# Petersburg School District
# K-12 Mathematics Curriculum
# Adopted - February 2025

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# Elementary
## Grades Kindergarten through 5th

# Kindergarten

**Instructional Focus:**
In Kindergarten, instructional time should focus on two critical areas:

- Representing, relating, and operating on whole numbers, initially with sets of objects.
- Describing shapes and space.

**Readiness Standards:**

- Must be 5 years old by September 1.

## Kindergarten Mathematical Content Standards

| Strand | Standard | Examples and Resources |
|---|---|---|
| **Domain: Counting and Cardinality** | | |
| **Know number names and the count sequence** | • (K.CC.1) Count to 100 by ones and by tens.<br>• (K.CC.2) Count forward beginning from a given number within the known sequence.<br>• (K.CC.3) Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects). | Use:<br>•<br><br>Literature Connections:<br>• |
| **Count to tell the number of objects** | • (K.CC.4) Understand the relationship between numbers and quantities; connect counting to cardinality.<br>a. When counting objects, say the number names in standard order, pairing each object with one and only one number name and each number name with one and only one object.<br>b. Understand that the last number name said, tells the number of objects counted. The number of objects is the same regardless of | Use:<br>•<br><br>Literature Connections:<br>• |

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| | their arrangement or the order in which they were counted.<br>c. Understand that each successive number name refers to a quantity that is one larger.<br>● (K.CC.5) Count to answer, “How many?” questions about as many as 20 things arranged in a line a rectangular array or a circle, or as many as 10 things in a scattered configuration; given a number from 1-20, count out that many objects. | |
| **Compare numbers** | ● (K.CC.6) Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group (e.g. by matching, counting, or estimating strategies).<br>● (K.CC.7) Compare and order two numbers between 1 and 10 presented as a written numeral. | Use:<br>●<br><br>Literature Connections:<br>● |
| **Domain: Operations and Algebraic Thinking** | | |
| **Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from** | ● (K.OA.1) Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.<br>● (K.OA.2) Add or subtract whole numbers to 10 (e.g., by using objects or drawings to solve word problems).<br>● (K.OA.3) Decompose numbers less than or equal to 10 into pairs in more than one way (e.g., by using objects or drawings, and recorded each decomposition by a drawing or equation).<br>● (K.OA.4) For any number from 1-4, find the number that makes 5 when added to the given number and, for any number from 1-9, find the number that makes 10 when added to the given number (e.g., by | Use:<br>●<br><br>Literature Connections:<br>● |

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| | using objects, drawings or 10 frames) and record the answer with a drawing or equation.<br>● (K.OA.5) Fluently add and subtract numbers up to 5. | |
| **Identify and continue patterns** | ● (K.OA.6) Recognize, identify and continue simple patterns of color, shape, and size. | Use:<br>●<br><br>Literature Connections:<br>● |
| **Domain: Number and Operations in Base Ten** | | |
| **Work with numbers 11-19 to gain foundations for place value** | ● (K.NBT.1) Compose and decompose numbers from 11 to 19 into ten ones and some further ones (e.g., by using objects or drawings) and record each composition and decomposition by a drawing or equation (e.g., 18=10+8); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight or nine ones. | Use:<br>●<br><br>Literature Connections:<br>● |
| **Domain: Measurement and Data** | | |
| **Describe and compare measurable attributes** | ● (K.MD.1) Describe measurable attributes of objects (e.g., length or weight). Match measuring tools to attribute (e.g., ruler to length). Describe several measurable attributes of a single object.<br>● (K.MD.2) Make comparisons between two objects with a measurable attribute in common to see which objects have “more of” or “less of” of the attribute, and describe the difference. | Use:<br>●<br><br>Literature Connections:<br>● |
| **Classify objects and count the number of** | ● (K.MD.3) Classify objects into given categories (attributes). Count the number of objects in each | Use:<br>● |

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| **objects in each category** | category (Limit category counts to be less than or equal to 10). | Literature Connections:<br>● |
| **Work with time and money** | ● (K.MD.4) Name in sequence the days of the week.<br>● (K.MD.5) Tell time to the hour using both analog and digital clocks.<br>● (K.MD.6) Identify coins by name. | Use:<br>●<br><br>Literature Connections:<br>● |
| **Domain: Geometry** | | |
| **Identify and describe shapes** | ● (K.G.1) Describe objects in the environment using names of shapes and describe their relative positions (e.g., above, below, beside, in front of, behind, next to).<br>● (K.G.2) Name shapes regardless of their orientation or overall size.<br>● (K.G.3) Identify shapes as two-dimensional (flat) or three-dimensional (solid). | Use:<br>●<br><br>Literature Connections:<br>● |
| **Analyze, compare, create, and compose shapes** | ● (K.G.4) Analyze and compare two-dimensional and three-dimensional shapes in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices), and other attributes (e.g., having sides of equal lengths).<br>● (K.G.5) Build shapes (e.g., using sticks and clay) and draw shapes.<br>● (K.G.6) Put together two-dimensional shapes to form larger shapes (e.g., join two triangles with full sides touching to make a rectangle). | |

# First Grade

**Instructional Focus:**
In Grade 1, instructional time should focus on four critical areas:

- Developing an understanding of addition, subtraction, and strategies for addition and subtraction within 20.
- Developing an understanding of whole number relationships and place value, including grouping in tens and ones.
- Developing an understanding of linear measurement and measuring lengths as iterating length units.
- Reasoning about attributes of, and composing and decomposing geometric shapes.

**Readiness Standards:**

- Students use numbers, including written numerals, to represent quantities and to solve quantitative problems, such as counting objects in a set; counting out a given number of objects; comparing sets of numerals; and modeling simple joining and separating situations with sets of objects, or eventually with equations such as 5 + 2 = 7 and 7 - 2 = 5.
- Students describe their physical world using geometric ideas (e.g., shape, orientation, spatial relations) and vocabulary.

| Grade 1 Mathematical Content Standards | | |
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| **Strand** | **Standard** | **Examples and Resources** |
| **Domain: Counting and Cardinality** | | |
| **Know ordinal names and counting flexibility** | • (1.CC.1) Skip count by 2s and 5s.<br>• (1.CC.2) Use ordinal numbers correctly when identifying object position (e.g., first, second, third).<br>• (1.CC.3) Order numbers from 1-100. Demonstrate ability in counting forward and backward. | Use:<br>•<br><br>Literature Connections:<br>• |
| **Count to tell the number of objects** | • (1.CC.4) Count a large quantity of objects by grouping into 10s and counting by 10s and 1s to find the quantity. | Use:<br>•<br><br>Literature Connections:<br>• |

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| **Compare numbers** | • (1.CC.5) Use the symbols for greater than, less than, or equal to when comparing two numbers or groups of objects.<br>• (1.CC.6) Estimate how many and how much in a given set to 20 and then verify estimate by counting. | Use:<br>•<br><br>Literature Connections:<br>• |
| **Domain: Operations and Algebraic Thinking** | | |
| **Represent and solve problems involving addition and subtraction** | • (1.OA.1) Use addition and subtraction strategies to solve word problems (using numbers up to 20), involving situations of adding to, taking from, putting together, taking apart and comparing with unknowns in all positions, using a number line (e.g., by using objects, drawings, and equations). Record and explain using equation symbols and a symbol for the unknown number to represent the problem.<br>• (1.OA.2) Solve word problems that call for the addition of three whole numbers whose sum is less than or equal to 20 (e.g., by using objects, drawings, and equations). Record and explain using equation symbols and a symbol for the unknown number to represent the problem. | Use:<br>•<br><br>Literature Connections:<br>• |
| **Understand and apply properties of operations and the relationship between addition and subtraction** | • (1.OA.3) Apply properties of operations as strategies to add and subtract (students need not know the name of the property).<br>• (1.OA.4) Understand subtraction as an unknown-addend problem. | Use:<br>•<br><br>Literature Connections:<br>• |
| **Add and subtract using numbers up to 20** | • (1.OA.5) Relate counting to addition and subtraction (e.g., by counting on 2 to add 2)<br>• (1.OA.6) Add and subtract using numbers up to 20, demonstrating fluency for addition and subtraction up to 10. Use strategies such as:<br>a. counting on | • |

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| | b. making ten (8+6=8+2+4=10+4=14)<br>c. decomposing a number leading to a ten (13-4=13-3-1=10-1=9)<br>d. using the relationship between addition and subtraction, such as fact families (8+4=12 and 12-8=4)<br>e. creating equivalent but easier or known sums (e.g., adding 6+7 by creating the known equivalent 6+6+1=12+1=13) | |
| **Work with addition and subtraction equations** | ● (1.OA.7) Understand the meaning of the equal sign (e.g., read equal sign as “same as”) and determine if equations involving addition and subtraction are true or false.<br>● (1.OA.8) Determine the unknown whole number in an addition or subtraction equation. | |
| **Identify and continue patterns** | ● (1.OA.9) Identify, continue, and label patterns (e.g., aabb, abab). Create patterns using number, shape, size, rhythm, or color. | |
| **Domain: Number and Operations in Base Ten** | | |
| **Extend the counting sequence** | ● (1.NBT.1) Count to 120. In this range, read, write and order numerals, and represent a number of objects with a written numeral. | Use:<br>●<br><br>Literature Connections:<br>● |
| **Understand place value** | ● (1.NBT.2) Model and identify place value positions of two digit numbers. Include:<br>a. 10 can be thought of as a bundle of ten ones, called a “ten”. | ● |

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| | b. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight or nine ones.<br>c. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90, refer to one, two, three, four, five, six, seven, eight or nine tens (and 0 ones).<br>● (1.NBT.3) Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, <. | |
| **Use place value understanding and properties of operations to add and subtract** | ● (1.NBT.4) Add using numbers up to 100 including adding a two-digit number and a one-digit number and adding a two-digit number and a multiple of 10. Use:<br>a. concrete models or drawings and strategies based on place value<br>b. properties of operations<br>c. and/or relationship between addition and subtraction. Relate the strategy to a written method and explain the reasoning used. Demonstrate in adding two-digit numbers, tens and tens are added, ones and ones are added and sometimes it is necessary to compose a ten from ten ones.<br>● (1.NBT.5) Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.<br>● (1.NBT.6) Subtract multiples of 10 up to 100. Use:<br>a. concrete models or drawings and strategies based on place value<br>b. properties of operation.<br>c. and/or relationship between addition and subtraction. Relate the strategy to a written method and explain the reasoning used. | Use:<br>●<br><br>Literature Connections:<br>● |

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| **Domain: Measurement and Data** | | |
| **Measure lengths indirectly and by iterating length units** | • (1.MD.1) Measure and compare three objects using standard or non-standard units.<br>• (1.MD.2) Express the length of an object as a whole number of length units, by laying multiple copies of shorter objects (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. | Use:<br>•<br><br>Literature Connections:<br>• |
| **Work with time and money** | • (1.MD.3) Tell and write time in half hours using both analog and digital clocks.<br>• (1.MD.4) Read a calendar distinguishing yesterday, today, and tomorrow. Read and write a date.<br>• (1.MD.5) Recognize and read money symbols including $ and ¢.<br>• (1.MD.6) Identify values of coins (e.g., nickel = 5 cents, quarter = 25 cents). Identify equivalent values of coins up to $1 (e.g., 5 pennies = 1 nickel, 5 nickels = 1 quarter). | Use:<br>•<br><br>Literature Connections:<br>• |
| **Represent and interpret data** | • (1.MD.7) Organize, represent, and interpret data with up to three categories. Ask and answer comparison and quantity questions about the data. | |
| **Domain: Geometry** | | |
| **Reason with shapes and their attributes** | • (1.G.1) Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes. Identify shapes that have non-defining attributes (e.g., color, orientation, overall size). Build and draw shapes given specified attributes.<br>• (1.G.2) Compose (put together) two-dimensional or three-dimensional shapes to create a larger, | Use:<br>•<br><br>Literature Connections:<br>• |

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| | composite shape, and compose new shapes from the composite shape.<br>● (1.G.3) Partition circles and rectangles into two and four equal shares. Describe the shares using the words: *halves, fourths, and quarters* and phrases: *half of, fourth of, and a quarter of*. Describe the whole as two of, or four of, the shares. Understand for these examples that decomposing (break apart) into more equal shares creates smaller shares. | |

# Second Grade

**Instructional Focus:**
In Grade 2, instructional time should focus on four critical areas:

- Extending understanding of base-ten notation.
- Building fluency with addition and subtraction.
- Using standard units of measure.
- Describing and analyzing shapes.

**Readiness Standards:**

- Students develop strategies for adding and subtracting whole numbers based on their prior work with small numbers.
- Students develop, discuss, and use efficient, accurate, and generalizable methods to add within 100 and subtract multiples of 10.
- Students develop an understanding of the meaning and processes of measurement, including underlying concepts such as iterating (the mental activity of building up the length of an object with equal-sized units) and the transitivity principle for indirect measurement.
- Students compose and decompose plane or solid figures (e.g., put two triangles together to make a quadrilateral) and build an understanding of part-whole relationships as well as the properties of the original and composite shapes.

