DoDEA Mathematics Standards
Pre-Kindergarten through Grade 8

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Mathematics Content Strands

M1 Numbers and Operations

Number pervades all areas of mathematics. The other four Content Standards as well as all five Process Standards are grounded in understanding number. Central to this standard is the development of number sense, which allows students to naturally combine or decompose numbers, solve problems using the relationships among operations and knowledge of the base-ten system, and make a reasonable estimate for the answer to a problem.

Computational fluency – having and using efficient and accurate methods for computing – is essential. Students should be able to perform computations in different ways, including mental calculations, estimation, and paper-and-pencil calculations using mathematically sound algorithms. All students should use calculators at appropriate times, setting the calculator aside when the instructional focus is on developing computational algorithms.

Pre-Kindergarten through Grade 12 instructional programs should enable all students to:

- understand numbers, ways of representing numbers, relationships among numbers and number systems;
- understand meanings of operations and how they relate to one another;
- understand how to compute fluently and make reasonable estimates.

M2 Algebra

The ideas of algebra are a major component of the school mathematics curriculum and help to unify it. Mathematical investigations and discussions of arithmetic and its properties frequently include aspects of algebraic reasoning. Such experiences present rich contexts and opportunities for enhancing mathematical understanding and are an important precursor to the more formalized study of algebra in the middle and secondary grades. A strong foundation in algebra should be in place by the end of the eighth grade, and all high school students should pursue ambitious goals in algebra.

Pre-Kindergarten through Grade 12 instructional programs should enable all students to:

- understand patterns, relations, and functions;
- represent and analyze mathematical situations and structures using algebraic symbols;
- use mathematical models to represent and understand quantitative relationships;
- analyze change in various contexts.

M3 Geometry

Geometry and spatial sense are fundamental components of mathematics learning. They offer ways to interpret and reflect on our physical environment and can serve as tools for the study of other topics in mathematics and science. Geometry is a natural area of mathematics for the development of students' reasoning and justification skills that build across the grades.
Geometry should be learned using concrete models, drawings, and dynamic software. As the study of the relationships among shapes and their properties becomes more abstract, students should come to understand the role of definitions and theorems and be able to construct their own proofs.

Pre-Kindergarten through Grade 12 instructional programs should enable all students to:

- analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships;
- specify locations and describe spatial relationships using coordinate geometry and other representational systems;
- apply transformations and use symmetry to analyze mathematical situations;
- use visualization, spatial reasoning, and geometric modeling to solve problems.

M4 Measurement

The study of measurement is crucial in the K-12 mathematics curriculum because of its practicality and pervasiveness in many aspects of everyday life. Measurement is possibly the area of mathematics that is most important when considering everyday applications of mathematics, and highlights connections between mathematics and areas outside of the school curriculum such as social studies, science, art, and physical education. The study of measurement helps students establish connections within mathematics and provides an opportunity for learning about and unifying ideas concerning number and operations, algebra, geometry, statistics, probability, and data analysis.

Pre-Kindergarten through Grade 12 instructional programs should enable all students to:

- understand measurable attributes of objects and the units, systems, and processes of measurement;
- apply appropriate techniques, tools, and formulas to determine measurements.

Data Analysis and Probability

To analyze data and reason statistically are essential to be an informed citizen, employee, and consumer. The amount of statistical information available to help make decisions in business, politics, research, and everyday life is staggering. Through experiences with the collection and analysis of data, students can learn to make sense of and interpret information and allow them to make appropriate arguments and recognize inappropriate arguments as well.

Pre-Kindergarten through Grade 12 instructional programs should enable all students to:

- formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them;
- select and use appropriate statistical methods to analyze data;
- develop and evaluate inferences and predictions that are based on data;
- understand and apply basic concepts of probability.

Mathematics Process Standards

The DoDEA PK-12 mathematics program includes the process standards: problem solving, reasoning and proof, communication, connections, and representation. Instruction in mathematics must focus on process standards in conjunction with all PK-12 content standards throughout the grade levels.

