

Mathematics Standards Clarification for Grade 6



 **The**
Nevada Ready!
Network

Standards-Based Instruction for
ALL Nevada Students



Table of Contents

| | |
|----------------------------|----|
| Ratios and Proportions | 3 |
| Number Systems | 8 |
| Expressions and Equations | 17 |
| Geometry | 31 |
| Statistics and Probability | 35 |

Ratios and Proportions

Sixth graders are introduced to ratio, a relationship or comparison of two quantities or measures. Students represent ratios in various forms and compare types of ratios. At this level, they use reasoning about multiplication and division to solve ratio and rate problems about quantities. Students learn how and where ratios and rates are used in the real world.

Cluster

Understand ratio concepts and use ratio reasoning to solve problems.

NVACS 6.RP.A.1 (Major Works)

Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."

| Element | Exemplars |
|--|--|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 4 As students write and simplify ratios to solve real world problems, they begin to understand that ratios are used in everyday life. ● MP 6 Students use precise ratio language to describe the relationship between two quantities. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Help students discover that a ratio is a relationship or comparison of two quantities or measures. ● Use real world problems and use ratio language to describe the relationships between quantities. ● Focus on the meaning of the terms “for every,” “for each,” and “for each 1,” and “per.” |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Development of multiplicative reasoning. ● Understand multiplication and division of fractions. ● Write and interpret numerical expressions. ● Analyze patterns and relationships. ● Understand equivalent fractions. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Understand ratio concepts and use ratio reasoning to solve problems. ● Understand that ratio relationships lead to understanding functions. ● Represent and analyze quantitative relationships between dependent and independent variables. ● Reason about and solve one-variable equations and inequalities. ● Solve proportions. ● Calculate and interpret slope. ● Calculate and interpret rates and unit rates. ● Understand directly proportional relationships. |

| | |
|---|---|
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none">● 6th Grade Unit 2 - Introducing Ratios and Ratio Language (Open Up- free account required)● Many Ways to Say It (Illustrative Mathematics)● Games at Recess (Illustrative Mathematics) |
| Assessment Examples | <ul style="list-style-type: none">● Sample SBAC Assessment Item 6.RP.A.1 SBAC Sample Assessment Items |

Ratios and Proportions

Cluster

Understand ratio concepts and use ratio reasoning to solve problems.

NVACS 6.RP.A.2 (Major Works)

Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship. For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is $3/4$ cup of flour for each cup of sugar." "We paid \$75 for 15 hamburgers, which is a rate of \$5 per hamburger."

| Element | Exemplars |
|--|---|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 1 Students make sense of unit rates associated with ratio $a:b$. ● MP 3 Students analyze results of calculations expressed in symbols and units of measure. Students use unit rates to compare quantities with different units. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Help students discover that a ratio is a relationship or comparison of two quantities or measures. ● Use real world problems and use ratio language to describe the relationships between quantities. ● Focus on the meaning of the terms "unit," "unit rate," "for every," "for each," "for each 1," and "per." ● Explore the difference between rate and ratio. ● Locate real world examples in magazines or ads. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Development of multiplicative reasoning. ● Understand multiplication and division of fractions. ● Write and interpret numerical expressions. ● Analyze patterns and relationships. ● Recognize patterns and relationships to find a missing value. ● Understand the concept of a ratio and use ratio language. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Analyze proportional relationships. ● Use proportional relationships to solve real-world and mathematical problems. ● Calculate and interpret slope. ● Analyze directly proportional relationships. |
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none"> ● Finals Week (Dan Meyer) ● Price Per Pound (Illustrative Mathematics) ● Highway Robbery (Illustrations- requires NCTM membership) |
| Assessment Examples | <ul style="list-style-type: none"> ● Sample SBAC Assessment Item 6.RP.A.2 SBAC Sample Assessment Items |

Ratios and Proportions

Cluster

Understand ratio concepts and use ratio reasoning to solve problems.

NVACS 6.RP.A.3 (Major Works)

Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

- **6.RP.A.3.a**
Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
- **6.RP.A.3.b**
Solve unit rate problems including those involving unit pricing and constant speed. For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?
- **6.RP.A.3.c**
Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.
- **6.RP.A.3.d**
Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

| Element | Exemplars |
|--|---|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 1 Students interpret and solve ratio problems. ● MP 2 Students solve problems by analyzing and comparing ratios and unit rates in tables, equations, and graphs. ● MP 4 Students model real-life situations with mathematics and model ratio problem situations symbolically. ● MP 6 Students communicate precisely with others and use clear mathematical language when describing a ratio relationship between quantities. ● MP 7 Students begin to make connections between covariance, rates, and representations showing the relationships between quantities. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Highlight multiplicative relationships. ● Represent ratios with tape diagrams (best used when two quantities have the same units). ● Represent ratios with double number line diagrams (best used when the quantities have different units). ● Represent pairs in a proportional relationship. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Graph points on the coordinate plane. ● Understand ratio concepts and use ratio reasoning. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Analyze proportional relationships. ● Solve real life problems using numerical and algebraic expressions and equations. ● Calculate and interpret slope. ● Analyze directly proportional relationships. |

| | |
|---|---|
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none"> ● Leaky Faucet (Dan Meyer) ● Super-Bear (Dan Meyer) ● Fizzy Juice (Illustrative Mathematics) ● Chocolate Chip Cookies (Louisiana Believes) |
| Assessment Examples | <ul style="list-style-type: none"> ● Ratio and Rates Mini-Assessment (Achieve the Core) ● Sample SBAC Assessment Item 6.RP.A.3 SBAC Sample Assessment Items |

Number Systems

Sixth graders continue their previous understanding of the meaning of fractions, the meanings of multiplication and division, and the relationship between multiplication and division to explain why the procedures for dividing fractions make sense. Students use visual models and equations to divide whole numbers by fractions and fractions by fractions to solve word problems. Students work with the system of rational numbers, including negative rational numbers. Sixth graders focus on the order and absolute value of rational numbers and location of points in all four quadrants of the coordinate plane (Miles and Williams, 2016).

