed rational numbers continue to satisfy the properties of operations ▪ the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers ▪ interpret the products of signed rational numbers in real world situations
■ 7.NS.A.2 Apply and extend previous understandings of multiplication and division of fractions to multiply and divide rational numbers. b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real world contexts.	▪ apply previous understandings of division of fractions to divide signed rational numbers ▪ integers can be divided as long as the divisor is not zero ▪ division of integers results in a signed rational number ▪ If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$ ▪ interpret quotients of signed rational numbers by describing real world contexts
■ 7.NS.A.2 Apply and extend previous understandings of multiplication and division of fractions to multiply and divide rational numbers. c. Apply properties of operations as strategies to multiply and divide rational numbers.	▪ apply properties of operations as strategies to multiply and divide signed rational numbers
■ 7.NS.A.2 Apply and extend previous understandings of multiplication and division of fractions to multiply and divide rational numbers. d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.	▪ convert a rational number to a decimal using long division ▪ the decimal form of a rational number terminates in zeros or eventually repeats

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Standard	Student Learning Objectives We are learning to ... / We are learning that ...
■ 7.NS.A.3 Solve real-world and mathematical problems involving the four operations with rational numbers.	▪ solve real-world and mathematical problems involving the four operations with rational numbers in fraction form ▪ solve real-world and mathematical problems involving the four operations with rational numbers in decimal form

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Grade 7 – Unit 1, Module B

Standard	Student Learning Objectives We are learning to ... / We are learning that ...
■ 7.EE.A.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	▪ apply the properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients
■ 7.EE.A.2 Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. <i>For example, $a + 0.05a = 1.05a$ means that “increase by 5%” is the same as “multiply by 1.05.”</i>	▪ rewriting an expression in different forms can clarify the problem and how the quantities are related
■ 7.EE.B.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. <i>For example: If a woman making \$25 an hour gets a 10% raise, she will make an additional $\frac{1}{10}$ of her salary an hour, or \$2.50, for a new salary of \$27.50. If you want to place a towel bar $9\frac{3}{4}$ inches long in the center of a door that is 27 $\frac{1}{2}$ inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.</i>	▪ convert between forms (fractions, decimals, and whole numbers) as appropriate to solve multi-step real life and mathematical problems with positive and negative rational numbers in any form ▪ apply the properties of operations to calculate with numbers in any form when solving multi-step real-life and mathematical problems, and assess the reasonableness of answers using mental computation and estimation strategies

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Grade 7 – Equations, Inequalities, and Two-Dimensional Geometric Concepts – Unit 2

Rationale

Unit 2 focuses on equations, inequalities and geometric concepts. Learners construct simple equations and inequalities to solve problems by reasoning about the quantities. They solve simple equations of particular forms fluently, graph the solution set of inequalities, and interpret solutions in the context of the problem. The unit also includes geometric concepts of area, surface area and volume. Learners add finding area and circumference of circles to their repertoire of skills related to area and perimeter. They solve real-world and mathematical problems involving area of two dimensional objects composed of triangles, quadrilaterals and polygons. Learners return to writing and solving simple equations to conclude the unit, using facts about supplementary, complementary, vertical, and adjacent angles in multi-step problems.

Grade 7 – Unit 2, Module A

Standard	Student Learning Objectives We are learning to ... / We are learning that ...
7.EE.B.4 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. a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. <i>For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?</i>	▪ solve world problems by reasoning about their quantities and constructing simple equations of the form $p(x + q) = r$, where p, q, and r are specific rational numbers ▪ compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. ▪ solve equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers with accuracy and efficiency

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Grade 7 – Unit 2, Module B

Standard	Student Learning Objectives We are learning to ... / We are learning that ...
■ 7.EE.B.4 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. b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. <i>For example: As a salesperson, you are paid \$50 per week plus \$3 per sale. This week you want your pay to be at least \$100. Write an inequality for the number of sales you need to make and describe the solutions.</i>	▪ solve world problems by reasoning about their quantities and constructing simple inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers ▪ use variables to represent unknown quantities in mathematical problems to construct and solve simple inequalities ▪ describe the solution of an inequality using a graph and inequality statement and interpret its meaning in the context of the problem

