

# Mathematics Standards Clarification for Grade 7



 **The**  
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Standards-Based Instruction for  
ALL Nevada Students



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## Ratios and Proportions

Seventh graders extend what they learned in grade 6 about ratios to analyzing proportions and proportional relationships. Students calculate unit rates with complex fractions and move to recognizing and representing proportional relationships in equations and on graphs. These skills and understandings are used to solve multi-step ratios and percent problems involving real-world scenarios such as interest, tax, shopping sales, and so on (Miles and Williams, 2016).

### Cluster

Analyze proportional relationships and use them to solve real-world and mathematical problems.

### NVACS 7.RP.A.1 (Major Works)

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

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"> <li>● MP 1 Students solve multi-step ratio and real world percent problems.</li> <li>● MP 3 Students recognize proportional relationships from non-proportional ones and discuss their reasoning with others.</li> <li>● MP 4 Students learn to represent proportional relationships as tables, graphs, verbal descriptions, diagrams, and equations.</li> <li>● MP 6 Students use units in their ratios requiring them to attend to the units such as 8 miles in 4 hours is a rate of 2 miles per hour.</li> </ul> (Miles and Williams, 2016)
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Scavenger hunts</li> <li>● Webquests</li> <li>● Centers/stations</li> </ul>
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Understand the concept of ratio and use ratio language</li> <li>● Unit rate</li> <li>● Graph proportional relationships</li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Slope of a graph</li> </ul>
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">Exploring Ratio and Proportional Relationships with the Orange Juice Problem</a> (SBAC Digital Library-account needed)</li> <li>● <a href="#">Molly's Run</a> (Illustrative Mathematics)</li> <li>● <a href="#">Ratios and Proportional Relationships</a> (Unbounded)</li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● <a href="#">7.RP.A.1 SBAC Sample Assessment Items</a></li> </ul>

# Ratios and Proportions

## Cluster

Analyze proportional relationships and use them to solve real-world and mathematical problems.

### NVACS 7.RP.A.2 (Major Works)

Recognize and represent proportional relationships between quantities.

- **7.RP.A.2.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.
- **7.RP.A.2.b**  
Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
- **7.RP.A.2.c**  
Represent proportional relationships by equations. 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  $t = pn$ .
- **7.RP.A.2.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.

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"><li>● MP 1 Students solve multi-step ratio and real world percent problems.</li><li>● MP 3 Students recognize proportional relationships from non-proportional ones and discuss their reasoning with others.</li><li>● MP 4 Students learn to represent proportional relationships as tables, graphs, verbal descriptions, diagrams, and equations.</li><li>● MP 6 Students use units in their ratios requiring them to attend to the units such as 8 miles in 4 hours is a rate of 2 miles per hour.</li></ul> (Miles and Williams, 2016)

Element	Exemplars
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Begin by showing students proportions are just equivalent fractions.</li> <li>● To solve ratio situations with rational numbers, including complex fractions use: <ul style="list-style-type: none"> <li>○ Scavenger hunts</li> <li>○ Webquests</li> <li>○ Centers/stations</li> </ul> </li> <li>● Sort real-world examples of proportional relationships from non-examples. Then have students create their own examples.</li> <li>● Model proportional relationships by creating tables. Determine if a proportional relationship exists from a given table.</li> <li>● Translate a proportional relationship from a verbal description into a diagram.</li> <li>● Play a sorting game to match the verbal description, graph, constant of proportionality (equation), and table.</li> <li>● Give students a selection of different lines to graph. Have them identify which are proportional and which are not and explain how they know.</li> </ul> <p>(Miles and Williams, 2016)</p>
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Understand the concept of ratio and use ratio language</li> <li>● Unit rate</li> <li>● Graph proportional relationships</li> <li>● Skip counting</li> <li>● Understand the Coordinate Plane</li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Use ratio and rate reasoning to solve real-world problems</li> <li>● Slope of a graph</li> <li>● Percent proportions used to find relative frequency in two-way tables</li> <li>● Solving rational expressions using proportional reasoning</li> </ul>
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">Buying Bananas, Assessment Version</a>: (Illustrative Mathematics)</li> <li>● <a href="#">Robot Races</a> (Illustrative Mathematics)</li> <li>● <a href="#">Introducing Proportional Relationships with Tables</a> (Open-Up Math)</li> <li>● <a href="#">More about Constant of Proportionality</a> (Open-Up Math)</li> <li>● <a href="#">Proportionality</a> (Illustrative Mathematics)</li> <li>● <a href="#">Proportional Relationships and Equations</a> (Open-Up Math)</li> <li>● <a href="#">Gym Membership Plans</a>: (Illustrative Mathematics)</li> <li>● <a href="#">Using Graphs to Compare Relationships</a> (Open-Up Math)</li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● <a href="#">7.RP.A.2 SBAC Sample Assessment Items</a></li> </ul>

## Ratios and Proportions

### Cluster

Analyze proportional relationships and use them to solve real-world and mathematical problems.