Cluster

Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

NVACS 6.NS.A.1 (Additional Works)

Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. For example, create a story context for $(2/3) \div (3/4)$ and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that $(2/3) \div (3/4) = 8/9$ because $3/4$ of $8/9$ is $2/3$. (In general, $(a/b) \div (c/d) = ad/bc$.) How much chocolate will each person get if 3 people share $1/2$ lb of chocolate equally? How many $3/4$ -cup servings are in $2/3$ of a cup of yogurt? How wide is a rectangular strip of land with length $3/4$ mi and area $1/2$ square mi?

| Element | Exemplars |
|--|---|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP1 Students interpret and make sense of a problem involving division of fractions. ● MP2 Students use the meaning of fractions, the meanings of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for dividing fractions make sense. ● MP4 Students use manipulatives to model everyday problems with fractions. ● MP 6 Students communicate precisely with others and use clear mathematical language when discussing the understanding and procedure of dividing fractions. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Use concrete materials such as pattern blocks to model division of fractions. ● Ask students to demonstrate the difference between dividing <i>in</i> half and dividing <i>by</i> half. ● Talk about the relationship between multiplication and division. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Connect understandings of dividing with whole numbers and decimals to dividing with fractions. ● Understand the quotient may be larger or smaller than the dividend or divisor. ● Connect division of non-zero whole numbers with unit fractions to dividing a fraction by a fraction. ● Connect division concepts learned with whole number to fractions and decimals (rational). ● Extend their understanding of division of fractions to ratios, rates and proportions. |

| | |
|--|---|
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Apply and extend understanding of multiplication and division and of fractions to multiply and divide rational numbers. ● Operations with mixed numbers. ● Complex fractions. |
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none"> ● Nana's Lemonade (Dan Meyer) |
| Assessment Examples | <ul style="list-style-type: none"> ● Sample SBAC Assessment Item 6.NS.A.1 SBAC Sample Assessment Items |

Number Systems

Cluster

Compute fluently with multi-digit numbers and find common factors and multiples.

NVACS 6.NS.B.2 (Additional Works)

Fluently divide multi-digit numbers using the standard algorithm.

| Element | Exemplars |
|--|---|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 2 Students are able to understand the meaning of a division problem. ● MP 7 Students apply division algorithms to divide multi-digit numbers. ● MP 8 Students consider the reasonableness of an estimated quotient. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Pose problem solving situations that focus on the meaning of division rather than the procedure. ● Use a variety of models such as partial quotient or area model. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Fluently multiply multi-digit numbers. ● Fluently subtract multi-digit numbers. ● Understand that division means partitioning into groups. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Operations with fractions. ● Simplify fractions. ● Convert to percents. |
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none"> ● Dividing Multi-Digit Numbers (Achieve the Core) |
| Assessment Examples | <ul style="list-style-type: none"> ● Sample SBAC Assessment Item 6.NS.B.2 SBAC Sample Assessment Items |

Number Systems

Cluster

Compute fluently with multi-digit numbers and find common factors and multiples.

NVACS 6.NS.B.3 (Additional Works)

Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

| Element | Exemplars |
|--|--|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 2 Students are able to understand the meaning of a division problem. ● MP 6 Students use appropriate vocabulary for decimal computation. ● MP 7 Students apply division algorithms to divide multi-digit numbers. ● MP 8 Students consider the reasonableness of an estimated quotient. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Model estimation. ● Demonstrate patterns with powers of 10 for multiplying and dividing. ● Demonstrate the differences in solving the four operations with decimals. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Use place value. ● Recall basic facts. ● Add, subtract, multiply, and divide multi-digit numbers. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Operations with rational numbers. ● Operations with numbers represented in Scientific Notation. |
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none"> ● Reasoning About Multiplication and Division Place Value (Illustrative Mathematics) ● Buying Gas (Illustrative Mathematics) ● Movie Tickets (Illustrative Mathematics) |
| Assessment Examples | <ul style="list-style-type: none"> ● Sample SBAC Assessment Item 6.NS.B.3 SBAC Sample Assessment Items 6.NS.B.3 Various Sample Assessment Items |

Number Systems

Cluster

Compute fluently with multi-digit numbers and find common factors and multiples.

NVACS 6.NS.B.4 (Additional Works)

Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. For example, express $36 + 8$ as $4(9 + 2)$.

| Element | Exemplars |
|--|--|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 1 Students persevere in problem-solving situations applying their knowledge of GCF and LCM. ● MP 7 Students explore different strategies and use of distributive property for factoring numbers. ● MP 8 Students use patterns to find factors and multiples of given numbers. ● (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Explore different strategies to find the GCF and LCM including using lists of factors/multiples and using prime factorization. ● Provide students with problem solving situations in which they must determine whether to find the GCF or LCM. ● Connect finding the GCF and LCM while investigating the distributive property. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Find factor pairs of whole numbers 1–100. ● Determine multiples of a given number. ● Determine if a number is prime or composite. ● Fluently multiply and divide within 100. ● Define factor. ● Define multiple. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Apply the properties of operations to generate equivalent expressions. ● For example, apply the distributive property to the expression $3(2 + x)$ to produce the equivalent expression $6 + 3x$ ● For example, apply the distributive property to the expression $24x + 18y$ to produce the equivalent expression $6(4x + 3y)$ ● Calculate rates and unit rates. ● Use of ratio tables. |
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none"> ● GCF and LCM Word Problems (Khan Academy) ● Shipping Routes (Dan Meyer) ● Factor Trees (Math Playground) |
| Assessment Examples | <ul style="list-style-type: none"> ● Sample SBAC Assessment Item 6.NS.B.4 SBAC Sample Assessment Items 6.NS.B.4 Various Sample Assessment Items |

Number Systems

Cluster

Apply and extend previous understandings of numbers to the system of rational numbers.

NVACS 6.NS.C.5 (Major Works)

Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.

| Element | Exemplars |
|--|--|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 1 Students relate the concepts of positive and negative numbers to real-world applications. ● MP 2 Students attend the meaning of quantities, not just how to compute them. ● MP 4 Students describe a real-world scenario with the number lines and coordinate grids and interpret the results. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Introduce the idea of an opposite as both sides of the number line. ● Move to modeling operational thinking on the number line. ● Build vocabulary that means positive and negative amounts in real world situations. ● Use real world examples to model use of positive and negative numbers. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Understand of order on the number line. ● Understand of operations with whole numbers. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Simplify expressions containing integers. ● Evaluate equations containing integers. ● Operations with integers. ● Interpret integers in context. ● Interpret solutions to systems. ● Calculate slope. ● Perform translations on figures on coordinate plane. ● Graph functions. |
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none"> ● Zip, Zilch Zero Rules (Illuminations) |
| Assessment Examples | <ul style="list-style-type: none"> ● Sample SBAC Assessment Item ● 6.NS.C.5 SBAC Sample Assessment Items ● 6.NS.C.5 Various Sample Assessment Items |

Number Systems

Cluster

Apply and extend previous understandings of numbers to the system of rational numbers.