## Grade 2 Mathematical Content Standards

| Strand | Standard | Examples and Resources |
|---|---|---|
| **Domain: Operations and Algebraic Thinking** | | |
| **Represent and solve problems involving addition and subtraction** | • (2.OA.1) Use addition and subtraction strategies to estimate, then solve one- and two- step word problems (using numbers up to 100) involving situations of adding to, taking from, putting together, taking apart, and comparing with unknowns in all positions (e.g., by using objects, drawings and equations). Record and explain using equation symbols and a symbol for the unknown number to represent the problem. | Use:<br>●<br><br>Literature Connections:<br>● |

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| **Add and subtract using numbers up to 20** | • (2.OA.2) Fluently add and subtract using numbers up to 20 using mental strategies. Know from memory all sums of two one-digit numbers. | Use:<br>•<br><br>Literature Connections:<br>• |
| **Work with equal groups of objects to gain foundations for multiplication** | • (2.OA.3) Determine whether a group of objects (up to 20) is odd or even (e.g., by pairing objects and comparing, counting by 2s) Model an even number as two equal groups of objects and then write an equation as a sum of two equal addends.<br>• (2.OA.4) Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns. Write an equation to express the total as repeated addition (e.g., array of 4 by 5 would be 5+5+5+5=20). | Use:<br>•<br><br>Literature Connections:<br>• |
| **Identify and continue patterns** | • (2.OA.5) Identify, continue, and label number patterns (e.g., aabb, abab). Describe a rule that determines and continues a sequence or pattern. | |
| **Domain: Number and Operations in Base Ten** | | |
| **Understand place value** | • (2.NBT.1) Model and identify place value positions of three-digit numbers. Include:<br>a. 100 can be thought of as a bundle of ten tens - called a “hundred”.<br>b. The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).<br>• (2.NBT.2) Count up to 1000, skip-count by 5s, 10s and 100s.<br>• (2.NBT.3) Read, write, order up to 1000 using base-ten numerals, number names, and expanded form. | Use:<br>•<br><br>Literature Connections:<br>• |

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| | • (2.NBT.4) Compare two three-digit numbers based on the meanings of the hundreds, tens, and ones digits, using >,=,< symbols to record the results. | |
| **Use place value understanding and properties of operations to add and subtract** | • (2.NBT.5) Fluently add and subtract using numbers up to 100. Use:<br>  ○ strategies based on place value<br>  ○ properties of operations<br>  ○ and/or the relationship between addition and subtraction.<br>• (2.NBT.6) Add up to four two-digit numbers using strategies based on place value and properties of operations.<br>• (2.NBT.7) Add and subtract using numbers up to 1000. Use:<br>  a. concrete models or drawings and strategies based on place value<br>  b. properties of operations<br>  c. and/or the relationship between addition and subtraction.<br>Relate the strategy to a written method and explain the reasoning used. Demonstrate in adding or subtracting three-digit numbers, hundreds and hundreds are added or subtracted, tens and tens are added or subtracted, ones and ones are added or subtracted, and sometimes it is necessary to compose a ten from ten ones or a hundred from ten tens.<br>• (2.NBT.8) Mentally add 10 or 100 to a given number 100-900 and mentally subtract 10 or 100 from a given number.<br>• (2.NBT.9) Explain or illustrate the processes of addition or subtraction and their relationship using place value and the properties of operations. | Use:<br>•<br><br>Literature Connections:<br>• |

| **Domain: Measurement and Data** | | |
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| **Measure and estimate lengths in standard units** | • (2.MD.1) Measure the length of an object by selecting and using standards tools such as rulers, yardsticks, meter sticks, and measuring tapes.<br>• (2.MD.2) Measure the length of an object twice using different length units for the two measurements. Describe how the two measurements relate to the size of the units chosen.<br>• (2.MD3) Estimate, measure, and draw lengths using whole units of inches, feet, yards, centimeters, and meters.<br>• (2.MD.4) Measure to compare lengths of two objects expressing the difference in terms of a standard length unit. | Use:<br>•<br><br>Literature Connections:<br>• |
| **Relate addition and subtraction to length** | • (2.MD.5) Solve addition and subtraction word problems using numbers up to 100 involving lengths that are given in the same units (e.g., by using drawings of rulers). Write an equation with a symbol for the unknown to represent the problem.<br>• (2.MD.6) Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0,1, 2,..., and represent whole-number sums and differences within 100 on a number line diagram. | Use:<br>•<br><br>Literature Connections:<br>• |
| **Work with time and money** | • (2.MD.7)Tell and write time to the nearest five minutes using a.m. and p.m. from analog and digital clocks.<br>• (2.MD.8) Solve word problems involving dollar bills and coins using the $ and ¢ symbols appropriately. | Use:<br>•<br><br>Literature Connections:<br>• |
| **Represent and interpret data** | • (2.MD.9) Collect, record, interpret, represent, and describe data in a table, graph, or line plot. | |

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| | • (2.MD.10) Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using the information presented in a bar graph. | |
| **Domain: Geometry** | | |
| **Reason with shapes and their attributes** | • (2.G.1) Identify and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces compared visually, not by measuring. Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.<br>• (2.G.2) Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.<br>• (2.G.3) Partition circles and rectangles into shares, describe the shares using the words *halves, thirds, half of, a third of,* etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape. | Use:<br>•<br><br>Literature Connections:<br>• |

# Third Grade

**Instructional Focus:**
In Grade 3, instructional time should focus on four critical areas:

- Developing an understanding of multiplication and division and strategies for multiplication and division within 100.
- Developing an understanding of fractions, especially unit fractions (fractions with a numerator of 1).
- Developing an understanding of the structure of rectangular arrays and of area.
- Describing and analyzing two-dimensional shapes.

**Readiness Standards:**

- Students extend their understanding of the base-ten system. This includes ideas of counting in fives, tens, and multiples of hundreds, tens, and ones, as well as number relationships involving these units, including comparing.
- Students use their understanding of addition to develop fluency with addition and subtraction within 100.
- Students recognize the need or standard units of measure (centimeter and inch) and the use of rulers and other measurement tools with the understanding that linear measure involves an iteration of units.
- Students describe and analyze shapes by examining their sides and angles.
- Students investigate, describe, and reason about decomposing and combining shapes to make other shapes.

| Grade 3 Mathematical Content Standards | | |
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| **Strand** | **Standard** | **Examples and Resources** |
| **Domain: Operations and Algebraic Thinking** | | |
| **Represent and solve problems involving multiplication and division** | • (3.OA.1) Interpret products of whole numbers (e.g., interpret 5x7 as the total number of objects in 5 groups of 7 objects each). | Use:<br>•<br><br>Literature Connections:<br>• |
| | • (3.OA.2) Interpret whole-number quotients of whole numbers (e.g., interpret 56÷8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of | Use:<br>•<br><br>Literature Connections:<br>• |

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| | shares when 56 objects are partitioned into equal shares of 8 objects each).<br>● (3.OA.3) Use multiplication and division numbers up to 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem).<br>● (3.OA.4) Determine the unknown whole number in a multiplication or division equation relating three whole numbers. | |
| **Understand the properties of multiplication and the relationship between multiplication and division** | ● (3.OA.5) Make, test, support, draw conclusions, and justify conjectures about properties of operations as strategies to multiply and divide (students need not use formal terms for these properties).<br>○ Commutative property of multiplication: If 6x4=24 is known, then 4x6=24 is also known.<br>○ Associative property of multiplication: 3x5x2 can be found by 3x5=15, then 15x2=30, or by 5x2=10, then 3x10=30.<br>○ Distributive property: knowing that 8x5=40 and 8x2=16, one can find 8x7 as 8x(5+2)=(8x5)+(8x2)=40+16=56.<br>○ Inverse property (relationship) of multiplication and division.<br>● (3.OA.6) Understand division as an unknown-factor problem. | Use:<br>●<br><br>Literature Connections:<br>● |
| **Multiply and divide up to 100** | ● (3.OA.7) Fluently multiply and divide numbers up to 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8x5=40, one knows 40÷5=8) or properties of operations. By the end of Grade 3, know from memory all the products of two one-digit numbers. | |

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| **Solve problems involving the four operations and identify and explain patterns in arithmetic** | • (3.OA.8) Solve and create two-step word problems using any of the four operations. Represent these problems using equations with a symbol (box, circle, question mark) standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.<br>• (3.OA.9) Identify arithmetic patterns (including patterns in the addition table or multiplication table) and explain them using properties of operations. | |
| **Domain: Number and Operations in Base Ten** | | |
| **Use place value understanding and properties of operations to perform multi-digit arithmetic** | • (3.NBT.1) Use place value understanding to round whole numbers to the nearest 10 or 100.<br>• (3.NBT.2) Use strategies and/or algorithms to fluently add and subtract with numbers up to 1000, demonstrating an understanding of place value, properties of operations, and/or the relationship between addition and subtraction.<br>• (3.NBT.3) Multiply one-digit whole numbers by multiples of 10 in the range 10-90 (e.g., 9x80, 10x60) using strategies based on place value and properties of operations. | Use:<br>•<br><br>Literature Connections:<br>• |
| **Domain: Number and Operations-Fractions** (Limited in this grade to fractions with denominators 2, 3, 4, 6, and 8) | | |
| **Develop an understanding of fractions as numbers** | • (3.NF.1) Understand a fraction *1/b* (e.g., ¼) as the quantity formed by 1 part when a whole is partitioned into b (e.g., 4) equal parts; understand a fraction *a/b* (e.g., 2/4) as the quantity formed by *a* (e.g., 2) parts of size *1/b* (e.g., ¼).<br>• (3.NF.2) Understand a fraction as a number on the number line; represent fractions on a number line diagram. | Use:<br>•<br><br>Literature Connections:<br>• |

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| | a. Represent a fraction *1/b* (e.g., ¼) on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into *b* e.g., 4) equal parts. Recognize that each part has size *1/b* (e.g., ¼) and that the endpoint of the part based at 0 locates the number *1/b* (e.g., ¼) on the number line.<br>b. Represent a fraction *a/b* (e.g., 2/8) on a number line diagram or ruler by marking off *a* lengths *1/b* (e.g., ⅛) from 0. Recognize that the resulting interval has size *a/b* (e.g., 2/8) and that its endpoint locates the number *a/b* (e.g., 2/8) on the number line.<br>● (3.NF.3) Explain equivalence of fractions in special cases and compare fractions by reasoning about their size.<br>a. Understand two fractions as equivalent if they are the same size (modeled) or the same point on a number line.<br>b. Recognize and generate simple equivalent fractions (e.g., ½=2/4, 4/6=⅔). Explain why the fractions are equivalent (e.g., by using a visual fraction model).<br>c. Express and model whole numbers as fractions and recognize and construct fractions that are equivalent to whole numbers.<br>● Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >,=, or < and justify the conclusions (e.g., by using a fraction model). | |

| **Domain: Measurement and Data** | | |
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| **Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects** | • (3.MD.1) Tell and write the time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes or hours (e.g., by representing the problem on a number line, diagram, or clock).<br>• (3.MD.2) Estimate and measure liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). (Excludes compound units such as $cm^3$ and finding the geometric volume of a container). Add, subtract, multiply, or divide to solve and create one-step word problems involving masses or volumes that are given in the same units (e.g., by using drawings, such as a beaker with a measurement scale to represent the problem). (Excludes multiplicative problems [problems involving notions of "times as much"]).<br>• (3.MD.3) Select an appropriate unit of English, Metric, or non-standard measurement to estimate the length, time, weight, or temperature. | Use:<br>•<br><br>Literature Connections:<br>• |
| **Represent and interpret data** | • (3.MD.4) Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step, "How many more?" and "How many fewer?" problems using the information presented in scaled bar graphs.<br>• (3.MD.5) Measure and record lengths using rulers marked with halves and fourths of an inch. Make a line plot with the data, where the horizontal scale is marked off in appropriate units- whole numbers, halves, or quarters. | Use:<br>•<br><br>Literature Connections:<br>• |

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| | ● (3.MD.6) Explain the classification of data from real-world problems shown in graphical representations. Use the terms minimum and maximum. | |
| **Geometric measurement: understand concepts of area and relate area to multiplication and to addition** | ● (3.MD.7) Recognize area as an attribute of plane figures and understand concepts of area measurement.<br>a. A square with side length 1 unit is said to have “one square unit” and can be used to measure area.<br>b. Demonstrate that a plane figure which can be covered without gaps or overlaps by *n* (e.g., 6) unit squares is said to have an area of *n* (e.g., 6) square units.<br>● (3.MD.8) Measure areas by tiling with unit squares (square centimeters, square meters, square inches, square feet, and improvised units).<br>● (3.MD.9) Relate area to the operations of multiplication and addition.<br>a. Find the area of a rectangle with whole-number side lengths by tiling it and show that the area is the same as would be found by multiplying the side lengths.<br>b. Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real-world and mathematical problems and represent whole-number products as rectangular areas in mathematical reasoning.<br>c. Use area models (rectangular arrays) to represent the distributive property in mathematical reasoning. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths *a* and *b+c* is the sum of *axb* and *axc* | |

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| | d. Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real-world problems. | |
| **Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures** | • (3.MD.10) Solve real-world and mathematical problems involving perimeters of polygons, including:<br>a. finding the perimeter given the side lengths<br>b. finding an unknown side length<br>c. exhibiting rectangles with the same perimeter and different areas<br>d. exhibiting rectangles with the same area and different perimeters. | Use:<br>•<br><br>Literature Connections:<br>• |
| **Domain: Geometry** | | |
| **Reason with shapes and their attributes** | • (3.G.1) Categorize shapes by different attribute classifications and recognize that shared attributes can define a larger category. Generalize to create examples or non-examples.<br>• (3.G.2) Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. | Use:<br>•<br><br>Literature Connections:<br>• |

# Fourth Grade

**Instructional Focus:**
In Grade 4, instructional time should focus on three critical areas:

- Developing understanding and fluency with multi-digit multiplication and developing understanding of dividing to find quotients involving multi-digit dividends.
- Developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers.
- Understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.

**Readiness Standards:**

- Students develop an understanding of the meanings of multiplication and division of whole numbers through activities and problems involving equal-sized groups, arrays, and area models; multiplication is finding an unknow product, and division is finding an unknown factor in these situations.
- Students develop an understanding of fractions, beginning with unit fractions.
- Students recognize area as an attribute of two-dimensional regions.
- Students describe, analyze, and compare the properties of two-dimensional shapes.

| Grade 4 Mathematical Content Standards | | |
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| **Strand** | **Standard** | **Examples and Resources** |
| **Domain: Operations and Algebraic Thinking** | | |
| **Use the four operations with whole numbers to solve problems** | • (4.OA.1) Interpret a multiplication equation as a comparison (e.g., interpret 35=5x7 as a statement that 35 is 5 groups of 7 and 7 groups of 5, commutative property) Represent verbal statements of multiplicative comparisons as multiplication equations (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem or missing numbers in an array). | Use:<br>•<br><br>Literature Connections:<br>• |

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| | • (4.OA.2) Multiply or divide to solve word problems involving multiplicative comparison. Distinguish multiplicative comparison from additive comparison.<br>• (4.OA.3) Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. | |
| **Gain familiarity with factors and multiples** | • (4.OA.4)<br>a. Find all factor pairs for a whole number in the range 1-100.<br>b. Explain the correlation/differences between multiples and factors.<br>c. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number.<br>d. Determine whether a given whole number in the range1-100 is prime or composite. | Use:<br>•<br><br>Literature Connections:<br>• |
| **Generate and analyze patterns** | • (4.OA.5) Generate a number, shape pattern, table, t-chart, or input/output function that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. Be able to express the pattern in algebraic terms.<br>• (4.OA.6) Extend patterns that use addition, subtraction, multiplication, division or symbols, up to 10 terms, represented by models (function machines), tables, sequences, or in problem situations. | Use:<br>•<br><br>Literature Connections:<br>• |
| **Domain: Number and Operations in Base Ten** | | |

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| **Generalize place value understanding for multi-digit whole numbers** | • (4.NBT.1) Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right.<br>• (4.NBT.2) Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on the value of the digits in each place, using >, =, and < symbols to record the results of comparisons.<br>• (4.NBT.3) Use place value understanding to round multi-digit whole numbers to any place using a variety of estimation methods; be able to describe, compare, and contrast solutions. | Use:<br>•<br><br>Literature Connections:<br>• |
| **Use place value understanding and properties of operations to perform multi-digit arithmetic** | • (4.NBT.4) Fluently add and subtract multi-digit whole numbers using any algorithm. Verify the reasonableness of the results.<br>• (4.NBT.5) Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.<br>• (4.NBT.6) Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. | Use:<br>•<br><br>Literature Connections:<br>• |
| **Domain: Number and Operations-Fractions** (Limited in this grade to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100). | | |

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| **Extend understanding of fraction equivalence and ordering** | • (4.NF.1) Explain why a fraction *a/b* is equivalent to a fraction (*nxa)/(nxb*) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.<br>• (4.NF.2) Compare two fractions with different numerators and different denominators (e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as ½). Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, <, and justify the conclusions (e.g., by using a visual fraction model). | |
| **Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers** | • (4.NF.3) Understand a fraction *a/b* with *a*>1 as a sum of fractions *1/b.*<br>a. Understanding addition and subtraction of fractions as joining and separating parts referring to the same whole.<br>b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions (e.g., by using a visual fraction model).<br>c. Add and subtract mixed numbers with like denominators (e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction).<br>d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators (e.g., by | |