### NVACS 7.RP.A.3 (Major Works)

Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"> <li>● MP 1 Students solve multi-step ratio and real world percent problems.</li> <li>● MP 3 Students recognize proportional relationships from non-proportional ones and discuss their reasoning with others.</li> <li>● MP 4 Students learn to represent proportional relationships as tables, graphs, verbal descriptions, diagrams, and equations.</li> <li>● MP 6 Students use units in their ratios requiring them to attend to the units such as 8 miles in 4 hours is a rate of 2 miles per hour.</li> </ul> <p>(Miles and Williams, 2016)</p>
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Use take-out menus to calculate meal cost, tax, tip, and total cost.</li> <li>● Use examples from the media to explore and describe vocabulary in this standard.</li> <li>● Use graphic organizer, foldable, or acting to help students remember steps.</li> </ul> <p>(Miles and Williams, 2016)</p>
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Recognize and represent proportional relationships.</li> <li>● Use ratio and rate reasoning to solve real-world problems.</li> <li>● Understand what percents represent.</li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Relate slope to real-world problems.</li> </ul>
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">Tax, Tip and Discount</a> (Open-Up Math)</li> <li>● <a href="#">All percent tasks</a> (Illustrative Mathematics)</li> <li>● <a href="#">Percent Increase/Decrease</a> (Open-Up Math)</li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● <a href="#">7.RP.A.3 SBAC Sample Assessment Items</a></li> </ul>

# Number Systems

Seventh graders develop an understanding of number, recognizing fractions, decimals, and percents as different representations of rational numbers. Students extend addition, subtraction, multiplication, and division to all rational numbers and explain and interpret the rules for adding, subtracting, multiplying, and dividing with negative numbers. Seventh graders solve real world mathematical problems involving all four operations with rational numbers.

## Cluster

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

### NVACS 7.NS.A.1 (Major Supporting Work)

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.

- **7.NS.A.1.a**  
Describe situations in which opposite quantities combine to make 0. For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.
- **7.NS.A.1.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.
- **7.NS.A.1.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.
- **7.NS.A.1.d**  
Apply properties of operations as strategies to add and subtract rational numbers.

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"><li>● MP 4 Students use multiple strategies to demonstrate the same meaning of an operation which include modeling with manipulative or on a number line.</li><li>● MP 6 Students are working toward being independent thinkers by self-correcting any errors they find.</li><li>● MP 7 Students make use of what they already know about operations and their properties and extend that understanding to rational numbers.</li><li>● MP 8 Students use several examples of integer combination to generalize a formal rule.</li></ul> (Miles and Williams, 2016)



Element	Exemplars
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Give students black and red tiles as a manipulative tool to add positives and negatives.</li> <li>● Discuss the word opposite.</li> <li>● Have students create stories where opposites make zero and model it on a number line.</li> <li>● Teach the multiplication rules prior to add/subtract integers. Apply them to the double symbols between the 1<sup>st</sup> and 2<sup>nd</sup> integer <math>-3 - (-2)</math> become <math>-3 + 2</math> due to a <math>[- x - = +]</math></li> </ul>
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Adding and subtracting decimals</li> <li>● Adding and subtracting fractions</li> <li>● Understand development of the number line</li> <li>● Understand and classify rational numbers</li> <li>● Recognize the opposite of a number</li> <li>● Discuss contextual examples of positives and negatives</li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Simplifying and solving expressions and equations</li> <li>● Compute with the Distance formula and Quadratic formula</li> <li>● Transformations</li> </ul>
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">Domain- The Number System</a> (Illustrative Mathematics)</li> <li>● <a href="#">Working with Algebra Tiles</a> (Math Bits)</li> <li>● <a href="#">Math Middle School Resources</a> (SNRPDP)</li> <li>● <a href="#">Number Systems BLAST</a> (CCSD Math Blast Module)</li> <li>● <a href="#">Number System Modules</a> (Engage NY)</li> <li>● <a href="#">Addition and Subtraction of Integers and Rational Numbers</a> (Unbounded)</li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● <a href="#">7.NS.A.1 &amp; 7.NS.A.2 Achieve The Core Assessment Examples</a></li> <li>● <a href="#">7.NS.A.1 SBAC Sample Assessment Items</a></li> </ul>

# Number Systems

## Cluster

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

### NVACS 7.NS.A.2 (Major Works)

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

- **7.NS.A.2.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.
- **7.NS.A.2.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.
- **7.NS.A.2.c**  
Apply properties of operations as strategies to multiply and divide rational numbers.
- **7.NS.A.2.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.

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"><li>● MP 4 Students use multiple strategies to demonstrate the same meaning of an operation which include modeling with manipulative or on a number line.</li><li>● MP 6 Students are working toward being independent thinkers by self-correcting any errors they find.</li><li>● MP 7 Students make use of what they already know about operations and their properties and extend that understanding to rational numbers.</li><li>● MP 8 Students use several examples of integer multiplication and division to generalize a formal rule.</li></ul> <p>(Miles and Williams, 2016)</p>