NVACS 6.NS.C.6 (Major Works)

Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.

- **6.NS.C.6.a**
Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., $-(-3) = 3$, and that 0 is its own opposite.
- **6.NS.C.6.b**
Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.
- **6.NS.C.6.c**
Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.

| Element | Exemplars |
|--|---|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP1 Students relate the concepts of positive and negative numbers to real-world applications. ● MP 2 Students attend the meaning of quantities, not just how to compute them. ● MP 4 Students describe a real-world scenario with the number lines and coordinate grids and interpret the results. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Start with a number line and build the coordinate plane by using two perpendicular number lines. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Understand a number line with integers. ● Understand meaning of 0 on number line and coordinate grid. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Understand why we extend our number system beyond whole numbers. ● Interpret integers in context. ● Solve systems of equations by graphing. ● Understand and use Absolute Value. ● Graph functions. |
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none"> ● Integers on the Number Line 2 (Illustrative Mathematics) |
| Assessment Examples | <ul style="list-style-type: none"> ● Sample SBAC Assessment Item 6.NS.C.6 SBAC Sample Assessment Items 6.NS.C.6 Various Sample Assessment Items |

Number Systems

Cluster

Apply and extend previous understandings of numbers to the system of rational numbers.

NVACS 6.NS.C.7 (Major Works)

Understand ordering and absolute value of rational numbers.

- **6.NS.C.7.a**
Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. For example, interpret $-3 > -7$ as a statement that -3 is located to the right of -7 on a number line oriented from left to right.
- **6.NS.C.7.b**
Write, interpret, and explain statements of order for rational numbers in real-world contexts. For example, write $-3^{\circ}\text{C} > -7^{\circ}\text{C}$ to express the fact that -3°C is warmer than -7°C .
- **6.NS.C.7.c**
Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. For example, for an account balance of -30 dollars, write $|-30| = 30$ to describe the size of the debt in dollars.
- **6.NS.C.7.d**
Distinguish comparisons of absolute value from statements about order. For example, recognize that an account balance less than -30 dollars represents a debt greater than 30 dollars.

| Element | Exemplars |
|--|--|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP1 Students relate the concepts of positive and negative numbers to real-world applications. ● MP 2 Students attend the meaning of quantities, not just how to compute them. ● MP 4 Students describe a real-world scenario with the number lines and coordinate grids and interpret the results. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Help students identify how positive and negative numbers are used to represent real world applications. ● Use the number line to allow students to identify the pattern of order for whole numbers and rational numbers of positive numbers. ● Use the number line to allow students to identify the pattern of order of negative whole numbers and negative rational numbers. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Understand the order of positive whole and rational numbers. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Develop the understanding of opposite numbers. ● Calculate with integers. ● Calculate slope. ● Understand and calculate with Distance Formula. |
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none"> ● Fractional Clothesline (Illustrations) |
| Assessment Examples | <ul style="list-style-type: none"> ● Sample SBAC Assessment Item 6.NS.C.7 SBAC Sample Assessment Items 6.NS.C.7 Various Sample Assessment Items |

Number Systems

Cluster

Apply and extend previous understandings of numbers to the system of rational numbers.

NVACS 6.NS.C.8 (Major Works)

Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.

| Element | Exemplars |
|--|---|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP1 Students relate the concepts of positive and negative numbers to real-world applications. ● MP 2 Students attend the meaning of quantities, not just how to compute them. ● MP 4 Students describe a real-world scenario with the number lines and coordinate grids and interpret the results. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Use a number line to determine absolute value, transfer that knowledge to the coordinate plane to determine absolute value and solve for distance. ● Relate to maps and have students calculate the distance between locations on grid. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Locate points on a number line. ● Calculate absolute value. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Understand operations with integers. ● Calculate distance between two points in the coordinate plane using the Pythagorean Theorem. |
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none"> ● Distance Between Points (Illustrative Mathematics) |
| Assessment Examples | <ul style="list-style-type: none"> ● Sample SBAC Assessment Item 6.NS.C.8 SBAC Sample Assessment Items 6.NS.C.8 Various Sample Assessment Items |

Expressions and Equations

At this level, the study of expressions and equations centers on the use of variables in mathematical expressions. Students write and evaluate numerical expressions and use expressions and formulas to solve problems. Student also solve simple one-step equations and use equations such as $3x = y$ to describe relationships between quantities. The sixth-grade study of expressions and equations is foundational in the transition to algebraic representation and problem solving, which is extended and formalized in Grade 7 (Miles and Williams, 2016).

Cluster

Apply and extend previous understandings of arithmetic to algebraic expressions.

NVACS 6.EE.A.1 (Major Works)

Write and evaluate numerical expressions involving whole-number exponents.

| Element | Exemplars |
|--|---|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> • MP 2 Students decontextualize to manipulate symbolic representations by applying properties of operations. • MP 4 Students model real-world scenarios with equations and expressions. • MP 6 Students communicate precisely with others and use clear mathematical language when describing expressions. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> • Emphasize vocabulary-base, power, exponent, factors, and expressions. |
| Prerequisite Skills | <ul style="list-style-type: none"> • Use the standard algorithm to multiply multi-digit whole numbers. • Explain patterns in the number of zeros of the product when multiplying a number by powers of 10. • Explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. • Use whole-number exponents to denote power of 10. • Add, subtract, multiply, and divide decimals to hundredths. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> • Write, read, and evaluate expressions in which letters stand for numbers. • Know and apply the properties of integer exponents to generate equivalent numerical expressions. <ul style="list-style-type: none"> ○ For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$ • Order of operations • Solve equations. • Representing and identifying perfect square and perfect cube numbers. • Solve perfect square and perfect cube equations. • Solve systems of equations. |

| | |
|--|---|
| Instructional Examples/Lessons/Task | <ul style="list-style-type: none"> ● Exponent Experimentation 1 (Illustrative Mathematics) ● Exponent Experimentation 2 (Illustrative Mathematics) ● Exponent Experimentation 3 (Illustrative Mathematics) ● The Djinni's Offer (Illustrative Mathematics) ● Seven to the What?!? (Illustrative Mathematics) ● Sierpinski's Carpet (Illustrative Mathematics) |
| Assessment Examples | <ul style="list-style-type: none"> ● Sample SBAC Assessment Item ● 6.EE.A.1 SBAC Sample Assessment Items |

Expressions and Equations

Cluster

Apply and extend previous understandings of arithmetic to algebraic expressions.