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| | using visual fraction models and equations to represent the problem).<br>● (4.NF4) Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.<br>a. Understand a fraction *a/b* as a multiple of *1/b*.<br>b. Understand a multiple of *a/b* as a multiple of *1/b* and use this understanding to multiply a fraction by a whole number.<br>● Solve word problems involving multiplication of a fraction by a whole number (e.g., by using visual fraction models and equations to represent the problem). Check for the reasonableness of the answer. | |
| **Understand decimal notation for fractions and compare decimal fractions** | ● (4.NF.5) Express a fraction with denominator 10 as an equivalent fraction with denominator 100 and use this technique to add two fractions with respective denominators 10 and 100.<br>● (4.NF.6) Use decimal notation for fractions with denominators 10 or 100.<br>● (4.NF.7) Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or < and justify the conclusions (e.g., by using a visual model). | |
| **Domain: Measurement and Data** | | |
| **Solve problems involving measurements and conversion of measurements from a** | ● (4.MD.1) Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr., min, sec. Within a single system of measurement, express measurements in a larger | Use:<br>●<br><br>Literature Connections:<br>● |

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| **larger unit to a smaller unit and involving time** | unit in terms of smaller units. Record measurement equivalents in a two-column table.<br>● (4.MD.2) Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.<br>● (4.MD.3) Apply the area and perimeter formulas for rectangles in real-world and mathematical problems.<br>● (4.MD.4) Solve real-world problems involving elapsed time between U.S. time zones (including Alaska Standard time). | |
| **Represent and interpret data** | ● (4.MD.5) Make a line plot to display a data set of measurements in fractions of a unit (½, ¼, ⅛). Solve problems involving addition and subtraction of fractions by using the information presented in line plots.<br>● (4.MD.6) Explain the classification of data from real-world problems shown in graphical representations including the use of terms range and mode with a given set data. | Use:<br>●<br><br>Literature Connections:<br>● |
| **Geometric measurement: understand the concepts of angle and measure angles** | ● (4.MD.7) Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint and understand the following concepts of angle measurement:<br>a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the | Use:<br>●<br><br>Literature Connections:<br>● |

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| | two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles.<br>b. An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees.<br>● (4.MD.8) Measure and draw angles in whole-number degrees using a protractor. Estimate and sketch angles of specified measure.<br>● (4.MD.9) Recognize angle measure as additive. When an angle is divided into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real-world and mathematical problems (e.g., by using an equation with a symbol for the unknown angle measure). | |
| **Domain: Geometry** | | |
| **Draw and identify lines and angles and classify shapes by properties of their lines and angles** | ● (4.G.1) Draw points, lines, line segments, rays, angles (right, acute, obtuse) and perpendicular, parallel, and intersecting line segments. Identify these in two-dimensional (plane) figures.<br>● (4.G.2) Classify two-dimensional (plane) figures based on the presence or absence of parallel or perpendicular lines or the presence or absence of angles of a specified size. Recognize right triangles as a category and identify right triangles.<br>● (4.G.3) Recognize a line of symmetry for a two-dimensional (plane) figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. | Use:<br>●<br><br>Literature Connections:<br>● |

# Fifth Grade

**Instructional Focus:**

In grade 5, Instructional time should focus on three critical areas:

- Developing fluency with addition and subtraction of fractions, and developing an understanding of the multiplication of fractions and of the division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions).
- Extending division to two-digit divisors, integrating decimal fractions into the place value system and developing an understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations.
- Developing an understanding of volume.

**Readiness Standards:**

- Students generalize their understanding of place value to 1,000,000, understanding the relative size of numbers in each place.
- Students develop an understanding of fraction equivalence and operations with fractions.
- Students describe, analyze, compare, and classify two-dimensional shapes.

| Fifth Grade Mathematical Content Standards | | |
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| **Strand** | **Standard** | **Examples and Resources** |
| **Domain: Operations and Algebraic Thinking** | | |
| **Write and Interpret numerical expressions.** | • (5.OA.1) Use parentheses to construct numerical expressions and evaluate numerical expressions with these symbols.<br>• (5.OA.2) Write simple expressions that record calculations with numbers and interpret numerical expressions without evaluating them. | |

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| **Analyze patterns and relationships** | • (5.OA.3) Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs, consisting of corresponding terms from those two patterns, and graph the ordered pairs on a coordinate plane. | |
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| **Domain: Number and Operations in Base Ten** | | |
| **Understand the place value system** | • (5.NBT.1) Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.<br>• (5.NBT.2) Explain and extend the patterns in the numbers of zeros, of the product when multiplying a number by powers of 10, and explain and extend the patterns in the placement of the decimal point when a decimal is a multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.<br>• (5.NBT.3) Read, write, and compare decimals to thousandths.<br>a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form (e.g., 347.392 = 3 x 100 + 4 x 10 + 7 x 1 + 3 (1/10) + 9(1/100) + 2 (1/1000).<br>b. Compare two decimals to thousandths place based on the meaning of the digits in each place, using >. =, and < symbols to record the results of comparisons.<br>• (5.NBT.4) Use place value understanding to round decimals to any place. | |

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| **Perform operations with multi-digit whole numbers and with decimals to hundredths** | • (5.NBT.5) Fluently multiply multi-digit whole numbers using a standard algorithm.<br>• (5.NBT.6) Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, number lines, real-life situations, and/or area models.<br>• (5.NBT.7) Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between the operations. Relate the strategy to a written method and explain their reasoning in getting their answers. | |
| **Domain: Fractions** | | |
| **Use equivalent fractions as a strategy to add and subtract fractions** | • (5.NF.1) Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators.<br>• (5.NF.2) Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators (e.g. by using visual fraction models or equations to represent the problem). Use benchmark fractions and number sense of fractions to estimate mentally and check the reasonableness of answers. | |
| **Apply and extend previous understanding of** | 1. (5.NF.3) Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). Solve word problems involving the division of whole | |

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| **multiplication and division to multiply and divide fractions** | numbers leading to answers in the form of fractions or mixed numbers (e.g., by using visual fraction models or equations to represent the problem).<br>2. (5.NF.4) Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.<br>a. Interpret the product (*a/b*) x *q* as parts of a partition of *q* into *b* equal parts; equivalently, as the result of a sequence of operations *a x q ÷ b.*<br>b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles and represent fraction products as rectangular areas.<br>● (5.NF.5) Interpret multiplication as scaling (resizing), by:<br>a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.<br>b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence *a/b* = (*nxa)/(nxb*) to the effect of multiplying *a/b* by 1 (division of a fraction by a fraction is not a requirement at this grade). | |

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| | • (5.NF.6) Solve real-world problems involving multiplication of fractions and mixed numbers (e.g., Use visual fraction models or equations to represent the problem).<br>• (5.NF.7) Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.<br>a. Interpret division of a unit fraction by a non-zero whole number and compute such quotients.<br>b. Interpret division of a whole number by a unit fraction and compute such quotients.<br>• Solve real-world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions (e.g., by using visual fraction models and equations to represent the problem). | |
| **Domain: Measurement and Data** | | |
| **Convert like measurement units within a given measurement system and solve problems involving time** | • (5.MD.1) Identify, estimate, measure, and convert equivalent measures within systems of English length (inches, feet, yards, miles), weight (ounces, pounds, tons), volume (fluid ounces, cups, pints, quarts, gallons), temperature (Fahrenheit) and Metric length (millimeters, centimeters, meters, kilometers), volume (milliliters, liters), temperature (Celsius), (e.g.,convert 5 cm to 0.05m) and use these conversions in solving multi-step real-world problems using appropriate tools.<br>• (5.MD.2) Solve real-world problems involving elapsed time between world time zones. | |
| **Represent and interpret data** | • (5.MD.3) Make a line plot to display a data set of measurements in fractions of a unit (½, ¼, ⅛). | |

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| | Solve problems involving information presented in line plots.<br>● (5.MD.4) Explain the classification of data from real-world problems shown in graphical representations including the use of terms mean and median with a given set of data. | |
| **Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition** | ● (5.MD.5) Recognize volume as an attribute of solid figures and understand concepts of volume measurement.<br>a. A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume and can be used to measure volume.<br>b. A solid figure, which can be packed without gaps or overlaps unit *n* unit cubes is said to have a volume of *n* cubic units.<br>● (5.MD.6) Estimate and measure volumes by counting unit cubes, using cubic cm, cubic in., cubic ft., and non-standard units.<br>● (5.MD.7) Relate volume to the operations of multiplication and addition and solve real-world and mathematical problems involving volume.<br>a. Estimate and find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Demonstrate the associative property of multiplication by using the product of three whole numbers to find volumes (length x width x height).<br>b. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole number | |

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| | edge lengths in the context of solving real-world and mathematical problems.<br>● Recognize volume as additive. Find volumes of solid figures composed of two, non-overlapping, right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real-world problems. | |
| **Domain: Geometry** | | |
| **Graph points on the coordinate plane to solve real-world and mathematical problems** | ● (5.G.1) Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate).<br>● (5.G.2) Represent the real-world and mathematical problems by graphing points in the first quadrant of the coordinate plane and interpret coordinate values of points in the context of the situation. | |
| **Classify two-dimensional (plane) figures into categories based on their properties** | ● (5.G.3) Understand that attributes belonging to a category of two-dimensional (plane) figures also belong to all subcategories of that category.<br>● (5.G.4) Classify two-dimensional (plane) figures in a hierarchy based on attributes and properties. | |

# Middle School
# Grades 6th-8th

# Math 6

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| **Grade(s)**: 6<br>**Length**: two semesters<br>**Prerequisite**: Math 5 | **Overview**:<br>In *Math* 6, instructional time should focus on four critical areas:<br>1. Connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems;<br>2. Completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers;<br>3. Writing, interpreting, and using expressions and equations; and<br>4. Developing understanding of statistical thinking. |

| **Mathematical Topics**<br>(Recommended Order) | |
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| **Semester 1** | **Semester 2** |
| ● Number Systems<br>● Writing Ratios, Finding Unit Rates, and Solving Proportions | ● Expressions and Equations<br>● Perimeter, Area, Surface Area, Volume of Polygons and Rectangular Prisms<br>● Statistics and Probability |

| NUMBER SYSTEMS | | |
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| | **Content Objectives** | **Standards** |
| | **<u>Must be Covered:</u>**<br>The learner will:<br>● Add and subtract rational numbers (fractions and decimals).<br>● Find and use the least common multiple for adding fractions.<br>● Find and use the great common factor for simplifying fractions. | **<u>AKSS</u>**<br>6.NS.1-4<br><br>**<u>Mathematical Practices</u>** Rational Numbers Arithmetic |
| | **<u>Must be Covered:</u>**<br>The learner will:<br>● Multiply and divide rational numbers (fractions and decimals).<br>● Find and use the greatest common factor for simplifying fractions. | **<u>AKSS</u>**<br>6.NS.1-4<br><br>**<u>Mathematical Practices</u>**<br>Rational Numbers Arithmetic |
| | **<u>Must be Covered:</u>**<br>The learner will:<br>● Understand absolute value.<br>● Graph points on a coordinate plane. | **<u>AKSS</u>**<br>6.NS.5-8<br><br>**<u>Mathematical Practices</u>** Rational Numbers Arithmetic |

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| | **<u>Can be Covered:</u>**<br>The learner will:<br>● Add and subtract integers.<br>● Place rational numbers in order on a number line.<br>● Divisibility Rules<br>● Cross-Simplification/Cancellation when multiplying fractions<br><br>**<u>Prerequisite Skills:</u>**<br>The learner will:<br>● Add and subtract fractions with common denominators.<br>● Converting between improper fractions and mixed-numbers | |
| **Suggested Activities,** | ● IXL<br>● Youtube Channel: Mr. J | |

| EXPRESSIONS & EQUATIONS | | |
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| **Course/ Grade Competency** | **Content Objectives** | **Standards** |
| | **Must be Covered:**<br>The learner will:<br>● Write and solve exponential problems, including expanded form. | **AKSS**<br>6.EE.1<br><br>**Mathematical Practices** |
| | **Must be Covered:**<br>The learner will:<br>● Write, read and solve one step expressions with variables.<br>● Use distributive property and factoring to simplify expressions.<br>● Write mathematical expressions and equations from real-world problems.<br><br>**Can be Covered:**<br>The learner will:<br>● Write, read, and solve two-step expressions for real-world problems. | **AKSS**<br>6.EE.2-3, 6<br><br>**Mathematical Practices** |
| | **Must be Covered:**<br>The learner will:<br>● Solve one-step equations and inequalities with positive rational numbers.<br>● Represent the relationship between the dependent and independent variables in an equation.<br><br>**Can be Covered:**<br>The learner will:<br>● Solve two-step equations with integers. | **AKSS**<br>6.EE.7-9<br><br>**Mathematical Practices** |
| **Suggested Activities, Materials, and Resources:** | ● IXL | |

| WRITING RATIOS, FINDING UNIT RATES, & SOLVING PROPORTIONS | | |
|---|---|---|
| | **Content Objectives** | **Standards** |
| | **<u>Must be Covered:</u>**<br>The learner will:<br>● Simplify proportions and know how to write them in multiple ways.<br>● Use ratio language to describe a relationship. | **<u>AKSS</u>**<br>6.RP.1<br><br>**<u>Mathematical Practices</u>** |
| | **<u>Must be Covered:</u>**<br>The learner will:<br>● Calculate unit rates using the same units with rational numbers (decimals and fractions).<br>● Use rate language in a ratio relationship.<br><br>**<u>Can be Covered:</u>**<br>The learner will:<br>● Calculate unit rates using the different units with rational numbers (decimals and fractions). | **<u>AKSS</u>**<br>6.RP.2<br><br>**<u>Mathematical Practices</u>** |
| | **<u>Must be Covered:</u>**<br>The learner will:<br>● Write and solve proportions including real-world problems. | **<u>AKSS</u>**<br>6.RP.3<br><br>**<u>Mathematical Practices</u>** |
| **Suggested Activities, Materials, and Resources:** | ● IXL | |

| PERIMETER, AREA, SURFACE AREA, VOLUME OF POLYGONS, & RECTANGULAR PRISMS | | |
|---|---|---|
| | **Content Objectives** | **Standards** |
| | **Must be Covered:**<br>The learner will:<br>● Use the standard formula to calculate the area of regular polygons (triangles and quadrilaterals).<br>● Decompose 2-D figures into other polygons.<br><br>**Can be Covered:**<br>The learner will:<br>● Calculate the area of regular polygons on coordinate planes.<br>● Calculate the circumference and area of circles.<br>● Identify the different parts of a circle. | **AKSS**<br>6.G.1, 3, 5<br><br>**Mathematical Practices** |
| | **Must be Covered:**<br>The learner will:<br>● Represent three-dimensional figures (cubes and prisms) as nets.<br>● Apply the standard formula to calculate the volume and surface area of rectangular and triangular prisms.<br><br>**Can be Covered:**<br>The learner will:<br>● Calculate the volume and surface area of rectangular and triangular pyramids. | **AKSS**<br>6.G.2, 4<br><br>**Mathematical Practices** |
| **Suggested Activities, Materials, and Resources:** | ● IXL | |

| STATISTICS & PROBABILITY | | |
|---|---|---|
| | **Content Objectives** | **Standards** |
| | **Must be Covered:**<br>The learner will:<br>● Write valid and invalid statistical questions, and be able to explain and identify why they are valid or invalid.<br>● Identify the distribution of a data set. | **AKSS**<br>6.SP.1-2<br><br>**Mathematical Practices** |
| | **Must be Covered:**<br>The learner will:<br>● Calculate measures of center, including range and finding outliers.<br>● Identify when to use the different measures of center.<br>● Explain the effect of adding or removing an outlier to the measures of center. | **AKSS**<br>6.SP.3, 5<br><br>**Mathematical Practices** |
| | **Must be Covered:**<br>The learner will:<br>● Calculate interquartile range and create box plots.<br>● Read and create dot plots, histograms, and pie charts.<br><br>**Can be Covered:**<br>The learner will:<br>● Calculate the standard deviations. | **AKSS**<br>6.SP.4-5<br><br>**Mathematical Practices** |
| | **Must be Covered:**<br>The learner will:<br>● Calculate simple and compound theoretical probability.<br>●<br><br>**Can be Covered:**<br>The learner will:<br>● Determine whether a game is fair or unfair based on probability.<br>● Calculate the experimental probability. | **AKSS**<br>6.SP.6-7<br><br>**Mathematical Practices** |
| **Suggested Activities, Materials, and Resources:** | ● IXL | |