Element	Exemplars
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Use real world contexts to help students make sense of multiplication of rational numbers.</li> <li>● Give students black and red tiles as a manipulative tool.</li> <li>● Discuss the word opposite.</li> <li>● Show students why a negative times a negative equals a positive using cell phones. <ul style="list-style-type: none"> <li>○ Have two students set their phones to negative pictures- using an iPhone, go to Settings, select General, select Accessibility, select Display Accommodations, select Invert Colors, and turn on Classic Inverse.</li> <li>○ On Phone 1, open up a stored picture.</li> <li>○ On Phone 2, open the camera app.</li> <li>○ Phone 2 views the picture on Phone 1 using the camera app - Phone 2 will display the picture using positive colors (i.e. the original colors of the picture, not the inverted colors)</li> </ul> </li> <li>● Show students why a negative times a positive equals a negative using cell phones. <ul style="list-style-type: none"> <li>○ Have one student set their phone to negative pictures- using an iPhone, go to Settings, select General, select Accessibility, select Display Accommodations, select Invert Colors, and turn on Classic Inverse</li> <li>○ On Phone 1, open up a stored picture</li> <li>○ On Phone 2, open the camera app</li> <li>○ Phone 2 views the picture on Phone 1 using the camera app - Phone 2 will display the picture using negative colors (i.e. the inverted colors, not the original colors of the picture)</li> </ul> </li> <li>● Have students develop the rules using a graphing calculator.</li> <li>● Discuss that a negative in front of a fraction can either be written in the numerator or denominator but not both (integer rules).</li> <li>● Discuss that <math>\div</math> is the same as a fraction bar and can be written interchangeably.</li> <li>● Use a deck of cards (black are positive and red are negative) to develop multiplication and division rules.</li> </ul>
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Understand or classify rational numbers.</li> <li>● Recognize the opposite of a number.</li> <li>● Students must know multiples and math facts.</li> <li>● Know how to multiply decimals and fractions.</li> <li>● Long division.</li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Proportional reasoning</li> <li>● Dilation of ordered pairs, e.g. dilate by <math>\frac{2}{3}</math></li> <li>● Distributive Property to simplify expressions and solve equations</li> <li>● Finding relative frequency (%) from two-way tables</li> <li>● Undefined and zero slope (dividing by zero)</li> </ul>

Element	Exemplars
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">Performance Assessment Task- Cat Food</a> (Inside Mathematics)</li> <li>● <a href="#">Math Middle School Resources</a> (SNRPDP)</li> <li>● <a href="#">Number Systems BLAST</a> (CCSD Math Blast Modules)</li> <li>● <a href="#">Number System Modules</a> (Engage NY)</li> <li>● <a href="#">Multiplication and Division of Rational Numbers</a> (Unbounded)</li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● <a href="#">7.NS.A.1 &amp; 7.NS.A.2 Achieve The Core Assessment Examples</a></li> <li>● <a href="#">7.NS.A.2 SBAC Sample Assessment Items</a></li> </ul>

# Number Systems

## Cluster

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

### NVACS 7.NS.A.3 (Major Works)

Solve real-world and mathematical problems involving the four operations with rational numbers.<sup>1</sup>

<sup>1</sup> Computations with rational numbers extend the rules for manipulating fractions to complex fractions.

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"> <li>● MP 4 Students use multiple strategies to demonstrate the same meaning of an operation which include modeling with manipulative or on a number line.</li> <li>● MP 6 Students are working toward being independent thinkers by self-correcting any errors they find.</li> <li>● MP 7 Students make use of what they already know about operations and their properties and extend that understanding to rational numbers.</li> <li>● MP 8 Students use several examples of integer operations to generalize a formal rule.</li> </ul> <p>(Miles and Williams, 2016)</p>
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Create order of operations problems with rational numbers-students need to understand the fraction bar/absolute value is a grouping symbol.</li> <li>● Teach students what a complex fraction is and how to turn it into a proper/improper fraction using fraction division rules.</li> <li>● Discuss that <math>\div</math> is the same as a fraction bar and can be written interchangeably.</li> <li>● Create/use contextual problems.</li> </ul>
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Adding and subtracting decimals</li> <li>● Adding and subtracting fractions</li> <li>● Understand development of the number line</li> <li>● Understand and classify rational numbers</li> <li>● Recognize the opposite of a number</li> <li>● Students must know multiples and math facts</li> <li>● Know how to multiply decimals and fractions</li> <li>● Long division</li> <li>● Order of operations</li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Proportions with complex fractions</li> <li>● Expressions with negative exponents</li> <li>● Solving equations when students try to divide by a fraction-understanding why dividing by a fraction is the same as multiplying by the reciprocal</li> </ul>

Element	Exemplars
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">Math Middle School Resources</a> (SNRPDP)</li> <li>● <a href="#">Number Systems BLAST</a> (CCSD Math Blast Modules)</li> <li>● <a href="#">Number System Modules</a> (Engage NY)</li> <li>● <a href="#">Applying Operations with Rational Numbers to Expressions and Equations</a> (Unbounded)</li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● <a href="#">7.NS.A.3 SBAC Sample Assessment Items</a></li> </ul>

## Expressions and Equations

Seventh graders use properties of operations to generate equivalent expressions. They use the arithmetic of rational numbers to formulate expressions and equations in one variable and use these equations to solve problems. The seventh grade focus of solving real world and mathematical problems using numerical and algebraic expressions and equations provides the foundation for equation work in Grade 8 and assists in building the foundation work for writing equivalent, nonlinear expressions in later grades.

### Cluster

Use properties of operations to generate equivalent expressions.

### NVACS 7.EE.A.1 (Major Works)

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

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"> <li>● MP 2 Students use expressions in different forms to understand how quantities in an equation are related.</li> <li>● MP 4 Students write expressions and equations to model contextual problems.</li> <li>● MP 6 Students communicate their reasoning using precise mathematical vocabulary.</li> </ul> <p>(Miles and Williams, 2016)</p>
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Discovery activity with/without algebra tiles.</li> </ul>
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Properties of operations</li> <li>● Identify equivalent expressions</li> <li>● Basic operations with integers and fractions</li> <li>● Order of operations</li> <li>● <math>x = 1x</math></li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Apply expressions to writing equations and formulas</li> <li>● Systems of two linear equations with two variables</li> </ul>
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">Menu Math</a> (Let's Go Learn)</li> <li>● <a href="#">Working with Algebra Tiles</a> (MathBits)</li> <li>● <a href="#">Algebra Tiles</a> (Illuminations)</li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● <a href="#">Performance Task- T-Shirts</a> (Core Mathematics)</li> <li>● <a href="#">Ticket to Ride</a> (Illustrative Mathematics)</li> <li>● <a href="#">7.EE.A.1 SBAC Sample Assessment Items</a></li> </ul>

## Expressions and Equations

### Cluster

Use properties of operations to generate equivalent expressions.