NVACS 6.EE.A.2 (Major Works)

Write, read, and evaluate expressions in which letters stand for numbers.

- **6.EE.A.2.a**
Write expressions that record operations with numbers and with letters standing for numbers. For example, express the calculation "Subtract y from 5" as $5 - y$.
- **6.EE.A.2.b**
Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. For example, describe the expression $2(8 + 7)$ as a product of two factors; view $(8 + 7)$ as both a single entity and a sum of two terms.
- **6.EE.A.2.c**
Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). For example, use the formulas $V = S^3$ and $A = 6S^2$ to find the volume and surface area of a cube with sides of length $S = 1/2$.

| Element | Exemplars |
|--|---|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 2 Students decontextualize to manipulate symbolic representations by applying properties of operations. ● MP 4 Students model real-world scenarios with equations and expressions. ● MP 6 Students communicate precisely with others and use clear mathematical language when describing expressions. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Clarify and emphasize similarities and differences between expressions and equations. ● Use caution when introducing mnemonic devices such as PEMDAS (Parentheses, Exponents, Multiplication, Division, Addition, Subtraction) for remembering Order of Operations, because they have the potential to cause students to focus on the device, rather than on the underlying mathematical meaning of an expression. ● Teaching the Order of Operations through the Relationships of the Operations (Eureka Math) |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Write simple expressions that record calculations with numbers. ● Interpret numerical expressions without evaluating them. ● Interpret multiplication as scaling (resizing). ● Write and evaluate numerical expressions involving whole-number exponents. ● Fluency in operations with whole numbers |

| | |
|---|---|
| <p>Connections Within and Beyond Grade Level</p> | <ul style="list-style-type: none"> ● Apply the properties of operations to generate equivalent expressions. ● Identify when two expressions are equivalent. ● Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers. ● Understand solving an equation or inequality as a process of answering a question: Which values from a specified set, if any, make the equation or inequality true? ● Use substitution to determine whether a given number in a specified set makes an equation or inequality true. ● Use variables to represent numbers and write expressions when solving a real-world or mathematical problem. ● Understand that a variable can represent an unknown number. ● Solve equations. ● Solve systems of equations. |
| <p>Instructional Examples/Lessons/Tasks</p> | <ul style="list-style-type: none"> ● Rectangular Perimeter 1 (Illustrative Mathematics) ● Distance to School (Illustrative Mathematics) ● Families of Triangles (Illustrative Mathematics) |
| <p>Assessment Examples</p> | <ul style="list-style-type: none"> ● Sample SBAC Assessment Item 6.EE.A.2 SBAC Sample Assessment Items |

Expressions and Equations

Cluster

Apply and extend previous understandings of arithmetic to algebraic expressions.

NVACS 6.EE.A.3 (Major Works)

Apply the properties of operations to generate equivalent expressions. For example, apply the distributive property to the expression $3(2 + x)$ to produce the equivalent expression $6 + 3x$; apply the distributive property to the expression $24x + 18y$ to produce the equivalent expression $6(4x + 3y)$; apply properties of operations to $y + y + y$ to produce the equivalent expression $3y$.

| Element | Exemplars |
|--|--|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 2 Students decontextualize to manipulate symbolic representations by applying properties of operations. ● MP 4 Students model real-world scenarios with equations and expressions. ● MP 6 Students communicate precisely with others and use clear mathematical language when describing expressions. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Use caution when introducing mnemonic devices such as PEMDAS (Parentheses, Exponents, Multiplication, Division, Addition, Subtraction) for remembering Order of Operations, because they have the potential to cause students to focus on the device, rather than on the underlying mathematical meaning of an expression. ● Ensure students have a firm grasp on variables as numbers to help students extend their work with the properties of operations from arithmetic to Algebra. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Write simple expressions that record calculations with numbers. ● Interpret numerical expressions without evaluating them. ● Write, read, and evaluate expressions in which letters stand for numbers. ● Multiplication means “groups of”. ● Multiplication represents repeated addition. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Identify when two expressions are equivalent. ● Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. ● Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. ● Evaluate square roots of small perfect squares and cube roots of small perfect cubes. ● Know that $\sqrt{2}$ is irrational. ● Solve multi-step equations. ● Solve systems of equations. |
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none"> ● Anna in D.C. (Illustrative Mathematics) |
| Assessment Examples | <ul style="list-style-type: none"> ● Sample SBAC Assessment Item 6.EE.A.3 SBAC Sample Assessment Items ● Achieve the Core |

Expressions and Equations

Cluster

Apply and extend previous understandings of arithmetic to algebraic expressions.

NVACS 6.EE.A.4 (Major Works)

- Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). For example, the expressions $y + y + y$ and $3y$ are equivalent because they name the same number regardless of which number y stands for.

| Element | Exemplars |
|--|---|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> MP 2 Students decontextualize to manipulate symbolic representations by applying properties of operations. MP 4 Students model real-world scenarios with equations and expressions. MP 6 Students communicate precisely with others and use clear mathematical language when describing expressions. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> Clarify and emphasize expressions and the meaning of the equal sign. |
| Prerequisite Skills | <ul style="list-style-type: none"> Write simple expressions that record calculations with numbers. Interpret numerical expressions without evaluating them. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> Apply the properties of operations to generate equivalent expressions. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. Write, read, and evaluate expressions in which letters stand for numbers. Combining like terms. |
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none"> Rectangular Perimeter 2 (Illustrative Mathematics) Equivalent Expressions (Illustrative Mathematics) |
| Assessment Examples | <ul style="list-style-type: none"> Sample SBAC Assessment Item 6.EE.A.4 SBAC Sample Assessment Items |

Expressions and Equations

Cluster

Reason about and solve one-variable equations and inequalities.