# Math 7

| | |
|---|---|
| **Grade(s)**: 7-8<br>**Length**: two semesters<br>**Prerequisite**: *Math 6* | **Overview**:<br>*Math 7* is for students to extend and apply many of the concepts they have learned in the previous year, to discover new types of relationships, new and efficient ways to solve problems, and new ways to analyze and look at data and associations. Students will investigate proportional relationships and use this understanding to solve real-world problems involving discounts, interest, taxes, and scale drawings. Building off their understanding of integers, students will apply the properties of operations to all rational numbers in order to efficiently and thoughtfully work with the number system, including how it applies to expressions and equations. |

| **Mathematical Topics**<br>(Recommended Order) | |
|---|---|
| **Semester 1** | **Semester 2** |
| ● Rational numbers arithmetic, including percent problems<br>● Order of operations with rational numbers, including exponents<br>● Unit rates, proportions, and constant of proportionality (k), including graphing k<br>● Solving two-step equations, including distributive property equations | ● Scale factors (proportions)<br>● Supplemental and complementary angles and triangle measures<br>● Perimeter, area, surface area, and volume of two- and three-dimensional figures (formulas forward and backward)<br>● Statistical displays and measure of central tendencies |

| NUMBER SYSTEMS | | |
|---|---|---|
| **Course/ Grade Competency** | **Content Objectives** | **Standards** |
| | **Must be Covered:**<br>The learner will:<br>● Add and subtract integers.<br>● Add and subtract rational numbers (fractions and decimals). | **AKSS**<br>7.NS.1<br><br>**Mathematical Practices**<br>Rational Numbers<br>Arithmetic |
| | **Must be Covered:**<br>The learner will:<br>● Multiply and divide integers.<br>● Multiple and divide rational numbers (fractions and decimals). | **AKSS**<br>7.NS.2<br><br>**Mathematical Practices**<br>Rational Numbers<br>Arithmetic |
| | **Must be Covered:**<br>The learner will:<br>● Understand the order of operations with integers.<br>● Understand the order of operations with rational numbers (fractions and decimals). | **AKSS**<br>7.NS.3<br><br>**Mathematical Practices**<br>Rational Numbers<br>Arithmetic |
| **Suggested Activities, Materials, and Resources:** | | |

| RATIOS, RATES, & PROPORTIONS –<br>CONSTANT OF PROPORTIONALITY (K), INCLUDING GRAPHING K | | |
|---|---|---|
| | **Content Objectives** | **Standards** |
| | **<u>Must be Covered:</u>**<br>The learner will:<br>● Understand and write ratios and rates.<br>● Write and solve proportions.<br>● Calculate unit rates using the same units with rational numbers (decimals and fractions).<br><br>**<u>Can be Covered:</u>**<br>The learner will:<br>● Calculate unit rates using the different units with rational numbers (decimals and fractions). | **<u>AKSS</u>**<br>7.RP.1<br><br>**<u>Mathematical Practices</u>** |
| | **<u>Must be Covered:</u>**<br>The learner will:<br>● Determine if fractions, tables, and graphs are proportional and justify their answer. | **<u>AKSS</u>**<br>7.RP.2<br><br>**<u>Mathematical Practices</u>** |
| | | |
| **Suggested Activities, Materials, and Resources:** | | |

| PERCENT PROBLEMS | | |
|---|---|---|
| **Course/ Grade Competency** | **Content Objectives** | **Standards** |
| | **Must be Covered:**<br>The learner will:<br>● Calculate percent of a number.<br>● Determine a number when given the percent.<br>● Calculate percent increase or decrease. | **AKSS**<br>7.RP.3<br><br>**Mathematical Practices** |
| | **Must be Covered:**<br>The learner will:<br>● Solve real-world problems involving discounts, markups, and items with and without a sales tax.<br><br>**Grade level Prerequisite skill:**<br>● Convert between fractions, decimals, and percents<br><br>**Can be Covered:**<br>The learner will:<br>● Calculate simple interest. | **AKSS**<br>7.RP.3<br><br>**Mathematical Practices** |
| **Suggested Activities, Materials, and Resources:** | | |

| EXPRESSIONS & EQUATIONS | | |
|---|---|---|
| **Course/ Grade Competency** | **Content Objectives** | **Standards** |
| | **Must be Covered:**<br>The learner will:<br>● Add, subtract, factor, expand, and simplify expressions and linear equations.<br><br>**Can be Covered:**<br>The learner will:<br>● Simplify expressions and equations with fractions and decimals by multiplying each term by the greatest common factor. | **AKSS**<br>7.EE.1, 7.EE.2<br><br>**Mathematical Practices** |
| | **Must be Covered:**<br>The learner will:<br>● Solve multi-step problems with rational numbers.<br><br>**Can be Covered:**<br>● Solve equations with the variable on either side. | **AKSS**<br>6.EE.3<br><br>**Mathematical Practices** |
| | **Grade level Prerequisite skill:**<br>● Solve one and two step equations with rational numbers.<br><br>**Must be Covered:**<br>The learner will:<br>● Solve two-step equations with integers.<br><br>**Can be Covered:**<br>The learner will:<br>● Solve two-step equations with fractions and decimals. | **AKSS**<br>7.EE.4a<br><br>**Mathematical Practices** |
| **Suggested Activities, Materials, and Resources:** | | |

| EXPRESSIONS & EQUATIONS (continued) | | |
|---|---|---|
| **Course/ Grade Competency** | **Content Objectives** | **Standards** |
| | **Must be Covered:**<br>The learner will:<br>● Solve two-step equations with distributive property.<br><br>**Can be Covered:**<br>The learner will:<br>● Solve two-step equations with the integer on both sides. | **AKSS**<br>7.EE.4a<br><br>**Mathematical Practices** |
| | **Grade level Prerequisite skill:**<br>● Solve one and two-step inequalities.<br><br>**Must be Covered:**<br>The learner will:<br>● Solve and graph two-step inequalities and check for reasonableness. | **AKSS**<br>7.EE.4b<br><br>**Mathematical Practices** |
| **Suggested Activities, Materials, and Resources:** | | |

| SCALE DRAWINGS | | |
|---|---|---|
| **Course/ Grade Competency** | **Content Objectives** | **Standards** |
| | **Must be Covered:**<br>The learner will:<br>● Solve problems involving scale drawings.<br>● Adjust to the appropriate unit as needed. | **AKSS**<br>7.G.1<br><br>**Mathematical Practices** |
| | **Must be Covered:**<br>The learner will:<br>● Bisect a line segment using a compass.<br>● Draw various polygons (triangle, square) with given conditions. | **AKSS**<br>7.G.2<br><br>**Mathematical Practices** |
| **Suggested Activities, Materials, and Resources:** | | |

| ANGLES & CIRCLES | | |
|---|---|---|
| **Course/ Grade Competency** | **Content Objectives** | **Standards** |
| | **Must be Covered:**<br>The learner will:<br>● Calculate area and circumference of circles with given conditions.<br>● Calculate volume and surface area of cylinders.<br><br>**Can be Covered:**<br>The learner will:<br>● Calculate volume of cones and spheres. | **AKSS**<br>7.G.4<br><br>**Mathematical Practices** |
| | **Must be Covered:**<br>The learner will:<br>● Calculate supplemental and complementary angles with given conditions.<br>● Calculate angles of triangles with given conditions.<br><br>**Can be Covered:**<br>The learner will:<br>● Alternate and same-side angles with transversals.<br>● Calculate remote interior angles. | **AKSS**<br>7.G.5<br><br>**Mathematical Practices** |
| **Suggested Activities, Materials, and Resources:** | | |

| PERIMETER, AREA, SURFACE AREA, & VOLUME OF PRISMS & PYRAMIDS | | |
|---|---|---|
| **Course/ Grade Competency** | **Content Objectives** | **Standards** |
| | **Must be Covered:**<br>The learner will:<br>● Calculate the volume and surface area of rectangular and triangular prisms.<br><br>**Can be Covered:**<br>The learner will:<br>● Calculate the volume and surface area of other regular prisms. | **AKSS**<br>7.G.6<br><br>**Mathematical Practices** |
| | **Can be Covered:**<br>The learner will:<br>● Determine the different types of cross-sections of three-dimensional figures. | **AKSS**<br>7.G.3<br><br>**Mathematical Practices** |
| **Suggested Activities, Materials, and Resources:** | | |

| STATISTICS & PROBABILITY | | |
|---|---|---|
| **Course/ Grade Competency** | **Content Objectives** | **Standards** |
| | **Must be Covered:**<br>The learner will:<br>● Understand valid and invalid samples, and why they are valid or invalid. | **AKSS**<br>7.SP.1, 7.SP.2<br><br>**Mathematical Practices** |
| | **Must be Covered:**<br>The learner will:<br>● Calculate interquartile range | **AKSS**<br>7.SP.3, 7.SP.4<br><br>**Mathematical Practices** |
| | **Must be Covered:**<br>The learner will:<br>● Calculate simple and compound probability.<br>● Create a theoretical simple and compound probability model.<br>● Complete an experimental simple and compound probability model.<br><br>**Can be Covered:**<br>The learner will:<br>● Calculate the probability of independent and dependent events. | **AKSS**<br>7.SP.5, 7.SP.6,<br>7.SP.7, 7.SP.8<br><br>**Mathematical Practices** |
| **Suggested Activities, Materials, and Resources:** | | |

# Math 8

| | |
|---|---|
| **Grade(s)**: 7-8<br>**Length**: two semesters<br>**Prerequisite**:<br>● Math 7<br>**Placement recommendation**:<br>When making decisions about placement, always consider student reflection, assessment data, teacher recommendation, and parent input. | **Overview**:<br>In *Math 8*, students make several advances in their algebraic reasoning, particularly as it relates to linear equations. Students extend their understanding of proportional relationships to include all linear equations, and they consider what a "solution" looks like when it applies to a linear equation. They learn that linear equations can be a useful representation to model bivariate data and to make predictions. Lastly, students study figures, lines, and angles in two-dimensional and three-dimensional space, investigating how these figures move, and how they are measured. This course prepares students to take *Algebra 1*. |

| **Mathematical Topics**<br>(Recommended Order) | |
|---|---|
| **Semester 1** | **Semester 2** |
| ● Solving Linear Equations and Inequalities (One Variable)<br>● Linear Equations and Graphs<br>● Systems<br>● functions<br>● Rigid Transformations, Congruence, and Similarity<br>● Angle Relationships | ● Pythagorean Theorem<br>● Volumes (Cylinders, Cones and Spheres)<br>● Statistics<br>● Integer Exponents and Scientific Notation |

| SOLVING LINEAR EQUATIONS & INEQUALITIES WITH ONE VARIABLE | | |
|---|---|---|
| **Course/ Grade Competency** | **Content Objectives** | **Standards** |
| | **Must be Covered:**<br>The learner will:<br>● Know the definitions of a constant and a coefficient.<br>● Know the difference between an expression and an equation.<br>● Be able to evaluate expressions using substitution.<br>● Be able to simplify expressions by combining like terms and or applying the distributive property.<br>● Know that for the expression x, the coefficient is 1 and the constant is 0. | **AKSS**<br><br>**Mathematical Practices** All mathematical practices are present in each unit. |
| | **Must be Covered:**<br>The learner will:<br>● Solve one- or two-step equations by isolating x, or changing the associated constant to 0 with addition or subtraction and the coefficient to 1 with multiplication or division.<br>● Solve multistep equations and understand there are multiple ways to do this.<br>● Solve equations with variables on both sides.<br>● Solve equations involving simplifying one or both sides by distributing and or combining like terms.<br>● Recognize when equations have infinite or no solutions.<br>● Write and solve equations based on word problems, including those where one variable must be written in terms of another.<br><br>**Can be Covered:**<br>The learner will:<br>● Solving equations where clearing of fractions or cross-multiplying is involved. | **AKSS**<br><br>**Mathematical Practices** All mathematical practices are present in each unit. |
| | **Must be Covered:**<br>The learner will:<br>● Understand inequalities and their symbols.<br>● Graph inequalities on the number line.<br>● Write inequalities given a graph on the number line.<br>● Solve simple multi-step inequalities, including those where the inequality must be flipped. | **AKSS**<br><br>**Mathematical Practices** All mathematical practices are present in each unit. |
| **Suggested Activities, Materials, and Resources:** | ● | |

| RIGID TRANSFORMATIONS, CONGRUENCE, & SIMILARITY | | |
|---|---|---|
| **Course/ Grade Competency** | **Content Objectives** | **Standards** |
| | **Must be Covered:**<br>The learner will:<br>● Know what congruent means and be able to recognize congruent figures.<br>● Know that if two figures are congruent, then one can be mapped onto the other with a sequence of rigid transformations<br>● Know the three rigid transformations are translations, reflections, and rotations.<br>● Be able to perform each transformation given the specific rule and graph paper (reflections will be over simple vertical or horizontal lines, and rotations will be in increments of 90 degrees).<br>● Be able to write the rule for transformations given an image on the coordinate plane (reflections will be over simple vertical or horizontal lines, and rotations will be in increments of 90 degrees).<br>● Be able to perform or write rules for simple sequences of translations. | **AKSS**<br>8.G.1,<br>8.G.2<br><br>**Mathematical Practices** All mathematical practices are present in each unit. |
| | **Must be Covered:**<br>The learner will:<br>● Define, describe, and perform dilations in the coordinate plane.<br>● Determine if two figures are similar using transformations and dilations.<br>● Understand angle measurement and parallel or perpendicular relationships are preserved under similarity.<br>● Find and use scale factor.<br>● Use properties of similar triangles to model and solve problems. | **AKSS**<br>8.G.3,<br>8.G.4<br><br>**Mathematical Practices** All mathematical practices are present in each unit. |
| **Suggested Activities, Materials, and Resources:** | | |