### NVACS 7.EE.A.2 (Major Works)

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. For example,  $a + 0.05a = 1.05a$  means that "increase by 5%" is the same as "multiply by 1.05."

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"> <li>● MP 2 Students use expressions in different forms to understand how quantities in an equation are related.</li> <li>● MP 4 Students write expressions and equations to model contextual problems.</li> <li>● MP 6 Students communicate their reasoning using precise mathematical vocabulary.</li> </ul> <p>(Miles and Williams, 2016)</p>
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● <a href="#">Free online algebra tile</a>: (Glencoe)</li> <li>● Group discussions and questioning strategies:               <ul style="list-style-type: none"> <li>○ Different perspectives</li> <li>○ “Talk to me about the thinking you have used so far”</li> </ul> </li> </ul>
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Properties of operations</li> <li>● Identify equivalent expressions</li> <li>● Basic operations with integers and fractions</li> <li>● Order of operations</li> <li>● <math>x = 1x</math></li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Apply expressions to writing equations and formulas</li> <li>● Systems of two linear equations with two variables</li> </ul>
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">Menu Math</a> (Let’s Go Learn)</li> <li>● Join the Club- <a href="#">Identifying and Combining Like Terms</a> (Illuminations - NCTM members only)</li> <li>● <a href="#">Working with Algebra Tiles</a> (MathBits)</li> <li>● Assessment Project- <a href="#">Fencing</a> (Math Shell)</li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● <a href="#">Interpreting Linear Expressions</a> (Khan Academy)</li> </ul>



# Expressions and Equations

## Cluster

Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

### NVACS 7.EE.B.3 (Major Works)

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. 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.

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"> <li>● MP 1 Students solve multi-step real-world problems. Students use equations and inequalities to solve problems.</li> <li>● MP 2 Students solve problems by reasoning about quantities.</li> <li>● MP 4 Students write equations to model contextual problems.</li> <li>● MP 6 Students estimate answers to problems as a check to accurate solutions.</li> </ul> <p>(Miles and Williams, 2016)</p>
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Use number lines and visuals such as bars.</li> <li>● Use appropriate tools (calculators) and know what the display represents.</li> </ul>
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Solve one-step variable equations</li> <li>● Evaluate expressions with variables</li> <li>● Know what a variable is and when to use a variable</li> <li>● <math>x = 1x</math></li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Solving multi-step equations</li> <li>● Solving linear equations with two variables</li> <li>● Solve for one solution, infinitely many solutions, and no solution</li> </ul>
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">Understanding Equations</a> (Unbounded)</li> <li>● <a href="#">Understanding Steps to Solving Equations</a> (SBAC Digital Library)</li> <li>● <a href="#">Happy Birthday to You</a> (Illuminations)</li> <li>● <a href="#">Writing and Solving Equations using Bar Models</a> (SBAC Digital Library)</li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● Performance Task- <a href="#">Using Water Wisely</a> (SBAC Digital Library)</li> <li>● Nevada Ready! Grade 7 (Student workbook- page 22)               <ul style="list-style-type: none"> <li>○ <a href="#">Teacher Edition-Grade 7</a></li> <li>○ <a href="#">Student Workbook-Grade 7</a></li> </ul> </li> </ul>

# Expressions and Equations

## Cluster

Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

### NVACS 7.EE.B.4 (Major Works)

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.

- **7.EE.B.4.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. For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?
- **7.EE.B.4.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. 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.

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"> <li>● MP 1 Students solve multi-step real-world problems. Students use equations and inequalities to solve problems.</li> <li>● MP 2 Students solve problems by reasoning about quantities.</li> <li>● MP 4 Students write equations to model contextual problems.</li> <li>● MP 6 Students estimate answers to problems as a check to accurate solutions.</li> </ul> <p>(Miles and Williams, 2016)</p>
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Use number lines to help students visualize answers.</li> <li>● Facilitate a classroom discussion about the importance of using the order of operations.</li> <li>● <a href="#">Free online algebra tiles</a>: (Glencoe)</li> <li>● Create a Venn diagram to compare and contrast inequalities and equations.</li> <li>● Check answers with substitution.</li> <li>● Use appropriate tools (calculator) and know what the display represents.</li> </ul>
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Solve one-step variable equations</li> <li>● Evaluation expressions with variables</li> <li>● Solve one-step variable inequalities</li> <li>● Understand inequalities have multiple solutions</li> <li>● Know what a variable is and when to use a variable</li> <li>● <math>x = 1x</math></li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Solve multi-step equations</li> <li>● Solve linear equations with two variables</li> <li>● Solve for one solution, infinitely many solutions, and no solution</li> </ul>

Element	Exemplars
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">Solving Equations Using Algebra</a> (Continued) (Unbounded)</li> <li>● Select word problems that lend themselves to algebraic equations in the forms: <math>px + q = r</math> and <math>p(x + q) = r</math></li> <li>● Apply formulas for area or perimeter</li> <li>● Convert between fractions, decimals, and percents</li> <li>● Provide examples of inequalities with negatives so students learn to reverse the direction of the inequality sign when multiplying or dividing by a negative</li> <li>● <a href="#">7.EE.B.4: Theorem and Proof</a></li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● <a href="#">7.EE.B.4 SBAC Sample Assessment Items</a></li> </ul>

## Geometry

Seventh graders solve problems involving scale drawings and informal geometric constructions, and they work with two- and three-dimensional shapes to solve problems involving area, surface area, and volume. Students take their study of area from Grade 6 to circles. Students work with three-dimensional figures, relating them to two-dimensional shape by examining cross sections. They solve real world and mathematical problems involving area, surface area, and volume of objects composed of triangles, quadrilaterals, polygons, cubes, and right prism.