NVACS 6.EE.B.5 (Major Works)

Understand solving an equation or inequality as a process of answering a question: Which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.

| Element | Exemplars |
|--|---|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 1 Students solve real-world and mathematical problems through the application of algebraic concepts. They look for meaning of a problem and find efficient ways to represent and solve it. ● MP 2 Students use properties of operations to generate equivalent expressions and use the number line to understand multiplication and division of rational numbers. ● MP 4 Students write expressions, equations, or inequalities from real-world contexts and connect symbolic and graphical representations. They use number lines to compare numbers and represent inequalities. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Solving is a process of reasoning to find the numbers which make an equation true, which can include checking if a given number is a solution. Although the process of reasoning will eventually lead to standard methods for solving equations, students should study examples where looking for structure pays off. ● Emphasize the difference between an equation and an inequality using real world and mathematical examples. ● Determine, by substitution, if a given number satisfies a given equation or inequality. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Write simple expressions that record calculations with numbers. ● Interpret numerical expressions without evaluating them. ● Interpret multiplication as scaling (resizing). ● Write and evaluate numerical expressions involving whole-number exponents. ● Understand what a variable stands for. ● Use substitution. |

| | |
|---|---|
| <p>Connections Within and Beyond Grade Level</p> | <ul style="list-style-type: none"> ● Write expressions that record operations with numbers and with letters standing for numbers. ● Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient). ● View one or more parts of an expression as a single entity. ● For example, describe the expression $2(8 + 7)$ as a product of two factors; view $(8 + 7)$ as both a single entity and a sum of two terms. ● Evaluate expressions at specific values of their variables. ● Include expressions that arise from formulas used in real-world problems. ● Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order. ● Use square root and cube root symbols to represent solutions to equations. ● Solve multi-step equations and inequalities. ● Represent solutions to inequalities in two variables. ● Interpret solutions to equations and inequalities in context. ● Represent solutions to inequalities on a number line. |
| <p>Instructional Examples/Lessons/Tasks</p> | <ul style="list-style-type: none"> ● Log Ride (Illustrative Mathematics) ● Make Use of Structure (Illustrative Mathematics) ● Exponent Experimentation 3 (Illustrative Mathematics) |
| <p>Assessment Examples</p> | <ul style="list-style-type: none"> ● Sample SBAC Assessment Item 6.EE.B.5 SBAC Sample Assessment Items 6.EE.B.5 Various Sample Assessment Items |

Expressions and Equations

Cluster

Reason about and solve one-variable equations and inequalities.

NVACS 6.EE.B.6 (Major Works)

Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

| Element | Exemplars |
|--|--|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 1 Students solve real-world and mathematical problems through the applications of algebraic concepts. They use variables to represent numbers and write expressions when solving problems. ● MP 4 Students solve real-world and mathematical problems through the application of algebraic concepts. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Students should state precisely the meaning of variables they use when setting up equations. This includes specifying whether the variable refers to a specific number, or to all numbers in some range. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Write simple expressions that record calculations with numbers. ● Interpret numerical expressions without evaluating them. ● Generate two numerical patterns using two given rules. ● Identify apparent relationships between corresponding terms. ● Understand what a variable stands for. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Write expressions that record operations with numbers and with letters standing for numbers. ● For example, express the calculation “Subtract y from 5” as $5 - y$ ● Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient). ● View one or more parts of an expression as a single entity. ● For example, describe the expression $2(8 + 7)$ as a product of two factors. ● View $(8 + 7)$ as both a single entity and a sum of two terms. ● Evaluate expressions at specific values of their variables. ● 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 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. ● Determine if a given solution set satisfies a system of equations. |
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none"> ● Firefighter Allocation (Illustrative Mathematics) ● Pennies to Heaven (Illustrative Mathematics) |
| Assessment Examples | <ul style="list-style-type: none"> ● Sample SBAC Assessment Item 6.EE.B.6 Various Sample Assessment Items |

Expressions and Equations

Cluster

Reason about and solve one-variable equations and inequalities.

NVACS 6.EE.B.7 (Major Works)

Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p , q , and x are all nonnegative rational numbers.

| Element | Exemplars |
|--|--|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 2 Represent a wide variety of situations through the use of real numbers and variables based on real world events such as texting friends. ● MP 6 Focus on vocabulary terms: equations and nonnegative rational numbers. ● MP 7 Apply properties to generate equivalent expressions and solve equations. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Utilize strategies to illustrate representing problems algebraically. ● Assist students in understanding the relevance of inverse operations. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Add and subtract fractions with unlike denominators (including mixed numbers) <ul style="list-style-type: none"> ○ For example, $2/3 + 5/4 = 8/12 + 15/12 = 23/12$ ○ In general, $a/b + c/d = (ad + bc)/bd$ ● Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). ● Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers. ● Multiply a fraction or whole number by a fraction. ● Solve real world problems involving multiplication of fractions and mixed numbers. ● Operations with decimals. ● Solve real world problems involving multiplication of decimals. |

| | |
|---|--|
| <p>Connections Within and Beyond Grade Level</p> | <ul style="list-style-type: none"> ● Interpret and compute quotients of fractions. ● Solve word problems involving division of fractions by fractions. ● Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true. ● Use substitution to determine whether a given number in a specified set makes an equation or inequality true. ● Use variables to represent numbers and write expressions when solving a real-world or mathematical problem. ● Understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. ● Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. ● 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. ● Solve multi-step equations. ● Solve systems of equations. ● Write equations to model systems of equations in context. |
| <p>Instructional Examples/Lessons/Tasks</p> | <ul style="list-style-type: none"> ● Fruit Salad (Illustrative Mathematics) ● Morning Walk (Illustrative Mathematics) |
| <p>Assessment Examples</p> | <ul style="list-style-type: none"> ● Sample SBAC Assessment Item 6.EE.B.7 SBAC Sample Assessment Items |

Expressions and Equations

Cluster

Reason about and solve one-variable equations and inequalities.