| ANGLE RELATIONSHIPS | | |
|---|---|---|
| **Course/ Grade Competency** | **Content Objectives** | **Standards** |
| | **<u>Must be Covered:</u>**<br>The learner will:<br>● Identify vertical, supplementary, and complementary angles.<br>● Identify corresponding angles, alternate interior and alternate exterior angles in parallel lines and transversals.<br>● Know the relationships between all of the above angles.<br>● Define and use the interior angle sum for triangles.<br>● Define and use the exterior angle sum for triangles.<br>● Define and use the angle-angle criterion for similar triangles.<br>● Solve for missing angles and or variables using equations.<br>● Use the interior angle sum to find sum of interior angles<br><br>**<u>Can be Covered:</u>**<br>The learner will: | **<u>AKSS</u>**<br>8.G.5<br><br>**<u>Mathematical Practices</u>** All mathematical practices are present in each unit. |
| **Suggested Activities, Materials, and Resources:** | | |

| LINEAR EQUATIONS & GRAPHS | | |
|---|---|---|
| **Course/ Grade Competency** | **Content Objectives** | **Standards** |
| | **<u>Must be Covered:</u>**<br>The learner will:<br>● Know that linear equations can be represented in tables, graphs, and equations.<br>● Know the four quadrants of the coordinate plane.<br>● Know the x and y axes and the origin.<br>● Be able to interpret scale for both axes.<br>● Understand that x is the independent variable and y is the dependent variable.<br>● Be able to graph linear equations from a table of values.<br>● Understand slope as rise over run or a unit rate.<br>● Determine slopes from graphs or word problems.<br>● Understand the meaning of y intercept as the value of y when x is 0.<br>● Be able to identify the y intercept from graphs or simple word problems<br>● Recognize slope intercept form as y = mx + b, where m or slope is the coefficient of x.<br>● Recognize the effect of slope on the steepness or direction of a graph.<br>● Graph equations written in slope intercept form or written in word problems.<br>● Know that proportional relationships are linear equations where the constant of proportionality is the slope and the y intercept is 0.<br>● Know horizontal lines are linear equations where slope is 0 leading to the form y = b.<br>● Know vertical lines have undefined slope because the change in x is 0 and division by 0 is undefined.<br>● Know vertical lines are written as x = a constant.<br>● Find the slope from a table or two coordinate pairs.<br>● Write the slope intercept form of a linear equation when only given two points.<br><br>**<u>Can be Covered:</u>**<br>The learner will: | **<u>AKSS</u>**<br>8.EE.5,<br>8.F.2, 8.F.4<br><br>**<u>Mathematical Practices</u>** All mathematical practices are present in each unit. |
| **Suggested Activities, Materials, and Resources:** | | |

| INTEGER EXPONENTS & SCIENTIFIC NOTATION | | |
|---|---|---|
| **Course/ Grade Competency** | **Content Objectives** | **Standards** |
| | **Must be Covered:**<br>The learner will:<br>● Identify equivalent exponential expressions.<br>● Evaluate numerical or algebraic expressions with exponents using the order of operations.<br>● Understand the effect of positive and negative bases with odd and even exponents.<br>● Understand the properties of exponents including product property, quotient property, and power to a power property.<br>● Recognize zero and negative (integer) exponents.<br>● Simplify exponential expressions using all properties. | **AKSS**<br>8.EE.1, 8.EE.2<br><br>**Mathematical Practices** All mathematical practices are present in each unit. |
| | **Must be Covered:**<br>The learner will:<br>● Write small or large numbers as powers of 10.<br>● Write numbers in scientific notation.<br>● Convert numbers written in scientific notation into standard form.<br>● Multiply, divide, add, and subtract numbers written in scientific notation, using exponential properties. | **AKSS**<br>8.EE.1, 8.EE.3, 8.EE.4<br><br>**Mathematical Practices** All mathematical practices are present in each unit. |
| **Suggested Activities, Materials, and Resources:** | | |

| NUMERACY | | |
|---|---|---|
| **Course/ Grade Competency** | **Content Objectives** | **Standards** |
| | **<u>Must be Covered:</u>**<br>The learner will:<br>● Define, evaluate, or estimate square and cube roots.<br>● Understand that squares and square roots and cubes and cube roots are inverse operations.<br>● Define and be able to identify rational numbers.<br>● Define and be able to identify irrational numbers, including pi and square roots of nonperfect squares.<br>● Approximate the value of irrational numbers and locate on a number line.<br>● Compare values of rational and irrational numbers.<br><br>**<u>Can be Covered:</u>**<br>The learner will:<br>● Know why there is no real square root to a negative number, and that square roots of negative numbers are classified as imaginary numbers. | **<u>AKSS</u>**<br>8.NS.1, 8.NS.2, 8.EE.2<br><br>**<u>Mathematical Practices</u>** All mathematical practices are present in each unit. |
| | **<u>Must be Covered:</u>**<br>The learner will:<br>● Understand that division of zero is not possible; for example a vertical line has undefined slope because the “run” in “rise over run” is 0. | **<u>AKSS</u>**<br><br>**<u>Mathematical Practices</u>** All mathematical practices are present in each unit. |
| **Suggested Activities, Materials, and Resources:** | | |

| PYTHAGOREAN THEOREM | | |
|---|---|---|
| **Course/ Grade Competency** | **Content Objectives** | **Standards** |
| | **<u>Must be Covered:</u>**<br>The learner will:<br>● Learn the Pythagorean Theorem.<br>● Use the converse to determine if a triangle is a right triangle.<br>● Use the Pythagorean Theorem to find missing side lengths of right triangles, slant height of cones, or distance between points in the coordinate plane.<br>● Apply the Pythagorean Theorem in area and perimeter problems and other real-world problems. | **<u>AKSS</u>**<br>8.EE.2, 8.G.6, 8.G.7, 8.G.8<br><br>**<u>Mathematical Practices</u>** All mathematical practices are present in each unit. |
| **Suggested Activities, Materials, and Resources:** | | |

| VOLUME OF CYLINDERS, CONES, & SPHERES | | |
|---|---|---|
| **Course/ Grade Competency** | **Content Objectives** | **Standards** |
| | **<u>Must be Covered:</u>**<br>The learner will:<br>● Find the volume of cylinders, cones, and spheres.<br>● Be able to find missing dimensions when given the volume of cones, cylinders, or spheres.<br>● Find the volumes of composite shapes that include cylinders, cones, or spheres. | **<u>AKSS</u>**<br>8.EE.2, 8.G.9<br><br>**<u>Mathematical Practices</u>** All mathematical practices are present in each unit. |
| **Suggested Activities, Materials, and Resources:** | | |

| TWO-WAY CATEGORICAL TABLES & ASSOCIATIONS | | |
|---|---|---|
| **Course/ Grade Competency** | **Content Objectives** | **Standards** |
| | **Must be Covered:**<br>The learner will:<br>● Know the difference between numerical and categorical data.<br>● Create and analyze two-way tables of categorical data for associations.<br>● Calculate relative frequencies in two-way tables to investigate associations. | **AKSS**<br>8.SP.4<br><br>**Mathematical Practices** All mathematical practices are present in each unit. |
| **Suggested Activities, Materials, and Resources:** | | |

# High School
## Grades 9th through 12th

# Pre-Algebra

| Integers | | |
|---|---|---|
| The Number System | 6.NS.5, 6.NS.6, 6.NS.7<br>7.NS.1, 7.NS.2 | |
| • *Understanding opposite numbers* | | |
| • *Adding same and opposite-signed integers* | | |
| • *Add, Subtract, Multiply, and Divide integers* | | |
| • *Adding like terms* | | |
| • *Applying the distributive property* | | |

| Basic Equations | | |
|---|---|---|
| Expressions and Equations | 6.EE.5, 6.EE.6, 6.EE.7, 6.EE.7<br>7.EE.3, 7.EE.4<br>8.EE.7 | |
| • *Solving equations using addition and multiplication* | | |
| • *Solving equations with two steps* | | |
| • *Simplifying and solving equations* | | |
| • *Simplifying and solving  inequalities* | | |
| • *Write equations and inequalities* | | |

| Factors and Exponents | |
|---|---|
| The Number System | 6.NS.4 |
| Expressions and Equations | 8.EE.1, 8.EE.4 |
| • *Understanding prime numbers* | |
| • *Find the greatest common factor* | |
| • *Find the least common multiple* | |
| • *Understanding fractions and mixed numbers* | |
| • *Applying the exponent properties* | |
| • *Write numbers in scientific notations* | |
| • *Add, subtract, multiply and divide scientific notations* | |

| Fractions and Decimals | |
|---|---|
| The Number System | 6.NS.1<br>7.NS.1, 7.NS.2, 7.NS.3 |
| • *Reduce fractions* | |
| • *Multiply fractions* | |

| Fractions and Decimals | |
|---|---|
| • *Adding fractions with equivalent or different denominators* | |
| • *Dividing fractions* | |
| • *Add, Subtract, Multiply and divide rational and mixed numbers* | |
| • *Add, Subtract, multiply, and divide decimals* | |

| Percents | |
|---|---|
| Ratios and Proportional Relationships | 6.RP.1, 6.RP.2, 6.RP.3<br>7.RP.1, 7.RP.2, 7.RP.3 |
| • *Rates* | |
| • *Proportions* | |
| • *Convert fractions, decimals, and percents* | |
| • *Solve and apply percent problems* | |
| • *Percent increase and decrease* | |
| • *Evaluate sales tax, tip, interest, and percent change* | |

| Applying Equations and Inequalities | | |
|---|---|---|
| Expressions and Equations | 7.EE.2, 7.EE.4<br>8.EE.7 | |
| • *Simplify and Solve Equations* | | |
| • *Solve equations with fractions* | | |
| • *Apply equations* | | |
| • *Multi-step inequalities* | | |
| • *Apply inequalities* | | |

| Roots and Radicals | | |
|---|---|---|
| Geometry | 8.G.7 | |
| Expressions and Equations | 8.EE.2 | |
| • *Understanding roots* | | |
| • *Multiplying and Simplifying square roots* | | |
| • *Solving rational equations* | | |
| • *Use the pythagorean theorem* | | |

| Relations and Functions | | |
|---|---|---|
| Functions | 8.F.1, 8.F.2, 8.F.3, 8.F.4, 8.F.5 | |
| • *Understanding and use the coordinate plane* | | |
| • *Understanding functions* | | |
| • *Interpreting the solutions of functions* | | |
| • *Graph linear functions* | | |
| • *Find x and y intercepts of a linear function* | | |
| • *Find slope of a line* | | |
| • *Graph a linear function using slope-intercept form* | | |
| • *Interpret and graph scatter plots* | | |
| • *Graph linear inequalities* | | |

| Relationships in Geometry | | |
|---|---|---|
| Geometry | 7.G.5<br>8.G.2, 8.G.4 | |
| • *Angle types and relationships* | | |
| • *Perpendicular and parallel lines* | | |
| • *Identifying polygons* | | |
| • *Quadrilaterals and perimeter* | | |
| • *Congruent polygons* | | |
| • *Transforming shapes across the coordinate plane* | | |
| • *Similar polygons* | | |

| Area and Volume | | |
|---|---|---|
| Geometry | 6.G.1, 6.G.2<br>7.G.4, 7.G.6<br>8.G.9 | |
| ● *Find the area of a parallelogram* | | |
| ● *Find the area of a triangle and trapezoid* | | |
| ● *Find the area of a circle* | | |
| ● *Find the surface area of prisms, cylinders, and spheres* | | |
| ● *Find the volume of prisms, cylinders, cones, pyramids and spheres* | | |

| Probability and Statistics | | |
|---|---|---|
| Statistics and Probability | 7.SP.1, 7.SP.4, 7.SP.5, 7.SP.7, 7.SP.8. | |
| • *Find mean, median, mode and range* | | |
| • *Interpret and create box and whisker plots* | | |
| • *Interpret and create stem and leaf plots* | | |
| • *Interpret data through a variety of graphs* | | |
| • *Fundamental principle of counting* | | |
| • *Probability* | | |
| • *Independent and dependent events* | | |

# Algebra I

| Linear Equations | | |
|---|---|---|
| **Numbers: Quantities** | Extend the properties of exponents to rational exponents: N.Q.1 | |
| **Algebra: Creating Equations and Inequalities** | Create equations and inequalities that describe numbers or relationships: A.CED.1, A.CED.4 | |
| **Algebra:Reasoning with Equations and Inequalities** | Understand solving equations as a process of reasoning and explain the reasoning: A.REI.1<br>Solve equations and inequalities in one variable: A.REI.3 | |
| ● *Simplify and solve one-step equations* | | Ch.1.1 |
| ● *Simplify and solve multi-step equations* | | Ch.1.2 |
| ● *Solve equations with variable on both sides* | | Ch. 1.3 |
| ● *Solve any linear equation* | | Ch.1.1-3 |
| ● *Rewrite equations and formulas to solve for an indicated variable* | | Ch.1.5 |
| ● *Write and solve equations  to model situations* | | Ch.1.5 |
| ● *Solve absolute Value Equations* | | Ch.1.4 |

| Linear Functions | |
|---|---|
| **Numbers: Quantities** | Reason quantitatively and use units to solve problems:u N.Q.1, N.Q.2, N.Q.3 |
| **Algebra: Creating Equations and Inequalities** | Create equations and inequalities that describe numbers or relationships: A.CED.2 |
| **Algebra: Reasoning with Equations and Inequalities** | Represent and solve equations and inequalities graphically: A.REI.10 |
| **Functions: Linear, Quadratic, and Exponential Models** | Construct and compare linear, quadratic, and exponential models and solve problems: F.FL.1, F.LE.2<br>Interpret expressions for functions in terms of the situation they model: F.LE.5 |
| **Functions: Building Functions** | Build a function that models a relationship between two quantities: F.BF.1, F.BF.2<br>Build new functions from existing functions: F.BF.3 |
| **Functions: Interpreting Functions** | Understand the concept of a function and use function notation: F.IF.1, F.IF.2, F.IF.3,<br>Interpet functions that arise in application in terms of the context: F.IF.4, F.IF.5<br>Analyze functions using differen representations: F.IF.7, F.IF.9 |
| **Statistics and Probability: Interpreting Categorical and Quantitative Data** | Summarize, represent, and interpret data on two categorical and quantitative variables: S.ID.6<br>Interpret linear models: S.ID.7, S.ID.8, S.ID.9 |

| | |
|---|---|
| • *Find and Interpret key characteristics (slope, x-intercept, y-intercept) of a linear situation, given a graph, ordered pairs, table, or written description* | 4.1-3 |
| • *Writing Equations in slope-intercept form* | 4.1 |
| • *Writing Equation in Point Slope Form* | 4.2 |
| • *Model linear situations with equations* | 4.1-5 |
| • *Write Equations for parallel and perpendicular lines* | 4.3 |
| • *Graph Scatter plots and find lines of best fit* | 4.4, 4.5 |
| • *Determine whether a relation is a function* | 3.1 |