Problem Solving	Reasoning and Proof	Communication	Connections	Representation
Instructional programs from Pre-Kindergarten through Grade 12 should enable all students to:	**Instructional programs from Pre-Kindergarten through Grade 12 should enable all students to:**	**Instructional programs from Pre-Kindergarten through Grade 12 should enable all students to:**	**Instructional programs from Pre-Kindergarten through Grade 12 should enable all students to:**	**Instructional programs from Pre-Kindergarten through Grade 12 should enable all students to:**
• build new mathematical knowledge through problem solving; • solve problems that arise in mathematics and in other contexts; • apply and adapt a variety of appropriate strategies to solve problems; • monitor and reflect on the process of mathematical problem solving.	• recognize reasoning and proof as fundamental aspects of mathematics; • make and investigate mathematical conjectures; • develop and evaluate mathematical arguments and proofs; • select and use various types of reasoning and methods of proof.	• organize and consolidate their mathematical thinking through communication; • communicate their mathematical thinking coherently and clearly to peers, teachers, and others; • analyze and evaluate the mathematical thinking and strategies of others; • use the language of mathematics to express mathematical ideas precisely.	• recognize and use connections among mathematical ideas; • understand how mathematical ideas interconnect and build on one another to produce a coherent whole; • recognize and apply mathematics in contexts outside of mathematics.	• create and use representations to organize, record, and communicate mathematical ideas; • select, apply, and translate among mathematical representations to solve problems; • use representations to model and interpret physical, social, and mathematical phenomena.

Strand: **M1** **Numbers and Operations**

Standards: In Pre-Kindergarten, all students should:

PK.M.1a: recognize written numbers 0 to 10 and differentiate them from other symbols;

Example: Identify numbers in environmental print, e.g., road signs.

PK.M.1b: count in a sequence forward from one to ten;

Example: Take pencils from a box and count as you remove each pencil.

PK.M.1c: identify and name numerals from 0 to 10;

Example: Identify numbers using number cards, e.g., sandpaper, pudding, etc.

PK.M.1d: use one-to-one correspondence to construct sets with more, fewer, or the same number of objects than a given set;

Example: Construct sets of the same, more, or fewer items, e.g., use raisins, banana chips, and dried fruit to make trail mix.

PK.M.1e: compare the number of items in two sets using comparative language, i.e., more, fewer, same number;

Example: Compare and identify the number of blocks in each set with comparative language.

Strand: **M2** **Algebra**

Standards: In Pre-Kindergarten, all students should:

PK.M.2a: sort, classify, and order objects by one attribute;

Example: Sort buttons into groups by size, number of holes, color, etc.

PK.M.2b: identify, copy, extend, and create simple patterns or patterns of sounds, shapes, and motions;

Example: Identify and copy patterns generated by the teacher, i.e., clap – clap – point. Student creates his/her own sound patterns.

PK.M.2c: identify and describe simple patterns in sets of objects;

Example: Using snap cubes create a tower that has a color pattern and describe the pattern you used.

PK.M.2d: identify a change in common objects, sounds, or movements;

Example: Start with blocks of four different colors. Students close their eyes, and one is removed. Ask students to identify change.

Strand: **M3** **Geometry**

Standards: In Pre-Kindergarten, all students should:

PK.M3a: identify, describe using their own words, and create two-dimensional shapes, e.g. triangle, rectangle, circle;

Example: While playing "I Spy" determine the shape of an object.

PK.M.3b: identify and describe using their own words attributes of three-dimensional objects, e.g. cube, sphere;

Example: Describe attributes of a baseball and a box.

PK.M.3c: describe and demonstrate location and physical proximity, i.e., above, behind, beside etc.

Example: Choose three children and describe their positions relative to each other.

Strand: **M4** **Measurement**

Standards: In Pre-Kindergarten, all students should:

PK.M.4a: describe everyday events in sequential order;

Example: Describe the routine for going to lunch, i.e., lining up, walking down hall, going through the lunch line, sitting, eating, etc.

PK.M.4b: identify the passage of time;

Example: Describe the sequence of events in the school day.

PK.M.4c: identify measurable attributes, e.g., length, capacity, weight, temperature;

Example: Using 12-inch string, children find items in the room that are the same size, longer, shorter.