NVACS 6.EE.B.8 (Major Works)

Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.

| Element | Exemplars |
|--|---|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 1 Ask themselves if their solution makes sense by substituting to determine if the graph is correct. ● MP 2 Provide real-world scenarios to use real numbers and variables in mathematical inequalities. ● MP 6 Discover a variable can stand for an infinite number of solutions when used in inequalities. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● To mitigate misconceptions when graphing inequalities, rewrite inequality so the variable is the first term <ul style="list-style-type: none"> ○ $3 < k = k > 3$ ● Represent solutions to equations and inequalities on a number line so student can see the difference between one solution and many solutions. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Understand a fraction as a number on the number line. ● Represent fractions on a number line diagram. ● Find and position integers and other rational numbers on a horizontal or vertical number line diagram. ● Find and position pairs of integers and other rational numbers on a coordinate plane. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Understand a rational number as a point on the number line. ● Extend number line diagrams and coordinate axes to represent points on the line and in the plane with negative number coordinates. ● Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. ● Write, interpret, and explain statements of order for rational numbers in real-world contexts. ● Understand the absolute value of a rational number as its distance from 0 on the number line. ● Interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. ● Distinguish comparisons of absolute value from statements about order. ● Use variables to represent quantities in a real-world or mathematical problem. ● Construct simple equations and inequalities to solve problems by reasoning about the quantities. ● Solve multi-step inequalities. ● Solve inequalities in two variables. |

| | |
|---|--|
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none">● Fishing Adventures 1 (Illustrative Mathematics)● Height Requirements (Illustrative Mathematics) |
| Assessment Examples | <ul style="list-style-type: none">● Sample SBAC Assessment Item 6.EE.B.8 SBAC Sample Assessment Items |

Expressions and Equations

Cluster

Represent and analyze quantitative relationships between dependent and independent variables.

NVACS 6.EE.C.9 (Major Works)

Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation $d = 65t$ to represent the relationship between distance and time.

| Element | Exemplars |
|--|--|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 2 Represent a variety of real-world situations through the use of variables in mathematical expressions and equations. ● MP 4 Model real-life situations using variables to represent two quantities. ● MP 6 Students precisely communicate with others and use clear mathematical vocabulary to describe the dependent and independent variables. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Students use tabular and graphical representations to develop an appreciation of varying quantities. ● Explore various scenarios to develop understandings of the connection and differences between independent and dependent variables. ● Build vocabulary understanding of dependent variable vs. independent variable. ● Identify independent variables and dependent variables on different graph examples. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Generate two numerical patterns using two given rules. ● Identify apparent relationships between corresponding terms. ● Form ordered pairs consisting of corresponding terms from the two patterns. ● Graph ordered pairs on a coordinate plane. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. ● Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers. ● Interpret slope in context. ● Graph linear functions. ● Identify functions. ● Identify directly proportional relationships. |
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none"> ● Chocolate Bar Sales (Illustrative Mathematics) |
| Assessment Examples | <ul style="list-style-type: none"> ● Sample SBAC Assessment Item 6.EE.C.9 SBAC Sample Assessment Items |

Geometry

Students in Grade 6 build on their understanding of area and volume from Grade 5 to deepen understanding of volume and develop the concept of surface area. Students prepare for their work in Grade 8 with transformations by working with polygons in the coordinate plane in Grade 6. Reasoning about relationships in their work on surface area, composing and decomposing shapes, finding distance on a coordinate plane using endpoint coordinates for horizontal and vertical lines prepare them for Grade 7 (Miles and Williams, 2016).

Cluster

Solve real-world and mathematical problems involving area, surface area, and volume.

NVACS 6.G.A.1 (Supporting Works)

Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

| Element | Exemplars |
|--|---|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 1 Solve real-world problems through the application of geometric concepts. ● MP 3 Explain orally or in writing their strategies and thinking using models, drawing, or symbolic representations. ● MP 4 Use models to explain their thinking to others. ● MP 8 Provide a variety of examples that explicitly focus on patterns and repeated reasoning. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Understand a parallelogram is composed of two identical triangles providing a justification for taking half of the product of the base and height. ● Through exploration, students will discover the relationships between triangles, quadrilaterals, and other polygons. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Apply the area and perimeter formulas for rectangles. ● Multiply and divide whole numbers, fractions, and decimals. ● Identify polygons. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Draw, construct, and describe geometrical figures and the relationship between them. ● 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 triangular prisms, cylinders, cones, and spheres. ● Area of circles. |
| Instructional Examples/ Lessons/Tasks | <ul style="list-style-type: none"> ● Bubble Wrap (Dan Meyer) ● Wallpaper Decomposition (Illustrative Mathematics) ● Same Base and Height, Variation 2 (Illustrative Mathematics) ● Finding Area of Polygons (Illustrative Mathematics) ● Area Tool (Illuminations) |
| Assessment Examples | <ul style="list-style-type: none"> ● Sample SBAC Assessment Item 6.G.A.1 SBAC Sample Assessment Items |

Geometry

Cluster

Solve real-world and mathematical problems involving area, surface area, and volume.

NVACS 6.G.A.2 (Supporting Works)

Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = lwh$ and $V = Bh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

| Element | Exemplars |
|--|--|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 1 Actively engage in solving real-world problems where at least one edge is a fractional unit. ● MP 2 Reason that finding volume of a figure is the same process and formulas whether the edge lengths are whole units or fractional units. ● MP 4 Model volume by filling a solid with cubes and counting them is the same result as using the formula. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Through explorations, students will find the formula for the volume of a rectangular prism. ● Provide students with the opportunity to fill a rectangular prism with cubes. If fractional length edges are not available, use centimeter cubes as $\frac{1}{2}$ units. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Volume is an attribute of a three-dimensional figure. ● Relate volume to the operations of multiplication and addition of whole and fractional numbers. ● Solve real-world and mathematical problems involving volume. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● 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 triangular prisms, cylinders, cones, and spheres. ● Area of circles. |
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none"> ● Computing Volume, Progression 1 (Illustrative Mathematics) ● Computing Volume, Progression 3 (Illustrative Mathematics) ● Banana Bread (Illustrative Mathematics) ● Popcorn Prisms (Illuminations) |
| Assessment Examples | <ul style="list-style-type: none"> ● Sample PARCC Assessment Item (Achieve the Core) ● Sample SBAC Assessment Item 6.G.A.2 SBAC Sample Assessment Items |

Geometry

Cluster

Solve real-world and mathematical problems involving area, surface area, and volume.

NVACS 6.G.A.3 (Supporting Works)

Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.

| Element | Exemplars |
|--|--|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 3 Explain orally or in writing, their strategies and thinking using drawings on how they solved problem. ● MP 6 Communicate precisely using appropriate mathematical vocabulary naming vertices and coordinate points to explain how to find the side lengths of a polygon in the coordinate plane. ● MP 7 Discover patterns of how to find the side lengths using the first or second coordinate. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Construct maps, diagrams, blueprints, etc. using polygons with specified dimensions in the coordinate plane. ● Specify coordinates for a polygon with a specific properties, justifying the attribution of those properties. ● Justify that a shape is a parallelogram by computing the length of its pairs of horizontal and vertical sides. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Define polygons and vertices. ● Understand the coordinate plane system (all four quadrants). ● Be able to read, write and plot ordered pairs. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Use absolute value to find distances between ordered pairs. ● Describe transformations on two-dimensional figures on the coordinate plane. ● Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. |
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none"> ● Polygons in the Coordinate Plane (Illustrative Mathematics) ● Walking the Block (Illustrative Mathematics) |
| Assessment Examples | <ul style="list-style-type: none"> ● Sample SBAC Assessment Item 6.G.A.3 SBAC Sample Assessment Items |

Geometry

Cluster

Solve real-world and mathematical problems involving area, surface area, and volume.