| Linear Functions | |
|---|---|
| ● *Determine the domain and range of a function, given a table of values, ordered pairs, mapping or graph* | 3.1-5 |
| ● *Graph a linear equation written in any form* | 3.4-5 |
| ● *Evaluate functions written in function notation* | 3.2 |
| ● *Interpret statements in function notation in terms of their context* | 3.1-5 |
| ● *Transform Linear Functions on a coordinate plane* | 3.6 |
| ★ *Write arithmetic sequence both recursively and with an explicit formula* | 4.6 |
| ★ *Graph Piecewise Functions* | 4.7 |
| ★ *Graph Absolute value functions* | 3.7 |

| Linear Inequalities | | |
|---|---|---|
| **Algebra: Creating Equation and Inequalities** | Create equations and inequalities that describe numbers or relationships: A.CED.1 | |
| **Algebra: Reasoning with Equations and Inequalities** | Solve equations and inequalities in one variable: A.REI.3 | |
| ● *Write and graph inequalities* | | 2.1 |
| ● *Solve inequalities using addition and subtraction* | | 2.2 |
| ● *Solve inequalities using multiplication and division* | | 2.3 |
| ● *Solve multi-step inequalities* | | 2.4 |
| ● *Write and solve inequalities to model situations* | | 2.1-4 |
| ★ *Solve compound inequalities* | | 2.5 |
| ★ *Solve absolute value inequalities* | | 2.6 |

| Systems of Equations and Inequalities | | |
|---|---|---|
| **Algebra: Creating Equations and Inequalities** | Create equations and inequalities the describe numbers or relationships: A.CED.1, A.CED.3 | |
| **Algebra: Reasoning with Equations and Inequalities** | Solve equations and inequalities in one variable: A.REI.3<br>Solve systems of equations: A.REI.5, A.REI.6<br>Represent and solve equations and inequalities graphically: A.REI.11, A.REI.12 | |
| • *Solve systems of equations by graphing* | | 5.1 |
| • *Solve systems of equations by substitution* | | 5.2 |
| • *Solve systems of equations by eliminations* | | 5.3 |
| • *Model situations with linear systems of equations* | | 5.1-5.5 |
| • *Graphing linear inequalities* | | 2.1, 5.6 |
| • *Determine solutions to linear inequalities and systems of linear inequalities* | | 5.6-7 |

| Polynomials | | |
|---|---|---|
| **Algebra: Arithmetic with Polynomials and Rational Expressions** | Perform arithmetic operations on polynomials: A.APR.1<br>Understand the relationship between zeros and factors of polynomials: A.APR.3 | |
| **Algebra: Reasoning with Equations and Inequalities** | Solve equations and inequalities in one variable: A.REI.4 | |
| **Algebra: Seeing Structure in Expressions** | Interpret the structure of expressions: A.SSE.2<br>Write expression in equivalent forms to solve problems: A.SSE.3 | |
| • *Interpret the structure of polynomial expressions using language such as terms, factors, and coefficients* | | Ch. 7.1-8 |

| Polynomials | |
|---|---|
| • *Add and subtract polynomials* | Ch.7.1 |
| • *Multiply polynomials* | Ch.7.2 |
| • *Multiply polynomials with special products* | Ch.7.3 |
| • *Factor binomials, trinomials, and a difference of squares* | Ch.7.5-8 |
| • *Factor polynomials completely* | Ch.7.8 |
| • *Solve polynomials in factored form* | Ch.7.4 |

| Quadratic Functions | |
|---|---|
| **Algebra: Creating Equations and Inequalities** | Create equations and inequalities that describe numbers or relationship: A.CED.1, A.CED.2, A.CED.4 |
| **Algebra: Arithmetic and Polynomials and Rational Expressions** | Understand the relationship between zeros and factors of polynomials: A.APR.3 |
| **Algebra: Reasoning with Equations and Inequalities** | Solve equations and inequalities in one variable: A.REI.4<br>Represent and solve equations and inequalities graphically: A.REI.11 |
| **Algebra: Seeing Structure in Expressions** | Write expression in equivalent forms to solve problems: A.SSE.3 |
| **Numbers: The Real Number System** | Extend the properties of exponents to rational exponents: N.RN.2<br>Use properties of rational irrational numbers: N.RN.3 |
| **Functions: Building Functions** | Build a function that models a relationship between two quantities: F.BF.1<br>Build new functions from existing functions: F.BF.3 |
| **Functions: Linear, Quadratic and Exponential Models** | Construct and compare linear, quadratic, and exponential models and solve problems: F.LE.3 |
| **Functions: Interpreting Functions** | Interpret functions that arise in applications in terms of the context: F.IF.4, F.IF.6<br>Analyze functions using different representations: F.IF.7, F.IF.8, F.IF.9 |

| | |
|---|---|
| • *Graph a quadratic function* | Ch.8.1-5 |
| • *Compare linear and quadratic functions* | Ch.8.6 |
| • *Simplify radical expressions* | Ch.9.1 |
| • *Solve quadratic equations by graphing* | Ch.9.2 |
| • *Solve quadratic equations using square roots* | Ch.9.3 |
| • *Solve quadratic equations by completing the square* | Ch.9.4 |
| • *Solve quadratic equations with quadratic formula* | Ch.9.5 |

| Quadratic Functions | |
|---|---|
| • *Solve nonlinear systems of equations* | Ch.9.6 |

| Exponential Functions and Sequences | | |
|---|---|---|
| **Algebra: Creating Equations and Inequalities** | Create equations and inequalities that describe numbers or relationships: A.CED.2 | |
| **Algebra: Seeing Structures in Expressions** | Interpret the structure of expressions: A.SSE.2 | |
| **Algebra: Reasoning with Equations and Inequalities** | Understand solving equations as a process of reasoning: A.REI.1<br>Represent and solve equations and inequalities graphically: A.REI.11 | |
| **Numbers: The Real Number System** | Extend the properties of exponents to rational exponents: N.RN.1, N.RN.2 | |
| **Functions: Linear, Quadratic, and Exponential Models** | Construct and compare linear, quadratic, and exponential models and solve problems: F.LE.1, F.LE.2 | |
| **Functions: Building Functions** | Build a function that models a relationship between two quantities: F.BF.1, F.BF.2<br>Build new functions from existing functions: F.BF.3 | |
| **Functions: Interpreting Functions** | Understand the concept of a function adn use function notation: F.IF.3<br>Interpret functions that arise in applications in terms of the contex: F.IF.4<br>Analyze functions using different representations: F.IF.7, F.IF.8, F.IF.9 | |
| ● *Simplify and Evaluate expressions containing integer exponents* | | Ch.6.1 |
| ● *Rewrite expressions involving radicals and rational exponents using the properties of exponents* | | Ch.6.1-4 |
| ● *Graph simple exponential functions* | | Ch.6.3-4 |
| ● *Graph and model situations of exponential growth and decay* | | Ch.6.4 |
| ● *Solve equations with rational exponents using the properties of exponents* | | Ch.6.5 |
| ● *Construct simple exponential functions from graphs, tables of values, or a description* | | Ch.6.1-5 |
| ● *Distinguish between situations that can be modeled with linear functions and with exponential functions* | | Ch.6.1-5 |
| ★ *Write geometric sequences both recursively and with an explicit formula* | | Ch.6.6-7 |

| Data Analysis and Displays | | |
|---|---|---|
| **Statistics and Probability: Interpreting Categorical and Quantitative Data** | Summarize, represent, and interpret data on a single count or measurement variable: S.ID.1, S.ID.2, S.ID.3<br>Summarize, represent, and interpret data on two categorical and quantitative variables: S.ID.5 | |
| ● *Compare the mean, median and mode of a data set* | | Ch. 11.1 |
| ● *Identify the effects of transformations on data* | | Ch.11.1 |
| ● *Interpret and use box and whisker plots to represent and compare data sets* | | Ch.11.2 |
| ● *Describe the shapes of data distributions and compare data distributions* | | Ch.11.3 |
| ● *Make and use two-way tables to recognize associations in data* | | Ch.11.4 |
| ● *Classify data as quantitative or qualitative, choose and create appropriate data displays, and analyze misleading graphs.* | | Ch.11.5 |

| Radical Functions and Equations (if time in the year) | | |
|---|---|---|
| **Algebra: Creating Equations and Inequalities** | Create equations and inequalities that describe numbers or relationships: A.CED.1, A.CED.2 | |
| **Functions: Building Functions** | Build new functions from existing functions: F.BF.4 | |
| **Functions: Interpreting Functions** | Interpret functions that arise in applications in terms of the context: F.IF.4, F.IF.6<br>Analyze functions using different representations: F.IF.7, F.IF.9 | |
| ● *Graph square root and cube root functions* | | Ch.10.1-2 |
| ● *Compare square root and cube root functions* | | Ch.10.1-2 |
| ● *Solve radical equations and identify extraneous solutions* | | Ch.10.3 |
| ● *Solve real-life problems involving square root functions, cube root functions, and radical equations* | | Ch.10.3 |
| ● *Find inverses of relations, linear function, and nonlinear functions* | | Ch.10.4 |

# Geometry

| Foundations of Geometry | | |
|---|---|---|
| **Geometry: Congruence** | Experiment with transformation in the plane: G.CO.1<br>Prove geometric theorems: G.CO.9, G.CO.10, G.CO.11<br>Make geometric constructions: G.CO.12 | |
| **Geometry: Expressing Geometric Properties with Equations** | Use coordinates to prove simple geometric theorems algebraically: G.GPE.7 | |
| **Geometry: Modeling with Geometry** | Apply Geometric concepts in modeling situation: G. MG.1 | |
| **Geometry: Similarity, Right Triangles, and Trigonometry** | Prove theorems involving similarity: G.SRT.4 | |
| ● *Know and be able to use precise definitions of geometric terms* | | Ch.1.1 |
| ● *Find segment lengths using the Ruler postulate, segment addition postulate, midpoints, segment bisectors, and the distance formula* | | Ch.1.2 |
| ● *Classify polygons and angles* | | Ch.1.4, Ch.1.6 |
| ● *Find perimeters and areas of polygons in the coordinate plane* | | Ch.1.3 |
| ● *Construct congruent segments and angles, and bisect segment and angles* | | Ch.1.2 Ch.1.5 |
| ● *Write conditional and biconditional statements* | | Ch.2.1 |
| ● *Use inductive and deductive reasoning* | | Ch.2.2 |
| ● *Write proofs* | | Ch.2.5-6 |

| Parallel and Perpendicular Lines | | |
|---|---|---|
| **Geometry:Congruence** | Experiment with transformations in the plane: G.CO.1<br>Proving geometric theorem: G.CO.9<br>Make geometric construction: G.CO.12 | |
| **Geometry: Expressing Geometric Properties with Equations** | Use coordinates to prove simple geometric theorems algebraically: G.GPE.5, G.GPE.6 | |
| ● *Identify pairs of angles formed by transversals, parallels, and perpendicular lines.* | | |
| ● *Use properties and theorems of parallel lines* | | |
| ● *Write equations of parallel lines and perpendicular lines* | | |
| ● *Find the distance from a point to a line* | | |

| Congruent and Similar Triangles | | |
|---|---|---|
| **Geometry: Congruence** | Understand congruence in terms of rigid motions: G.CO.7, G.CO.8<br>Prove geometric theorems: G.CO.10<br>Make geometric constructions: G.CO.13 | |
| **Geometry: Modeling with Geometry** | Apply geometric concepts in modeling situations: G.MG.1, G.MG.3 | |
| **Geometry: Expression Geometric Properties with Equations** | Use coordinates to prove simple geometric theorems algebraically: G.GPE.5, G.GPE.6 | |
| **Geometry: Similarity, Right Triangles, and Trigonometry** | Understand similarity in terms of similarity transformations: G.SRT.2, G.SRT.3<br>Prove theorems involving similarity: G.SRT.4, G.SRT.5 | |
| ● *Understand that there can be more than on sequence of rigid motion that carries a figure onto another figure* | | Ch 5 |
| ● *Identify and use corresponding parts* | | Ch.5.1-2 |
| ● *Use the definition of congruence in terms of rigid motion to decide if two figures are congruent* | | Ch. 5 |
| ● *Use SAS, SSS, HL, ASA, and AAs to prove two triangles are congruent* | | Ch.5.3-6 |
| ● *Prove theorems about triangles, lines, angles* | | Ch. 5 |
| ● *Use the AA, SSS, and SAS similarity theorems to prove triangles are similar* | | Ch.8.2, Ch.8.3 |
| ● *Use similarity criteria to solve problems about lengths, perimeters, and areas of triangles* | | Ch.8.4 |
| ● *Use the triangle proportionality theorem* | | Ch.8 |

| Triangle Relationship | | |
|---|---|---|
| **Geometry: Congruence** | Prove geometric theorems: G.CO.9, G.CO.10<br>Make geometric constructions: G.CO.12 | |
| **Geometry: Modeling with Geometry** | Apply geometric concepts in modeling situations: G.MG.1, G.MG.3 | |
| **Geometry: Circles** | Understand and apply theorems about circles: G.C.3 | |
| ● *Understand and use angle bisectors and perpendicular bisectors to find measures* | | Ch.6.1-2 |
| ● *Find and use the circumcenter, incenter, centroid, and orthocenter of a triangle* | | Ch.6.3-4 |
| ● *Use the triangle midsegment theorem and the triangle inequality theorem* | | Ch.6.5-6 |

| Right Triangle Trigonometry | | |
|---|---|---|
| **Geometry: Similarity, Right Triangles, and Trigonometry** | Prove theorems involving similarity: G.SRT.4, G.SRT.5<br>Define trigonometric ratios and solve problems involving right triangles: G.SRT.6, G.SRT.7, G.SRT.8<br>Apply trigonometry to general triangles: G.SRT.9, G.SRT.10, G.SRT.11 | |
| **Geometry: Modeling with Geometry** | Apply geometric concepts in modeling situation: G.MG.1, G.MG.3 | |
| ● *Use the Pythagorean Theorem and the converse of the Pythagorean Theorem* | | Ch.9.1 |
| ● *Using similarity, show that side ratios in right triangles are properties of angles* | | Ch.9.3 |
| ● *Use geometric means* | | Ch.9 |
| ● *Find side lengths and solve real-life problems involving special right triangles* | | Ch.9.2 |
| ● *Define the trigonometric ratios (sin, cos, tan) for acute angles* | | Ch.9.4-5 |
| ● *Find the tangent, sine, and cosine ratios and use them to solve real-life problems* | | Ch.9.6 |
| ● *Use the Law of Sines and Law of Cosines to solve triangles* | | Ch.9.7 |

| Circles | |
|---|---|
| **Geometry: Congruence** | Experiment with transformations in the plane: G.CO.1<br>Make geometric construction: G.CO.13 |
| **Geometry: Circles** | Understand and apply theorems about circles: G.C.1, G.C.2, G.C.3, G.C.4 |
| **Geometry: Modeling with Geometry** | Apply geometric concepts in modeling situations: G.MG.1, G.MG.3 |
| **Geometry: Expressing Geometric Properties with Equations** | Translate between the geometric description and the equation for a conic section: G.GPE.1<br>Use coordinates to prove simple geometric theorems algebrically: G.GPE.4 |