PK.M.4d: use nonstandard measurements to measure attributes of length, height and weight;

Example: Each child uses his/her hand to measure the height of a chair.

PK.M.4e: order a like set of objects according to a measurable attribute, e.g., length, thickness.

Example: Place five books in order from lightest to heaviest.

Strand: **M5** **Data Analysis and Probability**

Standards: In Pre-Kindergarten, all students should:

PK.M.5a: sort, organize, and interpret data by similarities and differences.

Example: Make a class graph about eye color and discuss results.

Strand: **M1** **Numbers and Operations**

Standards: In Kindergarten, all students should:

K.M.1a: identify, write, and name numbers up to 20;

Example: Using dice, child identifies number rolled.

K.M.1b: using one-to-one correspondence, count the number of objects in sets up to 20;

Example: Count a group of 12 Unifix cubes. Identify that 12 is the number for the set.

K.M.1c: position and identify the order of objects using ordinal numbers up to 10;

Example: Line up 6 children. Identify the ordinal position of each child.

K.M.1d: use objects and drawings to model, represent, and solve related addition and subtraction problems;

Example: While a story is read, use manipulatives to model the story. For example, There are 7 apples on tree. I pick one and eat it. How many apples left on the tree?

K.M.1e: estimate the number of objects in groups up to 20 and verify the results;
Example: Have each child estimate the number of seeds in a slice of watermelon by inspection. Remove and count the seeds and compare the estimate to the count.

Strand: **M2** **Algebra**

Standards: In Kindergarten, all students should:

K.M.2a: describe in their own words how objects are alike and different using one or two attributes;

Example: Describe as many attributes as you can for an object in the classroom. Choose one of the attributes and find other objects in the room that have that attribute.

K.M.2b: identify, sort, and classify a set of objects by color, shape, size, number, and other attributes;

Example: Find the squares in a collection of shapes. Sort these squares. Explain each grouping.

K.M.2c: identify, reproduce, describe, extend, and create color, rhythmic, shape, number, and letter repeating patterns with simple attributes, e.g., ABABAB, ABCABCABC;

Example: Predict and identify word patterns in familiar stories and rhymes, e.g., Bill Martin's *Brown Bear, Brown Bear, What Do You See?*.

K.M.2d: model a problem situation using actual objects;

Example: Ask, "How many cubes can you grab with two hands? Now reach into the bag and grab as many as you can." Record the number of cubes.

Strand: **M3** **Geometry**

Standards: In Kindergarten, all students should:

K.M.3a: name, describe, sort, compare, and draw two-dimensional shapes;

Example: Ask children to find two-dimensional shapes in their environment, e.g., go on a "shape walk" indoors or outside to find examples.

K.M.3b: identify and compare three-dimensional objects;

Example: Have children bring in examples of three-dimensional objects from home.

K.M.3c: describe and demonstrate positions of objects and compare their relative locations and distances;
Example: Have children identify the positions of two objects, e.g., over, behind, on top; and relative distance between the objects, e.g., near, far, beside.

Strand: **M4** **Measurement**

Standards: In Kindergarten, all students should:

K.M.4a: compare and order objects according to length, capacity, weight, and temperature by using descriptors, e.g., longer, taller, and heavier;

Example: Hold two books side by side and see which is shorter. Hold one in each hand to see which is heavier.

K.M.4b: order events based on time, e.g., days of the week;

Example: Today is Monday. What do we do on Monday?

K.M.4c: identify different ways to measure attributes of objects;

Example: Describe two ways a pair of rectangles are different using non-standard measurement.

K.M.4d: use non-standard measurement tools to estimate and verify results;

Example: Estimate the number of pencils that will fit across the length of the desk, using the pencil to verify results.

Strand: **M5** **Data Analysis and Probability**

Standards: In Kindergarten, all students should:

K.M.5a: gather, sort, and interpret data in response to questions posed, e.g., class surveys or teacher/student questions;

Example: Determine how many students have a pet and which category of pet is the most common.

K.M.5b: organize and represent data using concrete objects, pictures, and graphs;

Example: Use connecting cubes to represent the relationship between the number of girls and number of boys in the class.