NVACS 6.G.A.4 (Supporting Works)

Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

| Element | Exemplars |
|--|---|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 1 Solve real-world problems involving surface area. ● MP 2 Understand and determine patterns to see how area of a two-dimensional figure relates to surface area of a three-dimensional figure. ● MP 5 Encourage students to use physical objects or models to develop ideas. ● MP 6 Use correct vocabulary to discuss the parts of nets and how to use them to find surface area using correct units. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Lead students to find the area of the faces of a net and then adding the individual areas of the faces to find the surface area. ● Provide opportunities to discover there are a variety of different nets which can be folded to make the same cube. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Be able to calculate the area of various polygons. ● Understand that area covers a surface in square units without gaps or overlaps. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Solve 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 triangular prisms, cylinders, cones, and spheres. ● Area of circles. |
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none"> ● Dandy Candies (Dan Meyer) ● File Cabinet (Dan Meyer) ● Painting a Barn (Illustrative Mathematics) |
| Assessment Examples | <ul style="list-style-type: none"> ● Sample PARCC Assessment Item (Achieve The Core) ● Sample SBAC Performance Task (SBAC Sample Items) ● 6.G.A.4 SBAC Sample Assessment Items |

Statistics and Probability

A major focus for sixth graders is to develop an understanding of statistical thinking. Students study measures of center and variability with newly learned knowledge of mean, median, mode, and range. Using dot plots, histograms, and boxplots, students draw inferences and make comparisons between data sets. At this level, students recognize that a data distribution may not have a definite center and that different ways to measure center provide different values. Students discover that interpreting different measures of center for same data develops the understanding of how each measure can change how data get interpreted (The Common Core Mathematics Companion: The Standards Decoded, Miles and Williams, 2016).

Cluster

Develop understanding of statistical variability.

NVACS 6.SP.A.1 (Additional Works)

Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.

| Element | Exemplars |
|--|---|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 3: Students write and share their own statistical questions that can be used to survey and collect data from other classmates. They explain their thinking to others and respond to others thinking (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Allow students to discover the difference between a statistical and nonstatistical question through classroom discussion and examples. ● Have students write, sort and categorize statistical and nonstatistical questions. ● Use those questions to survey and collect data from their classmates. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Experience with collecting, organizing and analyzing data. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Recognize the difference between a measure of center and a measure of variation. ● Display numerical data utilizing the appropriate graphical representation. ● Mean Average Deviation. |
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none"> ● Buttons: Statistical Questions (Illustrative Mathematics) |
| Assessment Examples | Sample SBAC Assessment Item 6.SP.A.1 SBAC Sample Assessment Items |

Statistics and Probability

Cluster

Develop understanding of statistical variability.

NVACS 6.SP.A.2 (Additional Works)

Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.

| Element | Exemplars |
|--|---|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 6 Students use precise mathematical language to describe the distribution of data. ● MP 7 Students recognize and are able to describe the center, spread, and overall shape of the data. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Have students examine the meaning of mean, median, mode, and range and define how they are used to summarize data. ● Describe the overall shape of data from student created graphs and find measures of center (mean, median, mode) and spread (range). ● Build vocabulary concepts of center and variation. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Create number line diagrams and line plots to display data ● Order numbers from least to greatest. ● Add, subtract and divide multi-digit numbers. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Recognize the difference between a measure of center and a measure of variation. ● Display numerical data utilizing the appropriate graphical representation. ● Compare and contrast two numerical data distributions with similar variabilities and gain information about a population. ● Line of best fit. ● Identify strength and shape of scatter plots. |
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none"> ● Song for Mean, Median, Mode (SNRPDP) ● Puppy Weights (Illustrative Mathematics) ● Electoral College (Illustrative Mathematics) ● Describing Distributions (Illustrative Mathematics) |
| Assessment Examples | <ul style="list-style-type: none"> ● Sample SBAC Assessment Item 6.SP.A.2 SBAC Sample Assessment Items |

Statistics and Probability

Cluster

Develop understanding of statistical variability.

NVACS 6.SP.A.3 (Additional Works)

Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

| Element | Exemplars |
|--|--|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 2 Students match graphs to explanations of measure of center. ● MP 4 Students model examples of measures of center and measures of spread. ● MP 7 Students find mean, median, mode, and range. ● MP 8 Students recognize patterns in determining the appropriate center and variations for data sets. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Compare and contrast measures of center and measure of variation. ● Create a foldable that defines the purposes of each measure of center (mean, median, and mode) and the center and spread. ● Provide opportunities over time for students to practice identifying the mean, median, mode and range of a variety of data sets. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Understand how to find mean, median, mode and range. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Display numerical data utilizing the appropriate graphical representation (including dot plots, histograms and box plots). ● Understand that statistical questions represent variability in the data. ● Mean Average Deviation. ● Standard Deviation. |
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none"> ● Compare Measures of Center and Variability (CPALMS) ● Is It Center or Is It Variability? (Illustrative Mathematics) |
| Assessment Examples | <ul style="list-style-type: none"> ● Sample SBAC Assessment Item 6.SP.A.3 Various Sample Assessment Items |

Statistics and Probability

Cluster

Summarize and describe distributions.

NVACS 6.SP.B.4 (Additional Works)

Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

| Element | Exemplars |
|--|---|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 4 Students display data in appropriate format. ● MP 6 Students use precise mathematical language when describing data displays. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Discuss how to select the most appropriate graph to display the data. ● Allow students the opportunity to create dot plots, histograms, and box plots and interpret them. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Understand the purpose of graphs is to organize data in order to analyze it. ● Organize, represent, and interpret data with up to three categories. ● Ask and answer questions about the total number of data points: how many in each category, and how many more or less are in one category than in another. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Compare and contrast two numerical data distributions with similar variabilities and gain information about a population. |
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none"> ● Puzzle Times (Illustrative Mathematics) ● Comparing Test Scores (Illustrative Mathematics) ● Describing Distributions (Illustrative Mathematics) |
| Assessment Examples | <ul style="list-style-type: none"> ● Sample SBAC Assessment Item 6.SP.B.4 SBAC Sample Assessment Items |

Statistics and Probability

Cluster

Summarize and describe distributions.