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Grade 7 – Unit 2, Module C

Standard	Student Learning Objectives We are learning to ... / We are learning that ...
7.G.B.4 Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.	- know the formulas for area and circumference of a circle - solve problems using the formula for circumference of a circle and for the area of a circle - informally derive the relationship between the circumference and area of a circle
7.G.B.6 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.	solve real-world and mathematical problems involving area of two-dimensional objects composed of triangles, quadrilaterals, and polygons
7.G.B.5 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.	- supplementary angles are two angles whose sum is 180 degrees and complementary angles are two angles whose sum is 90 degrees - vertical angles, the pairs of opposite angles made by two intersecting lines, have equal measures - adjacent angles are two angles that share a vertex and a side - 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

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Grade 7 – Proportionality and Three-Dimensional Geometric Concepts – Unit 3

Rationale

Unit 3 focuses on proportionality. Learners begin the unit, extending the work with unit rates from grade 6, to compute unit rates associated with ratios of fractions. They recognize and represent proportional relationships in multiple ways, deciding whether two quantities are in a proportional relationship. They identify the constant of proportionality in a variety of representations (e.g. tables, graphs, equations, diagrams, and verbal descriptions) and use proportions to solve problems involving scale drawings of geometric figures. Grade 7 learners work with proportions concludes as they represent proportional relationships by equations, interpret points on graphs of proportional relationships in context, and use proportional relationships to solve multistep percent and ratio problems.

The geometric concepts of Unit 3 focus on analyzing geometric figures. Learners solve real-world and mathematical problems involving volume and surface area of three-dimensional objects, describe the two-dimensional figures that result from slicing three-dimensional figures and draw (with technology, with ruler and protractor, as well as freehand) geometric shapes with given conditions. They focus on constructing triangles and noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

Grade 7 – Unit 3, Module A

Standard	Student Learning Objectives We are learning to ... / We are learning that ...
7.RP.A.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. <i>For example, if a person walks $\frac{1}{2}$ mile in each $\frac{1}{4}$ hour, compute the unit rate as the complex fraction $\frac{1/2}{1/4}$ miles per hour, equivalently 2 miles per hour.</i>	compute unit rates involving ratios of fractions (complex fractions) in quantities measured in like or different unit

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Standard	Student Learning Objectives We are learning to ... / We are learning that ...
■ 7.RP.A.2 Recognize and represent proportional relationships between quantities. a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.	▪ decide whether two quantities show a proportional relationship by testing for equivalent ratios in a table ▪ decide whether two quantities show a proportional relationship by graphing on a coordinate plane and observing whether the graph is a straight line through the origin ▪ identify the constant of proportionality (unit rate) in equations and verbal descriptions of proportional relationships ▪ identify the constant of proportionality (unit rate) in tables, graphs, and diagrams
● 7.G.A.1 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.	▪ 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

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Grade 7 – Unit 3, Module B

Standard	Student Learning Objectives We are learning to ... / We are learning that ...
■ 7.RP.A.2 Recognize and represent proportional relationships between quantities. c. Represent proportional relationships by equations. <i>For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as $t = pn$.</i> d. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0, 0)$ and $(1, r)$ where r is the unit rate.	- represent proportional relationships by equations using the constant of proportionality (unit rate) - explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0, 0)$ and $(1, r)$ where r is the unit rate
■ 7.RP.A.3 Use proportional relationships to solve multistep ratio and percent problems. <i>Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.</i>	- solve multistep ratio and percent problems using proportional relationships - solve multistep ratio and percent problems sing proportional relationships involving simple interest and sales tax - solve multistep ratio and percent problems using proportional relationships involving markups and markdowns - solve multistep ratio and percent problems using proportional relationships involving gratuities, commissions, and fees - solve multistep ratio and percent problems using proportional relationships involving percent increase, percent decrease, and percent error