K.M.5c: ask and answer questions and make predictions based on data collected;

Example: Record the lunch count for each day of the week. Compare the results and make predictions for Monday's lunch count.

Strand: **M1** **Numbers and Operations**

Standards: In Grade 1, all students should:

1.M.1a: count and group objects into ones and tens up to 100;

Example: Separate a group of 27 blocks into two groups of ten blocks and 7 single blocks.

1.M.1b: position and identify the order of objects using ordinal numbers up to 10;

Example: Line up 6 children. Identify the ordinal position of each child.

1.M.1c: identify the number of tens and ones in numbers less than 100;

Example: How many tens and how many ones are in 58? Describe how you know.

1.M.1d: identify and generate equivalent forms of the same number using concrete objects and number statements;

Example: Fill in the blank: _____ tens and 5 ones = 155.

1.M.1e: express the concepts of one-digit whole number addition and subtraction using objects, drawings, number sentences, and verbal explanations;

Example: Draw a picture that represents the following story: I had 8 pennies but lost 3 of them.

1.M.1f: explain and use the inverse relationship between addition and subtraction to solve problems and check solutions;

Example: How can you determine how many pennies you started with if you lost 3 and now have 5?

1.**M.1g:** select, explain, and use addition and subtraction strategies to solve real-world problems;

Example: Jill posted 6 of her pictures on the refrigerator. If she posts 3 more, how many pictures will there be on the refrigerator?

1.M.1.h: describe using their own words an estimate of the number of objects in groups up to 100 and verify the results;

Example: I can hold 6 teddy bear counters in my hand. How many will fit in the jar?

1.M.1i: recognize wholes and parts of wholes, i.e., ½, $^{1}/_{3}$, and, ¼.

Example: Draw a rectangle and separate it into 4 equal parts and shade ¼.

Strand: **M2** **Algebra**

Standards: In Grade 1, all students should:

1.M.2a: sort, classify, and order objects by two or more attributes and explain how objects were sorted;

Example: Sort a box of pencils into two groups and explain your groupings.

1.M.2b: identify, describe, extend, and create repeating patterns and number sequences;

Example: A number pattern begins with 1, 3, 5. Tell what the next number will be and explain how you decided on that number.

1.M.2c: solve open sentences using the commutative property of addition;

Example: Fill in the blank: 5 + ____ = 3 + 5.

1.M.2d: write equations using mathematical symbols;

Example: Joe bounces the ball 7 times and stops. He bounces it 3 more times. Write a number sentence that will show how many times Joe bounced the ball.

1.M.2e: model and describe problem situations using representations, such as words, objects, number phrases, or sentences;

Example: Three geese land in a pond. Four more geese join them. Five geese fly away. Use your counters to show how many geese are left in the pond.

1.M.2f: model equivalency between sets using concrete materials;

Example: Using your connecting cubes show that 15 single cubes is the same as 10 connected cubes and 5 single cubes.

Strand: **M3** **Geometry**

Standard: In Grade 1, all students should:

1.M.3a: identify triangles, rectangles, squares, and circles as the faces of three-dimensional objects;

Example: Look at a collection of solid objects and find the triangles.

1.M.3b: create new shapes by combining, cutting, or taking apart existing shapes;

Example: Use tangram pieces to construct triangles.

1.M.3c: give and follow directions to find a place or object;

Example: Show someone how to get to the school cafeteria by making a map or diagram.

1.M.3d: identify and determine whether two-dimensional shapes are congruent, i.e., same shape and size; or similar, i.e., same shape and proportional size;

Example: Use pattern blocks to make a design. Using different pattern blocks, make a congruent shape.

1.M3e: identify symmetry in objects and figures;

Example: Find examples of symmetry in the classroom.

1.M3f: identify geometric shapes and structures in the environment;

Example: Find as many rectangles as you can on the playground.

Strand: **M4** **Measurement**

Standards: In Grade 1, all students should:

1.M.4a: identify common instruments used for measurement, i.e., rulers, scales, measuring cups;

Example: Which is the best tool for measuring the length of your desk? Why do you think so?