NVACS 6.SP.B.5 (Additional Works)

Summarize numerical data sets in relation to their context, such as by:

- **6.SP.B.5.a**
Reporting the number of observations.
- **6.SP.B.5.b**
Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
- **6.SP.B.5.c**
Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
- **6.SP.B.5.d**

Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

| Element | Exemplars |
|--|---|
| Standards for Mathematical Practice | <ul style="list-style-type: none"> ● MP 1 Students explain correspondence between data, graphing of data, and relationship between data. ● MP 6 Students will communicate using specific mathematical language for data displays. (Miles and Williams, 2016) |
| Instructional Strategies | <ul style="list-style-type: none"> ● Analyze data and expand to include quartiles, interquartile range, and Mean Absolute Deviation. ● Provide students with samples of graphs from newspapers or current events and have them identify the attribute being investigated, how it was measured and with what unit of measurement. |
| Prerequisite Skills | <ul style="list-style-type: none"> ● Graph data using accurate displays and terminology. ● Understand how to find mean, median, mode and range. |
| Connections Within and Beyond Grade Level | <ul style="list-style-type: none"> ● Understand that statistical questions represent variability in the data. ● Understand that statistics can be used to gain information about a population. ● Standard Deviation. |
| Instructional Examples/Lessons/Tasks | <ul style="list-style-type: none"> ● Mean Absolute Deviation Template (Teachers Pay Teachers- free download). ● Variation About the Mean: Boston Harbor Project (Arizona PBS) ● Average Number of Siblings (Illustrative Mathematics) ● Mean or Median (Illustrative Mathematics) |
| Assessment Examples | <ul style="list-style-type: none"> ● Sample SBAC Assessment Item 6.SP.B.5 SBAC Sample Assessment Items 6.SP.B.5 Various Sample Assessment Items |

Acknowledgements

April Acosta

Clark County School District

Bethany Andrews

Clark County School District

Kristin Asa

Clark County School District

Jennifer Barczynyn

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

Carson City School District

Dana Dyer

Clark County School District

Virginie Eldridge

Elko County School District

Rebecca Glasser

Clark County School District

Theresa Guthrie

Elko County School District

Kristen Holzhaus

Clark County School District

Heather Hoyle

Douglas County School District

Robin Kato

Carson City School District

Andrea Keller

Clark County School District

Marcia Klink

Clark County School District

Kathy Lawrence

Washoe County School District

Sarah Lobsinger

Carson City School District

Jennifer Loescher

Clark County School District

Mike Liu

Business Member

Deena Lyons

Clark County School District

Dana Martin

Clark County School District

Candice Meiries

Southern RPD

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

Clark County School District

Sheri Sanchez

Elko County School District

Stacey Samuels

Clark County School District

Carly Strauss

Douglas County School District

Sara Swanson

Clark County School District

Connie Thomson

Elko County School District

Channon Toles

Washoe County School District

Denise Trakas

Washoe County School District

Lynn Trell

Clark County School District

Wendy Weatherwax

Clark County School District

Adrienne Wiggins

Carson City School District

Kim Whisler

Carson City School District

Teresa Yeoman

Clark County School District

Hillary Zeune de Soto

Clark County School District

References

(n.d.). Retrieved from <http://rpd.net/>

(n.d.). Retrieved from <https://illuminations.nctm.org/>

(n.d.). Retrieved from <https://ccsd.softchalkcloud.com/login>

(n.d.). Retrieved from <http://www.letsgolearn.com>

Calcasieu Parish Public Schools / Homepage. (n.d.). Retrieved from <https://www.cpsb.org/>

Common Core Map. (n.d.). Retrieved from <https://www.khanacademy.org/commoncore/>

CORE Math Performance Assessment Modules. (n.d.). Retrieved from <http://collaborate.caedpartners.org/display/SAI/CORE+Math+Performance+Assessment+Modules>

GeoGebra | Free Math Apps - used by over 100 Million Students & Teachers Worldwide. (n.d.). Retrieved from <https://www.geogebra.org>

Grade 7 Mathematics. (n.d.). Retrieved from <https://www.engageny.org/resource/grade-7-mathematics>

Home page. (n.d.). Retrieved from <https://knpb.pbslearningmedia.org/>

Illustrative Mathematics. (n.d.). Retrieved from <https://www.illustrativemathematics.org/>

Math Interactives. (n.d.). Retrieved from http://www.learnalberta.ca/content/mejhm/index.html?l=0&ID1=AB.MATH.JR.SHAP&ID2=AB.MATH.JR.SHAP.SURF&lesson=html/object_interactives/surfaceArea/explore_it.html

Mathematics Assessment Project. (n.d.). Retrieved from <http://map.mathshell.org/>

Miles, R. H., & Williams, L. A. (2016). *The common core mathematics companion: The standards decoded, grades 6-8: What they say, what they mean, how to teach them*. Thousand Oaks, CA: Corwin.

Online Math Help & Learning Resources. (n.d.). Retrieved from <https://www.onlinemathlearning.com/>

Open Up Resources and Illustrative Mathematics. (n.d.). Grade 7 Teacher Materials. Retrieved from <https://im.openupresources.org/7/students/>

Roberts, D. (n.d.). Math Bits Secondary Math Resources with the Common Core. Retrieved from <https://mathbits.com/>

SILC. (n.d.). Retrieved from <http://spatiallearning.org>

Smart Curriculum. Smarter Teaching. (n.d.). Retrieved from <https://learnzillion.com/p/>

Smarter Balanced Single Sign On. (n.d.). Retrieved from <https://sso.smarterbalanced.org/auth/UI/Login>

UnboundEd. (n.d.). Retrieved from <https://www.unbounded.org/>

Virtual Manipulatives. (n.d.). Retrieved from
http://www.glencoe.com/sites/common_assets/mathematics/ebook_assets/vmf/VMF-Interface.html

Jhone Ebert

Superintendent of Public Instruction

Jonathan Moore, Ed.D

Deputy Superintendent for Student Achievement

Dave Brancamp

Director of Standards and Instructional Support

Tracy Gruber

K-12 Mathematics Education Program Professional