### Cluster

Draw construct, and describe geometrical figures and describe the relationships between them.

### NVACS 7.G.A.1 (Additional Works)

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.

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"> <li>● MP 1 Students solve problems using scale drawings.</li> <li>● MP 4 Students use drawings and hands-on materials to model geometric shapes and relationships.</li> <li>● MP 5 Students draw freehand or use technology or other tools to draw geometric shapes.</li> </ul> (Miles and Williams, 2016)
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Floor plans using graph paper or Google Sheets.</li> </ul>
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Use ratio and proportional reasoning to convert measurement units</li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Proportions</li> <li>● Dilations</li> </ul>
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">Solve Problems Involving Scale</a> (Illustrative Mathematics)</li> <li>● <a href="#">Ratios of Scale Drawings</a> (Unbounded)</li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● <a href="#">7.G.A.1 SBAC Sample Assessment Items</a></li> </ul>

# Geometry

## Cluster

Draw construct, and describe geometrical figures and describe the relationships between them.

### NVACS 7.G.A.2 (Additional Works)

Draw (freehand, with ruler and protractor, and with technology) 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.

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"> <li>● MP 1 Students solve problems using scale drawings.</li> <li>● MP 4 Students use drawings and hands-on materials to model geometric shapes and relationships.</li> <li>● MP 5 Students draw freehand or use technology or other tools to draw geometric shapes.</li> </ul> (Miles and Williams, 2016)
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Provide different-sized lengths of spaghetti (any stick-like hands-on manipulative will work) for students to discover how the lengths of sides relate to one another to make a triangle.</li> <li>● Provide multiple examples where the triangles students form are unique, multiple examples where it is impossible to construct a triangle, and some scenarios where more than one triangle can be drawn. Provide students time to figure out how they can tell if a triangle is created from the information given.</li> <li>● Develop the understanding that the sum of the three interior angles of a triangle is 180 degrees.</li> </ul> (Miles and Williams, 2016)
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Know characteristics of a triangle</li> <li>● Know the definition of unique</li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Geometry constructions</li> <li>● Draw and describe transformations</li> <li>● Triangle proofs</li> </ul>
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">Constructing Triangles</a> (Unbounded)</li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● <a href="#">7.G.A.2 SBAC Sample Assessment Items</a></li> </ul>

# Geometry

## Cluster

Draw construct, and describe geometrical figures and describe the relationships between them.

### NVACS 7.G.A.3 (Additional Works)

Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"> <li>● MP 1 Students solve problems using scale drawings.</li> <li>● MP 4 Students use drawings and hands-on materials to model geometric shapes and relationships.</li> <li>● MP 5 Students draw freehand or use technology or other tools to draw geometric shapes.</li> </ul> (Miles and Williams, 2016)
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Relate 2D shapes to 3D figures:               <ul style="list-style-type: none"> <li>○ Right rectangular prisms</li> <li>○ Cube</li> <li>○ Right rectangular pyramids</li> </ul> </li> <li>● Create a chart of naming the 3D figure and what 2D shape is created.</li> <li>● Use styrofoam or florist forms to cut for visuals.</li> <li>● Use playdoh and dental floss.</li> </ul>
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Draw polygons in the coordinate plane given coordinates for the vertices.</li> <li>● Use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate.</li> <li>● Make real word connections.</li> <li>● Represent 3D figures using nets made of rectangles and triangles.</li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Describe the effect of dilations, translations, rotations, and reflections on two-dimensional shapes using coordinates</li> </ul>
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">Sections of Spheres</a> (GeoGebra)</li> <li>● <a href="#">Lesson Slides</a> (LearnZillion)</li> <li>● <a href="#">3D Geometry and Cross Sections</a> (GeoGebra)</li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● <a href="#">7.G.A.3 SBAC Sample Assessment Items</a></li> <li>● <a href="#">Cross Section Test</a> (Spatial Learning)</li> </ul>

# Geometry

## Cluster

Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

### NVACS 7.G.B.4 (Additional Works)

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.

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"> <li>● MP 1 Students solve problems using scale drawings.</li> <li>● MP 4 Students use drawings and hands-on materials to model geometric shapes and relationships.</li> <li>● MP 5 Students draw freehand or use technology or other tools to draw geometric shapes.</li> </ul> (Miles and Williams, 2016)
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Have students discover the relationship between circumference and diameter by measuring classroom objects.</li> <li>● Solve real-world problems by applying formulas using centers, scavenger hunts, real materials, graphic organizers, etc.</li> <li>● Build understanding before presenting formulas.</li> </ul> (Miles and Williams, 2016)
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Calculate the area of polygons.</li> <li>● Calculate the perimeter of polygons.</li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Compute with the formulas for the volumes of cones, cylinders, and spheres.</li> <li>● Derive volume formulas.</li> </ul>
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">Areas of Circles</a> (GeoGebra)</li> <li>● <a href="#">Exploring Circle Geometry Properties</a> (Math Interactives)</li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● <a href="#">7.G.A.3 SBAC Sample Assessment Items</a></li> </ul>

# Geometry

## Cluster

Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

### NVACS 7.G.B.5 (Additional Works)

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.