| | |
|---|---|
| ● *Identify chords, diameters, radii, secants, and tangents of circles* | |
| ● *Use the pythagorean Theorem to derive an equation for a circle given center and radius* | |
| ● *Describe the relationship between central and inscribed angles and their arcs* | |
| ● *Find angle and arc measures* | |
| ● *Describe relationships and ratios of lengths of intersecting chords* | |
| ● *Use relationships about inscribed angles to solve problems about inscribed polygons* | |
| ● *Solve problems involving properties of circles* | |
| ● *Write and graph equations of circles* | |

| Coordinate Geometry | | |
|---|---|---|
| **Geometry: Congruence** | Experiment with transformations in the plane: G.CO.2, G.CO.3, G.CO.4, G.CO.5<br>Understand congruence in terms of rigid motions: G.CO.6 | |
| **Geometry: Modeling with Geometry** | Apply geometric concepts in modeling situation: G.MG.3 | |
| **Geometry: Similarity, Right Triangles, and Trigonometry** | Understand similarity in terms of similarity transformations: G.SRT.1, G.SRT.2 | |
| ● *Describe functions as transformations using coordinate transformation notation* | | Ch.4 |
| ● *Describe transformations in the coordinate plane* | | Ch.4 |
| ● *Perform translations, reflections, rotations, dilations, and compositions of transformations* | | Ch. 4 |
| ● *Solve real-life problems involving transformations* | | Ch. 4 |
| ● *Identify lines of symmetry and rotational symmetry* | | Ch.4.5 |
| ● *Describe and perform congruence transformations and similarity transformations* | | Ch.4.6 |

| Solid Geometry | | |
|---|---|---|
| **Geometry: Geometric Measurement and Dimension** | Explain volume formulas and use them to solve problems: G.GMD.1, G.GMD.2, G.GMD.3<br>Visualize relationships between two-dimensional and three-dimensional objects: G.GMD.4 | |
| **Geometry: Modeling with Geometry** | Apply geometric concepts in modeling situations: G.MG.1, G.MG.2 | |
| ● *Find arc lengths and areas of sectors of circles* | | |
| ● *Find areas of rhombuses, kits, and regular polygons* | | |
| ● *Find and use volumes of prisms, cylinders, pyramids, cones, and sphere* | | |
| ● *Identify the shapes of two-dimensional cross-sections of three-dimensional objects and 3D objects from rotation of 2D shapes* | | |
| ● *Understand the effects of dilation on area and volume* | | |

| Probability | |
|---|---|
| **Statistics and Probability: Conditional Probability and the Rules of Probability** | Understand independence and conditional probability and use them to interpret data: S.CP.1, S.CP.2, S.CP.3, S.CP.4, S.CP.5<br>Use the rules of probability to compute probabilities of compound events in a uniform probability model: S.CP.6, S.CP.7, S.CP.8, S.CP.9 |
| **Statistics and Probability: Using Probability to Make Decisions** | Calculate expected values and use them to solve problems: S.MD.1, S.MD.2, S.MD.3, S.MD.4<br>Use probability to evaluate outcomes of decisions: S.MD.5, S.MD.6, S.MD.7 |
| ● *Find probabilities of independent and dependent events* | |
| ● *Use conditional relative frequencies to find conditional probabilities* | |
| ● *Use the formulas for the number of permutations and the number of combinations* | |
| ● *Construct and interpret probability distributions and binomial distributions* | |

# Algebra II

| Linear Function and Systems | |
|---|---|
| **Algebra: Creating Equations and Inequalities** | Create equations and inequalities that describe numbers or relationships: A.CED.1, A.CED.3 |
| **Algebra: Reasoning with Equations and Inequalities** | Solve systems of equations: A.REI.6<br>Represent adn solve equations and inequalities graphically: A.REI.11 |
| **Functions: Building Functions** | Build a function that models a relationship between two quantities: F.BF.1,F.BF.2<br>Build new functions from existing function: F.BF.3, |
| **Functions: Interpreting Functions** | Understand the concept of a function and use function notationF.IF.3<br>Interpret functions that arise in applications in terms of the context: F.IF.4, F.IF.5, F.IF.6<br>Analyze functions using different representations: F.IF.7 |
| **Functions: Linear, Quadratic, and Exponential Models** | Construct and compare linear, quadratic, and exponential models and solve problems: F.LE.2 |
| **Statistics and Probability: Interpreting Categorical and QUantitative Data** | Summarize, represent, adn interpret data on two categorical and quantitative variables: S.ID.6 |

| | |
|---|---|
| • *Identify Families of functions* | |
| • *Describe transformations of parent functions* | |
| • *Write functions representing combinations of transformations* | |
| • *Solve linear and compound inequalities* | |
| • *Solve absolute value equations and inequalities* | |
| • *Solve systems of linear equations graphically and algebraically* | |
| • *Solve systems of linear equations in three variables algebraically* | |

| Quadratic Functions and Equations | |
|---|---|
| **Algebra: Arithmetic and Polynomials and Rational Expressions** | Perform arithmetic operations on polynomials: A.APR.3 |
| **Algebra: Creating Equations and Inequalities** | Create equations and inequalities that describe numbers or relationships: A.CED.2 |
| **Algebra: Reasoning with Equations and Inequalities** | Understand solving equations as a process of reasoning and explain the reasoning: A.REI.4<br>Solve systems of equations: A.REI.7<br>Represent and solve equations and inequalities graphically: A.REI.11 |
| **Algebra: Seeing STructure in Expressions** | Interpret the structure of expressions: A.SSE.2<br>Write expressions in equivalent forms to solve problems: A.SSE.3 |
| **Functions: Building Functions** | Build new functions from existing functions: F.BF.3 |
| **Functions: Interpreting Functions** | Interpret functions that arise in applications in terms of the context: F.IF.4 |
| **Numbers and Quantity: The Complex Number System** | Perform arithmetic operations with complex numbers: N.CN.1, N.CN.2, C.CN.3<br>Use complex numbers in polynomial identities and equations: N.CN.7 |
| **Statistics and Probability: Interpreting Categorical and Quantitative Data** | Summarize, represent, adn interpret data on two categorical and quantitative variables: S.ID.6 |

- *Describe and write transformations of quadratic functions*
- *Graph quadratic functions using vertex form, standard form, and x-intercepts*
- *Solve quadratic equations by square root, factoring, completing the square, and the quadratic formula*
- *Solve a system of linear and quadratic equations by graphing and algebraically*
- *Perform arithmetic operations with complex numbers*
- *Find conjugates of complex numbers and use conjugates of complex numbers to divide complex numbers*

| Polynomial Functions | |
|---|---|
| **Algebra: Arithmetic and Polynomials and Rational Expressions** | Perform arithmetic operations on polynomials: A.APR.1<br>Understand the relationship between zeros and factors of polynomials: A.APR.2, A.APR.3<br>Use polynomial identities to solve problems: A.APR.4, A.APR.5<br>Rewrite rational expressions: A.APR.6 |
| **Algebra: Seeing Structures in Expressions** | Interpret the structure of expressions: A.SSE.2 |
| **Functions: Building Functions** | Build a function that models a relationship between two quantities: F.BF.1<br>Build new functions from existing functions: F.BF.3 |
| **Functions: Interpreting Functions** | Interpret functions that arise in applications in terms of the context: F.IF.4, F.IF.6<br>Analyze functions using different representations: F.IF.7, F.IF.9 |
| **Number and Quantity: The Complex Number System** | Use complex numbers in polynomial identities and equations: N.CN.8, N.CN.9 |

| | |
|---|---|
| • *Interpret key features of graphs of polynomials: extrema, symmetry, vertex, zeros, and end behavior* | |
| • *Add, subtract, and multiply polynomials* | |
| • *Apply long and synthetic division to divide polynomials* | |
| • *Know and apply the binomial theorem* | |
| • *Factor an expression to find zeros* | |
| • *Use rational root theorem to solve polynomials* | |
| • *Identify the roots of a polynomial* | |
| • *Write the equation of a polynomial of least degree with given roots* | |
| • *Transform functions: vertical and horizontal shifts, reflections, vertical and horizontal stretches and compression* | |
| • *Recognize even/odd functions from their graphs or equations* | |

| Rational Exponents and Radical Functions | |
|---|---|
| **Algebra: Creating Equations and Inequalities** | Create equations and inequalities that describe numbers or relationships: A.CED.1 |
| **Algebra: Reasoning with Equations and Inequalities** | Understand solving equations as a process of reasoning and explain the reasoning: A.REI.1 |
| **Algebra: Seeing Structure in Expressions** | Interpret the structure of Expressions: A.SSE.2<br>Write expressions in equivalent forms to solve problems: A.SSE.3, A.SSE.4 |
| **Functions: Building Functions** | Build a function that models a relationship between two quantities: F.BF.1, F.BF.2<br>Build new functions from existing functions: F.BF.3, F.BF.4, F.BF.5 |
| **Functions: Interpreting Functions** | Understand the concept of a function and use function notation: F.IF.3<br>Interpret functions that arise in applications in terms of the context: F.IF.4, F.IF.5, F.IF.6<br>Analyze functions using different representations: F.IF.7, F.IF.8, F.IF.9 |
| **Functions: Linear, Quadratic, and Exponential Models** | Construct and compare linear, quadratic, and exponential models and solve problems: F.LE.2, F.LE.4<br>Interpret expressions for functions in terms of the situation they model: F.LE.5 |
| **Statistics and Probability: Interpreting Categorical and Quantitative Data** | Summarize, represent, and interpret data on two categorical and quantitative variables: S.ID.6 |

| | |
|---|---|
| • *Rewrite radical expressions using rational exponents* | |
| • *Simplify radical expressions* | |
| • *Evaluate expressions using properties of rational exponents* | |
| • *Graph radical functions* | |
| • *Solve equations containing radicals and rational exponents* | |
| • *Solve radical inequalities* | |
| • *Explore inverse of functions* | |

| Rational, Exponential, and Logarithmic Functions | |
|---|---|
| **Algebra: Arithmetic with Polynomials and Rational Expressions** | Rewrite rational expressions: A.APR.6, A.APR.7 |
| **Algebra: Creating Equations and Inequalities** | Create equations and inequalities that describe numbers or relationships: A.CED.1, A.CED.2 |
| **Algebra: Reasoning with Equations and Inequalities** | Understand solving equations as a process of reasoning and explain the reasoning: A.REI.1, A.REI.2<br>Represent and solve equations and inequalities graphically: A.REI.11 |
| **Algebra: Seeing Structure in Expressions** | Interpret the structure of expressions: A.SSE.2<br>Write expressions in equivalent forms to solve problems: A.SSE.3, A.SSE.4 |
| **Functions: Building Functions** | Build a function that models a relationship between two quantities: F.BF.1, F.BF.2<br>Build new functions from existing functions: F.BF.3, F.BF.4, F.BF.5 |
| **Functions: Interpreting Functions** | Understand the concept of a function and use function notation: F.IF.3<br>Interpet functions that arise in application in terms of the context: F.IF.4, F.IF.5, F.IF.6.<br>Analyze functions using different representations: F.IF.7, F.IF.8, F.IF.9 |
| **Functions: Linear, Quadratic, and Exponential Models** | Construct and compare linear, quadratic, and exponential models and solve problems: F.LE.2, F.LE.4<br>Interpret expressions for cunctions in terms of the situation they model: F.LE.5 |
| **Statistics and Probability: Interpreting Categorical and Quantitative Data** | Summarize, represent, adn interpret data on two categorical and quantitative variables: S.ID.6 |

| | |
|---|---|
| • *Classify and write direct and inverse variations* | |
| • *Graph rational functions* | |
| • *Add, subtract, multiply, and divide rational expressions* | |
| • *Solve rational equations* | |
| • *Distinguish between situations that are linear, quadratic, or exponential* | |

| Rational, Exponential, and Logarithmic Functions | |
|---|---|
| • *Graph exponential growth and decay* | |
| • *Write exponential functions* | |
| • *Write, graph, evaluate, and simplify logarithmic functions* | |
| • *Translate between logarithms in any base* | |
| • *Write equivalent forms for exponential and logarithmic functions* | |
| • *Solve exponential and logarithmic equations and inequalities* | |
| • *Model data using exponential and logarithmic functions* | |

| Trigonometric Functions | | |
|---|---|---|
| **Functions: Building Functions** | Build new functions from existing functions: F.BF.3 | |
| **Functions: Interpreting Functions** | Interpret functions that arise in applications in terms of the context: F.IF.4, F.IF.6<br>Analyze functions using different representations: F.IF.7, F.IF.9 | |
| **Functions: Trigonometric Functions** | Extend the domain of trigonometric functions using the unit circle: F.TF.1, F.TF.2, F.TF.3<br>Model periodic phenomena with trigonometric functions: F.TF.5<br>Prove and apply trigonometric identities: F.TF.8 | |
| • *Convert between radians, degrees, and degree/minute/second* | | |
| • *Extend the domain of trig functions using the unit circle* | | |
| • *Evaluate all six trig functions for exact values* | | |
| • *Write and graph trigonometric functions* | | |
| • *Transform the graphs of sine and cosine functions* | | |
| • *Graph other trig functions* | | |

| Trigonometric Equations and Identities | | |
|---|---|---|
| **Algebra: Seeing Structures in Expression** | Interpret the structure of expressions: A.SSE.2 | |
| **Functions: Building Functions** | Build new functions from existing functions: F.BF.4 | |
| **Functions: Trigonometric Functions** | Extend the domain of trigonometric functions using the unit circle: F.TF.3, F.TF.4<br>Model periodic phenomena with trigonometric functions: F.TF.6, F.TF.7<br>Prove and apply trigonometric identities: F.TF.9 | |
| **Geometry: Similarity, Right Triangles, and Trigonometry** | Apply trigonometry to general triangles: G.SRT.10, G.SRT.11 | |
| **Numbers: The Complex Number System** | Perform arithmetic operations with complex numbers: N.CN.3<br>Represent complex numbers and their operation on teh complex plane: N.CN.4, N.CN.5, N.CN.6 | |
| ● *Use inverse trigonometric functions to solve trigonometric equations* | | |
| ● *Apply law of sines and law of cosines* | | |
| ● *Verify and use trigonometric identities* | | |
| ● *Calculate the distance between numbers in the complex plane* | | |
| ● *Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane* | | |
| ● *Represent complex numbers on the complex plane in rectangular and polar form* | | |

| Conic Sections | | |
|---|---|---|
| **Algebra: Reasoning with Equations and Inequalities** | Solve systems of equations: A.REI.7 | |
| **Algebra: Seeing Structure in Expressions** | Interpret the structure of expressions: A.SSE.2<br>Write expression in equivalent forms to solve problems: A.SSE.3 | |
| **Geometry: Expressing Geometric Properties with Equations** | Translate between the geometric description adn teh equation for a conic section: G.GPE.1, G.GPE.2, G.GPE.3 | |
| ● *Graph conic sections: Circles, parabolas, ellipses, hyperboles* | | |
| ● *Transform conic sections* | | |
| ● *Write equations of conic section: circles parabolas ellipses, hyperboles* | | |
| ● *Derive the equations of ellipse and hyperbolas given foci and directrices* | | |