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Grade 7 – Unit 3, Module C

Standard	Student Learning Objectives We are learning to ... / We are learning that ...
7.G.A.2 Draw (with technology, with ruler and protractor, as well as freehand) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.	- draw geometric shapes with given conditions with technology, with rulers and protractors, as well as freehand - construct triangles from three measures of angles or sides using technology and notice when the conditions determine a unique triangle, more than one triangle, or no triangle - construct triangles from three measures of angles or sides using rulers and protractors and notice when the conditions determine a unique triangle, more than one triangle, or no triangle
7.G.A.3 Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.	describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids
7.G.B.6 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.	solve real-world and mathematical problems involving volume and surface area of three-dimensional objects composed of cubes and right prisms

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Grade 7 – Probability and Statistics – Unit 4

Rationale

In Unit 4, learners are introduced to probability. The focus of the unit is on both probability and statistics. Learners understand that the probability of a chance event is a number between 0 and 1, with larger numbers indicating greater likelihood and probabilities near 0 indicating an unlikely event. They collect data to approximate the probability of a chance event. Learners develop uniform and non-uniform probability models, use them to find probabilities, and compare probabilities from a model to observed frequencies. Learners conclude the first module of the unit by representing sample spaces and finding probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

In the final grade 7 module, learners understand that statistics can be used to gain information about a population by examining a sample of the population, and understand the role of random sampling in producing valid inferences. They use data from a random sample to draw inferences about a population and generate multiple samples to gauge the variation in predictions. Building on the work of grade 6, they use measures of center and measures of variability for data from random samples to make informal inferences and compare two populations.

Grade 7 – Unit 4, Module A

Standard	Student Learning Objectives We are learning to ... / We are learning that ...
7.SP.C.5 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.	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

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Standard	Student Learning Objectives We are learning to ... / We are learning that ...
▣ 7.SP.C.6 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. <i>For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.</i>	▪ approximate the probability of a chance event by collecting data on the chance process that it produces observing long run relative frequency ▪ predict the approximate relative frequency
▣ 7.SP.C.7 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. a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. <i>For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.</i>	▪ develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events
▣ 7.SP.C.7 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. b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. <i>For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?</i>	▪ develop a probability model, which may not be uniform, by observing frequencies in data generated from a chance process ▪ compare probabilities from a model to observed frequencies and explain possible sources of the discrepancy if the agreement is not good

New Jersey Student Learning Standards for Mathematics and Student Learning Objectives

Standard	Student Learning Objectives We are learning to ... / We are learning that ...
▣ 7.SP.C.8 Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.	the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs
▣ 7.SP.C.8 Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event.	- represent the sample space for a compound event using various methods such as, organized lists, tables, and tree diagrams - identify the outcomes in the sample space which compose an event that has been described in everyday language
▣ 7.SP.C.8 Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. c. Design and use a simulation to generate frequencies for compound events. <i>For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?</i>	design and use a simulation to generate frequencies for compound events

New Jersey Student Learning Standards for Mathematics and Student Learning Objectives

Grade 7 – Unit 4, Module B

Standard	Student Learning Objectives We are learning to ... / We are learning that ...
▣ 7.SP.A.1 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.	▪ statistics is 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 ▪ random sampling tends to produce representative samples of the population and support valid inferences
▣ 7.SP.A.2 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. <i>For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.</i>	▪ use data from a random sample to make inferences about a population with an unknown characteristic ▪ generate multiple samples, or simulated samples, of the same size to gauge variation in estimates or predictions
○ 7.SP.B.3 Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. <i>For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.</i>	▪ informally gauge the extent of visual overlap between two numerical distributions with similar variabilities, measure the difference between the centers and express the difference as a multiple of the measure of variability

New Jersey Student Learning Standards for Mathematics and Student Learning Objectives

Standard	Student Learning Objectives We are learning to ... / We are learning that ...
● 7.SP.B.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. <i>For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.</i>	▪ draw informal comparative inferences about two populations by using the measures of center (mean and median) and measures of variability (interquartile range and mean absolute deviation) from random samples**