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"> <li>● MP 1 Students solve problems involving geometric principles.</li> <li>● MP 4 Students use geometric models to solve problems.</li> </ul> (Miles and Williams, 2016)
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Have students explore supplementary, complementary, vertical, and adjacent angles first through measuring and then finding the patterns. Apply these findings to look at the same angles in intersecting lines and many types of polygons.</li> </ul> (Miles and Williams, 2016)
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Know that the angle measure of the whole is the sum of the angle measure of the parts.</li> <li>● Write and solve multi-step equations.</li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Know, understand, and calculate angle relationships formed by lines cut by a transversal.</li> </ul>
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">Solving for Unknown Angles using Equations</a> (Unbounded)</li> <li>● <a href="#">Use Facts About Supplementary, Complementary, Vertical, and Adjacent Angles</a> (Illustrative Mathematics)</li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● <a href="#">7.G.B.5 SBAC Sample Assessment Items</a></li> </ul>



# Geometry

## Cluster

Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

### NVACS 7.G.B.6 (Additional Works)

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.

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"> <li>● MP 1 Students solve problems involving geometric principles.</li> <li>● MP 4 Students use geometric models to solve problems.</li> </ul> (Miles and Williams, 2016)
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Provide students with a variety of problems to solve from single to multi-step, from real-world to mathematical.</li> <li>● Present opportunities to solve the problems as individuals, pairs, and small groups. Allow students to present their findings and justifications in writing such as journal entries and orally as in class presentations.</li> </ul> (Miles and Williams, 2016)
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Represent three-dimensional figures using nets made up of rectangles and triangles.</li> <li>● Calculate the area of polygons.</li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Find the volume and surface area of two- and three-dimensional objects.</li> <li>● Know the and calculate with formulas for volumes of cones, cylinders, and spheres.</li> </ul>
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">Surface Area and Volume</a> (Math Interactives)</li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● <a href="#">7.G.B.6 SBAC Sample Assessment Items</a></li> </ul>

## Statistics and Probability

In seventh grade, students learn that statistics can be used to gain information about a population by examining a sample of the population. They draw inferences about a population and also draw informal comparative inferences about two populations. Seventh graders investigate and learn that the probability of chance event is a number between 0 and 1. They develop a probability model and use it to find probabilities of events.

### Cluster

Use random sampling to draw inferences about a population.

### NVACS 7.SP.A.1 (Supporting Works)

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.

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"> <li>● MP 2 Students make generalizations and predictions based on random samples.</li> <li>● MP 3 Students use statistical methods as justification for predictions and inferences.</li> <li>● MP 4 Students develop probability models and use them to find probabilities of events.</li> <li>● MP 5 Students use organized lists, tables, tree diagrams, and simulations tools.</li> </ul> (Miles and Williams, 2016)
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Provide a list of sampling examples for students to critique and justify if they are random samplings.</li> <li>● Have students create foldables for all the vocabulary words.</li> </ul> (Miles and Williams, 2016)
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Recognize statistical questions.</li> <li>● Understand that a set of data has a distribution.</li> <li>● Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring.</li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Understand statistics.</li> <li>● Recognize the purposes of and differences among sample surveys, experiments, and observational studies.</li> </ul>
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">Statistics and Probability Module</a> (Unbounded)</li> <li>● <a href="#">Mr. Briggs’s Class Likes Math</a> (Illustrative Mathematics)</li> <li>● Random Sampling- <a href="#">How Many Fish?</a> (PBS Learning)</li> <li>● <a href="#">Statistics and Probability</a> (Khan Academy)</li> <li>● <a href="#">Statistics and Probability BLASTS</a> (CCSD Blast Module)</li> </ul>

Element	Exemplars
<b>Assessment Examples</b>	<ul style="list-style-type: none"><li data-bbox="565 113 1117 149">● <a href="#">Engage NY SP Summative Assessment</a></li><li data-bbox="565 149 1156 184">● <a href="#">7.SP.A.1 SBAC Sample Assessment Items</a></li></ul>

# Statistics and Probability

## Cluster

Use random sampling to draw inferences about a population.

### NVACS 7.SP.A.2 (Supporting Works)

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. 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.

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"> <li>● MP 2 Students make generalizations and predictions based on random samples.</li> <li>● MP 3 Students use statistical methods as justification for predictions and inferences.</li> <li>● MP 4 Students develop probability models and use them to find probabilities of events.</li> <li>● MP 5 Students use organized lists, tables, tree diagrams, and simulations tools.</li> </ul> (Miles and Williams, 2016)
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Use random samples from examples done in class and have students collect data (ex. word length, school election, school lunches preferred, etc.).</li> <li>● Draw inferences and generalizations from random samplings and justify using appropriate vocabulary.</li> </ul> (Miles and Williams, 2016)
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Recognize statistical questions.</li> <li>● Understand that a set of data has a distribution.</li> <li>● Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring.</li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Understand statistics.</li> <li>● Recognize the purposes of and differences among sample surveys, experiments, and observational studies.</li> </ul>
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">Valentine Marbles</a> (Illustrative Mathematics)</li> <li>● <a href="#">Forming Generalizations about Populations</a> (PBS Learning)</li> <li>● <a href="#">Statistics and Probability</a> (Khan Academy)</li> <li>● <a href="#">Statistics and Probability BLAST</a> (CCSD Blast Module)</li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● <a href="#">7.SP.A.2 SBAC Sample Assessment Items</a></li> <li>● <a href="#">Engage NY SP Summative Assessment</a></li> </ul>

# Statistics and Probability

## Cluster

Draw informal comparative inferences about two populations.