| Matrices | |
|---|---|
| **Algebra: Creating Equations and Inequalities** | Create equations and inequalities that describe numbers or relationships: A.CED.3 |
| **Algebra: Reasoning with Equations and Inequalities** | Solve systems of equations: A.REI.8, A.REI.9 |
| **Numbers: Vector and Matrix Quantities** | Represent and model with vector quantities: N.VM.1, N.VM.2, N.VM.3<br>Perform operations on vectors: N.VM.4, N.VM.5<br>Perform operations on matrices and use matrices in applications: N.VM.6, N.VM.7, N.VM.8, N.VM.9, N.VM.10, N.VM.11, N.VM.12 |

| | |
|---|---|
| ● *Recognize vector quantities as having both magnitude and direction* | |
| ● *Find the components of a vector* | |
| ● *Solve problems involving velocity and other quantities that can be represented by vectors* | |
| ● *Add and subtract vectors* | |
| ● *Multiply a vector by a scalar* | |
| ● *Use matrices to represent and manipulate data* | |
| ● *Multiply matrices by scalars to produce new matrices* | |
| ● *Add, subtract, and multiply matrices of appropriate dimensions* | |

| Data Analysis and Probability | |
|---|---|
| **Numbers: Quantities** | Reason quantitatively and use units to solve problems: N.Q.2 |
| **Statistics and Probability: Making Inferences and Justifying Conclusions** | Understand and evaluate random processes underlying statistical experiments: S.IC.1, S.IC.2<br>Make inferences and justify conclusions from sample survey, experiments, and observational studies: S.IC.3, S.IC.4, S.IC.5, S.IC.6 |
| **Statistics and Probability: Interpreting Categorical and Quantitative Data** | Summarize, represent, and interpret data on a single count or measurement variable: S.ID.2, S.ID.4 |
| **Statistics and Probability: Conditional Probability and the Rules of Probability** | Understand independence nad conditional probability and use them to interpret data S.CP.1, S.CP.2, S.CP.3, S.CP.4, S.CP.5<br>Use the rules of probability to compute probabilities of compound events in a uniform probability model: S.CP.6, S.CP.7, S.CP.8, S.CP.9 |
| **Statistics and Probability: Using Probability to Make Decisions** | Claculate expected values and use them to solve problems: S.MD.1, S.MD.2, S.MD.3, S.MD.4<br>Use probability to evaluate outcomes of decisions: S.MD.5, S.MD.6, S.MD.7 |

| | |
|---|---|
| • *Find probabilities of independent and dependent events* | |
| • *Use conditional relative frequencies to find conditional probabilities* | |
| • *Use the formulas for the number of permutations and the number of combinations* | |
| • *Use combinations and the binomial theorem to expand binomials* | |
| • *Construct and interpret probability distributions and binomial distributions.* | |
| • *Calculate probabilities using normal distributions* | |
| • *Use z-scores and the standard normal table to find probabilities* | |
| • *Analyze methods of collecting data, and recognize bias in survey questions* | |
| • *Approximate margins of error for samples* | |

| Data Analysis and Probability | |
|---|---|
| • *Resample data using a simulation to analyze a hypothesis* | |

# Pre-Calculus

| Functions | |
|---|---|
| | F.BF.1, F.BF.4, F.BF.5 |
| ● *Perform operations with functions: add, subtract, composition* | |
| ● *Find inverses of functions*<br>○ *To include domain restrictions when needed* | |
| ● *Verify inverses through composition* | |
| ● *Use a graph or table to find values of an inverse* | |
| ● *Use the inverse relationship between exponentials and logarithms to solve problems* | |

| Polynomials | |
|---|---|
| | A.APR.1, N.CN.9, F.IF.4 |
| ● *Use long and or synthetic division to factor polynomials of degree three or higher* | |
| ● *Use algebraic methods to find all real and imaginary zeros of polynomials degree three or higher* | |
| ● *Graph polynomials of degree three or higher and identify key features*<br>○ *Intercepts, increasing/decreasing intervals, positive/negative intervals, end behavior, relative max/min* | |

| Rational Functions | | |
|---|---|---|
| | F.IF.5, F.IF.7 | |
| ● *Graph function and show key features*<br>○ *Linear, Quadratic, Square and Cube root, Piece to include and step and absolute value, Polynomial functions, Rational functions, Exponential functions, Logarithmic functions* | | |
| ● *Find domain and range of a function* | | |

| Exponential and Logarithmic Relationships | | |
|---|---|---|
| | F.IF.5 | |
| ● *Use properties of logarithms to simplify and expand logarithms* | | |
| ● *Use a variety of algebraic methods to solve logarithmic and exponential equations; include restrictions in the solutions.* | | |

| Sequence and Series | |
|---|---|
| | F.BF.2, A.SSE.4 |
| • *Write arithmetic sequences recursively* | |
| • *Write arithmetic sequences explicitly* | |
| • *Write geometric sequences recursively* | |
| • *Write geometric sequences explicitly* | |
| • *Model situations with sequences* | |
| • *Use summation notation to write finite and infinite series* | |
| • *Use summation notation to evaluate finite and infinite series* | |

| Unit Circle and Right/Non-Right Triangle Trigonometry | |
|---|---|
| | G.SRT.8, G.SRT.11, F.TF.1, F.TF.2, F.TF.3, F.TF.7 |
| • *Solve right triangles us Pythagorean Theorem and trigonometry ratios* | |
| • *Solve non-right triangles using Law of Sines and/or Law of Cosines* | |
| • *Convert between radians, degrees, and degree/minute/second* | |
| • *Extend the domain of trig functions using the unit circle* | |
| • *Evaluate all six trig functions for exact values* | |
| • *Use inverse trig functions to solve trigonometric equations* | |

| Graphs of Trigonometric Functions | | |
|---|---|---|
| | F.BF.3, F.TF.6, F.TF.5 | |
| • *Graph the six trigonometric functions and their transformations* | | |
| • *Graph the inverses of trigonometric functions* | | |
| • *Model periodic phenomena with trigonometric functions* | | |

| Trigonometric Identities | | |
|---|---|---|
| | F.TF.8, F.TF.9 | |
| • *Prove and apply the Pythagorean Identities* | | |
| • *Prove and apply the addition and subtraction formulas* | | |
| • *Prove and apply the double and half-angle identities* | | |
| • *Use identities to solve trigonometric equations* | | |
| • *Graph linear inequalities* | | |

| Other Coordinate Systems | |
|---|---|
| | N.VM1, N,VM.2, N.VM3, N.VM.4, N.VM.5, N.CN.4 |
| • *Recognize vector quantities have both magnitude and direction* | |
| • *Represent vectors with directed line segments* | |
| • *Use appropriate symbols for vectors and their magnitudes* | |
| • *Find the components of a vector* | |
| • *Solve problems that can be represented by vectors* | |
| • *Add and subtract vectors* | |
| • *Multiply a vector by a scalar* | |
| • *Graph parametric functions with and without technology* | |
| • *Graph ordered pairs in polar* | |
| • *Graph Polar Functions* | |
| • *Represent complex numbers on the complex plane* | |

# Calculus

| (Currently Incomplete) | |
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# Statistics

| Introduction to Statistics | |
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| | |
| • *Distinguish between population and a sample and between a parameter and a statistic* | |
| • *Distinguish between descriptive statistics and inferential statistics* | |
| • *Distinguish between qualitative data and quantitative data* | |
| • *Design a statistical study and how to distinguish between an observational study and an experiment* | |
| • *Collect data by using a survey or a simulation* | |
| • *Design an experiment* | |
| • *Create a sample using random sampling, simple random sampling, stratified sampling, cluster sampling, and systematic sampling and hot to identify a biased sample* | |

| Descriptive Statistics | |
|---|---|
| | |
| • *Construct a frequency distribution, including limits, midpoints, relative frequencies, cumulative frequencies, and boundaries* | |
| • *Construct frequency histograms, frequency polygons, relative frequency histograms, and ogives* | |
| • *Graph and interpret quantitative dat sets using stem and leaf plots and dot plots* | |
| • *Graph and interpret qualitative data sets using pie charts* | |
| • *Graph and interpret paired data sets using scatter plots and time series charts* | |
| • *Find the mean, median, and mode of a population and of a sample* | |
| • *Find a weighted mean of a data set, and how to estimate the sample mean of grouped data* | |
| • *Describe the shape of a distribution as symmetric, uniform, or skewed, and how to compare the mean and median for each* | |
| • *Find the range of a data set* | |
| • *Find the variance and standard deviation of a population and of a sample* | |
| • *Use the Empirical Rule ad Chebychev's Theorem to interpret standard deviation* | |
| • *Estimate the sample standard deviation for grouped data* | |
| • *Use the coefficient of variation to compare variation to different data sets* | |
| • *Find the first, second, and third quartiles of a data set, how to find the interquartile range of a data set, and how to represent a data set graphically using a box and whisker plot* | |
| • *Interpret other fractiles such as percentiles, and how to find percentiles for a specific data entry* | |
| • *Find and interpret the standard score (z-score)* | |

| Probability | |
|---|---|
| | |
| • *Identify the sample space of a probability experiment and how to identify simple events* | |
| • *Use the Fundamental Counting Principle to find the number of ways two or more events can occur* | |
| • *Distinguish among classical probability, empirical probability, and subjective probability* | |
| • *Find the probability of the complement of an event* | |
| • *Use the tree diagram and the FUndamental Counting Principle to find probabilities* | |
| • *Find the probability of an event given that another event has occurred* | |
| • *Distinguish between independent and dependent events* | |
| • *Use the Multiplication Rule to find the probability of two or more events occurring in sequence and to find conditional probabilities* | |
| • *Determine whether two events are mutually exclusive* | |
| • *Use the Addition Ru;e to find the probability of two events* | |
| • *Find the number of ways a group of objects can be arranged in order* | |
| • *Find the number of ways to choose several objects from a group without regard to order* | |
| • *Use counting principles to find probabilities* | |

| Discrete Probability Distributions | |
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| | |
| ● *Distinguish between discrete random variables and continuous random variables* | |
| ● *Construct and graph a discrete probability distribution and how to determine whether a distribution is a probability distribution* | |
| ● *Find the mean, variance, and standard deviation of a discrete probability distribution* | |
| ● *Find the expected value of a discrete probability distribution* | |
| ● *Determine whether a probability experiment is a binomial experiment* | |
| ● *Find binomial probabilities using the binomial probability formula* | |
| ● *Find binomial probabilities using technology, formulas, and a binomial probability table* | |
| ● *Construct and graph a binomial distribution* | |
| ● *Find the mean, variance, and standard deviation of a binomial probability distribution* | |
| ● *Find probabilities using the geometric distribution* | |
| ● *Find probabilities using the Poisson distribution* | |

| Normal Probability Distributions | |
|---|---|
| | |
| • *Interpret graphs of normal probability distributions* | |
| • *Find areas under the standard normal curve* | |
| • *Find probabilities for normally distributed variable using a table and using technology* | |
| • *Find a z-score given the area under the normal curve* | |
| • *Transform a z-score to an x-value* | |
| • *Find a specific data value of a normal distribution given the probability* | |
| • *Find sampling distributions and verify their properties* | |
| • *Interpret the Central Limit Theorem* | |
| • *Apply the Central Limit Theorem to find the probability of a sample mean* | |
| • *Determine when a normal distribution can approximate a binomial distribution* | |
| • *Find the continuity correction* | |
| • *Use a normal distribution to approximate binomial probabilities* | |

| Confidence Intervals | |
|---|---|
| | |
| • *Find a point estimate and a margin of error* | |
| • *Construct and interpret confidence intervals for a population mean when σ (standard deviation) is known* | |

| Confidence Intervals | |
|---|---|
| ● *Determine the minimum sample size required when estimating a population mean* | |
| ● *Interpret the t-distribution and use a t-distribution table* | |
| ● *Construct and interpret confidence intervals for a population mean when σ (standard deviation) is not known* | |
| ● *Find a point estimate for a population proportion* | |
| ● *Construct and interpret confidence intervals for a population proportion* | |
| ● *Determine the minimum sample size required when estimating a population proportion* | |
| ● *Interpret the chi-square distribution and use a chi-square distribution table* | |
| ● *Construct and interpret confidence intervals for a population variance and standard deviation* | |

# Hypothesis Testing with One Sample

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| | |
|---|---|
| • *State a null hypothesis and an alternative hypothesis* | |
| • *Identify type I and type II errors and interpret the level of significance* | |
| • *Know whether to use a one-tailed or two-tailed statistical test and find a P-value* | |
| • *Make and interpret a decision based on the results of a statistical test* | |
| • *Write a claim for a hypothesis test* | |
| • *Find and interpret P-values* | |
| • *Use P-values for a z-test for a mean* $\mu$ *when standard deviation* $\sigma$ *is known* | |
| • *Find critical values and rejection regions in the standard normal distribution* | |
| • *Use rejection regions for a z-test for a mean* $\mu$ *when standard deviation* $\sigma$ *is known* | |
| • *Find critical values in a t-distribution* | |
| • *Use the t-test to test a mean* $\mu$ *when standard deviation* $\sigma$ *is not known* | |
| • *Use technology to find P-values and use them with a t-test to test a mean* $\mu$ *when* $\sigma$ *is not known* | |
| • *Use the z-test to test a population proportion p* | |
| • *Find critical values for a chi-square test* | |
| • *Use the chi-square test to test a variance* $\alpha^2$ *or a standard deviation* $\sigma$ | |

| Hypothesis Testing with Two Samples | |
|---|---|
| | |
| • *Determine whether two samples are independent or dependent* | |
| • *Perform a two-sample z-test for the difference between two means* $\mu_1$ *and* $\mu_2$ *using independent samples with* $\sigma_1$ *and* $\sigma_2$ *known* | |
| • *Perform a t-test to test the mean of the differences for a population of paired data* | |
| • *Perform a two-sample z-test for the difference between two population proportions* $p_1$ *and* $p_2$ | |

| Correlation and Regression | |
|---|---|
| | |
| • *Find a correlation coefficient* | |
| • *Test a population correlation coefficient $p$ using a table* | |
| • *Perform a hypothesis test for a population correlation coefficient $p$* | |
| • *Distinguish between correlation and causation* | |
| • *Find the equation of a regression line* | |
| • *Predict y-values using a regression equation* | |
| • *Interpret the three types of variation about a regression line* | |
| • *Find and interpret the coefficient of determination* | |
| • *Find and interpret the standard error of estimate for a regression line* | |
| • *Construct and interpret a prediction interval for y* | |
| • *Use technology to find and interpret a multiple regression equation, the standard error estimate, and the coefficient of determination* | |
| • *Use a multiple regression equation to predict y-values* | |

| Chi-Square Tests and the F-Distribution | |
|---|---|
| | |
| • *Use the chi-square distribution to test whether a frequency distribution fits an expected distribution* | |
| • *Use a contingency table to find expected frequencies* | |
| • *Use a chi-square distribution to test whether two variables are independent* | |
| • *Interpret the F-distribution and use and F-table to find critical values* | |
| • *Perform a two-sample F-test to compare two variances* | |
| • *Use one-way analysis of variance to test claims involving three or more means* | |

# Appendices