### NVACS 7.SP.B.3 (Additional Works)

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. 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.

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"> <li>● MP 2 Students compare statistical measures on two populations.</li> <li>● MP 3 Students use statistical methods as justification functions on graphing calculators for large data sets.</li> <li>● MP 5 Students use statistical functions on graphing calculators for large data sets.</li> <li>● MP 6 Students calculate measures of center and variability with accuracy.</li> </ul> <p>(Miles and Williams, 2016)</p>
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Provide numerical data sets that are of interest to students. Data can be found in fact books and online. Use of contextual examples allows students to understand how to not only calculate the measures of center and variability but also understand their meaning in the given context.</li> <li>● Display two data sets presented on dot plots and ask students what they notice. Ask about the variability of the sets.</li> </ul> <p>(Miles and Williams, 2016)</p>
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Measure of center</li> <li>● Measure of variation</li> <li>● Shape of data distribution</li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Use data to make inferences.</li> <li>● Compare statistical measures on two populations.</li> </ul>
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">College Athletes and Offensive Linemen</a> (Illustrative Mathematics)</li> <li>● <a href="#">Statistics and Probability</a> (Khan Academy)</li> <li>● <a href="#">Statistics and Probability BLAST</a> (CCSD Blast Module)</li> <li>● <a href="#">Statistics and Probability</a> (Unbounded)</li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● <a href="#">7.SP.B.3 SBAC Sample Assessment Items</a></li> <li>● <a href="#">Engage NY SP Summative Assessment</a></li> </ul>

# Statistics and Probability

## Cluster

Draw informal comparative inferences about two populations.

### NVACS 7.SP.B.4 (Additional Works)

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

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"> <li>● MP 2 Students compare statistical measures on two populations.</li> <li>● MP 3 Students use statistical methods as justification functions on graphing calculators for large data sets.</li> <li>● MP 5 Students use statistical functions on graphing calculators for large data sets.</li> <li>● MP 6 Students calculate measures of center and variability with accuracy.</li> </ul> (Miles and Williams, 2016)
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Share data sets and inferences and have students determine if inferences are valid.</li> <li>● Present other data sets to students in different formats (dot plots, box and whisker plots, etc.) and have them determine which measures to use to compare the sets.</li> </ul> (Miles and Williams, 2016)
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Measure of center</li> <li>● Measure of variation</li> <li>● Shape of data distribution</li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Use data to make inferences.</li> <li>● Compare statistical measures on two populations.</li> </ul>
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">Measures of Center- Against All Odds</a> (PBS Learning)</li> <li>● <a href="#">College Athletes and Offensive Linemen</a> (Illustrative Mathematics)</li> <li>● <a href="#">Statistics and Probability</a> (Khan Academy)</li> <li>● <a href="#">Statistics and Probability BLAST</a> (CCSD Blast Module)</li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● <a href="#">(SBAC Performance Task)</a></li> <li>● <a href="#">Engage NY SP Summative Assessment</a></li> </ul>

# Statistics and Probability

## Cluster

Investigate chance processes and develop, use, and evaluate probability models.

### NVACS 7.SP.C.5 (Supporting Works)

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 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"> <li>● MP 2 Students use reasoning to determine the likelihood of an event.</li> <li>● MP 4 Students construct and use probability models for chance events.</li> <li>● MP 5 Students select from tree diagrams, organized lists, tables, and simulations to determine probabilities.</li> <li>● MP 6 Students calculate probabilities.</li> </ul> (Miles and Williams, 2016)
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Give students specific events to categorize as unlikely, likely, or neither likely nor unlikely. Present students with a list of events and their probabilities over 1 to be certain students understand the 0 – 1 scale and that anything over 1 is not a probability.</li> <li>● Conduct simple probability experiments. Examples include tossing dice, flipping coins, marbles in a bag, and so on. Use these calculations (expressed in fraction, decimal, and percent forms) to determine if the events are likely, unlikely, or neither likely nor unlikely.</li> </ul> (Miles and Williams, 2016)
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Understand the concept of a ratio.</li> <li>● Understand and compare unit fractions.</li> <li>● Calculate decimal and fraction equivalents.</li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Independent events.</li> <li>● Conditional probability.</li> </ul>
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">Statistics and Probability</a> (Khan Academy)</li> <li>● <a href="#">Flipping coins and rolling dice on the TI-84</a> (Illuminations)</li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● <a href="#">Engage NY SP Summative Assessment</a></li> <li>● <a href="#">Engage NY SP Formative Assessment Task</a></li> </ul>

# Statistics and Probability

## Cluster

Investigate chance processes and develop, use, and evaluate probability models.

### NVACS 7.SP.C.6 (Supporting Works)

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. 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.

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"> <li>● MP 2 Students use reasoning to determine the likelihood of an event.</li> <li>● MP 4 Students construct and use probability models for chance events.</li> <li>● MP 5 Students select from tree diagrams, organized lists, tables, and simulations to determine probabilities.</li> <li>● MP 6 Students calculate probabilities.</li> </ul> (Miles and Williams, 2016)
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Conduct a simple experiment with a large number of trials (i.e., spinning a spinner, marbles in a bag, coin toss). Let the students determine the theoretical probability first, and then collect data individually and compile class data.</li> </ul> (Miles and Williams, 2016)
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Understand the concept of a ratio.</li> <li>● Understand and compare unit fractions.</li> <li>● Calculate decimal and fraction equivalents.</li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Independent events</li> <li>● Conditional probability</li> </ul>
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● Compare individual student experiment results to entire class results.</li> <li>● <a href="#">Statistics and Probability</a> (Khan Academy)</li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● <a href="#">Engage NY SP Summative Assessment</a></li> <li>● <a href="#">Engage NY SP Formative Assessment Task</a></li> </ul>



# Statistics and Probability

## Cluster

Investigate chance processes and develop, use, and evaluate probability models.

### NVACS 7.SP.C.7 (Supporting Works)

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.

- **7.SP.C.7.a**  
Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. 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.
- **7.SP.C.7.b**  
Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. For example, find the approximate probability that a spinning coin 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?

Element	Exemplars
<b>Standards for Mathematical Practice</b>	<ul style="list-style-type: none"> <li>● MP 2 Students use reasoning to determine the likelihood of an event.</li> <li>● MP 4 Students construct and use probability models for chance events.</li> <li>● MP 5 Students select from tree diagrams, organized lists, tables, and simulations to determine probabilities.</li> <li>● MP 6 Students calculate probabilities.</li> </ul> (Miles and Williams, 2016)
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Present numerous opportunities for students to find the theoretical probability of an event. Have students compare their theoretical probabilities to the experimental probability to the theoretical. Experiments can be hands-on or use a variety of random generation devices, including spinners, number cubes, coin tosses, and colored chips. Students can collect simulation data using graphing calculators or computers for web-based simulations.</li> <li>● Give each pair of students a pair of number cubes. Assign one student to be the <i>Odd</i> player and one student to be the <i>Even</i> player. Each player takes a turn rolling the cubes, finding the product, and determining if <i>even</i> or <i>odd</i> gets a point. After a winner is determined, students must find the experimental and theoretical probability. Students can also discuss changing the rules of the game to make it <i>fair</i>. Will finding the sum make the game fair?</li> </ul> (Miles and Williams, 2016)
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Understand the concept of a ratio</li> <li>● Understand and compare unit fractions</li> <li>● Calculate decimal and fraction equivalents</li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Independent events</li> <li>● Conditional probability</li> </ul>

Element	Exemplars
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">Probability Choice Board</a> (SNRPDP)</li> <li>● <a href="#">Comparing Estimated Probabilities to Probabilities Predicted by a Model</a> (SNRPDP)</li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● <a href="#">Engage NY SP Summative Assessment</a></li> <li>● <a href="#">Engage NY SP Formative Assessment Task</a></li> <li>● <a href="#">7.SP.C.7 SBAC Sample Assessment Items</a></li> </ul>

# Statistics and Probability

## Cluster

Investigate chance processes and develop, use, and evaluate probability models.

### NVACS 7.SP.C.8 (Supporting Works)

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

- **7.SP.C.8.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.

- **7.SP.C.8.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.

- **7.SP.C.8.c**

Design and use a simulation to generate frequencies for compound events. 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?

Element	Exemplars
<b>Standards for Mathematical Practice</b>	MP 2 Students use reasoning to determine the likelihood of an event. MP 4 Students construct and use probability models for chance events. MP 5 Students select from tree diagrams, organized lists, tables, and simulations to determine probabilities. MP 6 Students calculate probabilities. (Miles and Williams, 2016)
<b>Instructional Strategies</b>	<ul style="list-style-type: none"> <li>● Give students many opportunities to read/answer questions from sample spaces, and create sample spaces for compound events using organized lists, tables, and tree diagrams. Students identify the outcomes.</li> <li>● Provide many opportunities for students to use simulations to collect data on compound events. Once students are comfortable with simulations, have them design their own to model a compound event and generate frequencies (data) so that students can approximate probabilities for their event.</li> </ul> (Miles and Williams, 2016)
<b>Prerequisite Skills</b>	<ul style="list-style-type: none"> <li>● Understand the concept of a ratio.</li> <li>● Understand and compare unit fractions.</li> <li>● Calculate decimal and fraction equivalents.</li> </ul>
<b>Connections Within and Beyond Grade Level</b>	<ul style="list-style-type: none"> <li>● Independent events</li> <li>● Conditional probability</li> </ul>
<b>Instructional Examples/Lessons/Tasks</b>	<ul style="list-style-type: none"> <li>● <a href="#">Investigate Change Processes</a> (Illustrative Mathematics)</li> </ul>
<b>Assessment Examples</b>	<ul style="list-style-type: none"> <li>● <a href="#">Engage NY SP Summative Assessment</a></li> <li>● <a href="#">Engage NY SP Formative Assessment Task</a></li> </ul>

## Acknowledgements

**April Acosta**

Clark County School District

**Bethany Andrews**

Clark County School District

**Kristin Asa**

Clark County School District

**Jennifer Barczyszyn**

Clark County School District

**JoEtta Barto**

Humboldt County School District

**Erica Cazett**

Clark County School District

**Carolyn Cook**

Carson City School District

**Christine Corbin**

Clark County School District

**Rachel Croft**

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**Kathy Lawrence**

Washoe County School District

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Clark County School District

**Candice Meiries**

Southern RPDP

**Heidi Marmo**

Clark County School District

**Julie Michel**

Douglas County School District

**Christin O'Keefe**

Washoe County School District

**Shannone Paki**

Clark County School District

**Barbara Perez**

Clark County School District

**Terri Romaniello**

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**Carly Strauss**

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**Sara Swanson**

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**Teresa Yeoman**

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