1.M.4b: measure and differentiate objects using both comparative terms and standard units of measure, e.g., inches, centimeters;

Example: Compare two pieces of string, and determine which is shorter. Use a ruler to measure the length of each. Does the measure match your findings? Explain why.

1.M.4c: estimate and measure a variety of attributes of objects using standard and nonstandard units;

Example: Estimate and measure attributes of a textbook, e.g., length, width, height, weight.

1.M.4d: identify repeating patterns of time, e.g., days of the week, months of the year;

Example: Describe how the seasons represent a repeating pattern.

1.M.4e: tell time to the hour and half hour using digital and analog timepieces;

Example: If the minute hand is on the 6 and the hour hand is on the 9 what time is it?

1.M.4f: order a sequence of events that occur over time;

Example: Order the days of the week. List season-specific events that occur throughout the year.

	1.M4g:	make estimates about the passage of time in events, e.g., tasks being completed, living things growing, etc. **Example:** How long does it take to eat lunch?
Strand: **Standards:**	**M5**	**Data Analysis and Probability** In Grade 1, all students should:
	1.M.5a:	use interviews and observations to gather data about themselves and their surroundings; **Example:** Collect data on how many people are in their families.
	1.M.5b:	collect, organize, represent, and interpret data using concrete objects, pictures, tallies, and graphs; **Example:** Collect data on how many people are in their families. Make a class graph, and compare and contrast findings.
	1.M.5c:	compare and contrast similar data sets; **Example**: Compare family graph findings with similar data from other classes.
	1.M.5d:	construct questions and make predictions that can be answered by using information from a graph or table. **Example**: Students ask questions and make predictions based on data from family graphs.

Strand: **M1** **Numbers and Operations**

Standards: In Grade 2, all students should:

2.M.1a: use place value to represent whole numbers through 1000 using numerals, words, and physical models;

Example: Show 78 as a number, with words, and by drawing a picture.

2.M.1b: identify numbers as even or odd numbers and determine whether a set of objects has an odd or even number of elements;

Example: Identify odd and even numbers on the calendar.

2.M.1c: show equivalent representations for whole numbers by using addition and subtraction facts;

Example: Find three ways to represent 8 as a difference.

2.M.1d: explain and demonstrate addition and subtraction for two-digit numbers without regrouping, e.g., doubling, making jumps of ten, partial sums or differences, counting up or back;

Example: Explain different ways to find the sum of 23 and 11.

2.M.1e: explain and demonstrate addition and subtraction for two-digit numbers with regrouping, e.g., doubling, making jumps of ten, partial sums or differences, counting up or back;

Example: Explain different ways to find the sum of 52 and 29.

2.M.1f: estimate and verify answers in addition and subtraction problems with two-digit numbers;

Example: Estimate which sum is larger. Explain your answer.

28 + 41 or 37 + 37

2.M.1g: solve multi-step problems involving addition and subtraction;

Example: Determine the largest number that can be subtracted from 58 and still have more than 35 left.

2.M.1h: count by twos, fives, and tens to 100;

Example: Count 54 pencils by groups of tens and twos.

2.M.1i: model and demonstrate multiplication and division problems;

Example: Demonstrate two ways to represent 4 x 3.

2.M.1j: use words, numerals, and physical models to represent fractions and their relationship to the whole;

Example: What is another way of representing three thirds? Explain your answer.

Strand: **M2** **Algebra**

Standards: In Grade 2, all students should:

2.M.2a: create and describe patterns with multiple attributes;

Example: Create a geometric pattern in which at least two attributes change.

2.M.2b: identify and extend a linear pattern by its rules;

Example: A dog has four legs. Two dogs have eight legs and so on. Continue the pattern to determine how many legs five dogs have.

2.M.2c: use symbols to represent unknown quantities and identify values for symbols;

Example: What is the value of this symbol, ♥, if ♥ - 54 is 33.

2.M.2d: represent equivalence and extend the concept to situations involving symbols;

Example: Find two numbers that can replace the symbols to make an equivalence statement of the following: ▲ + ■ = 100.

2.M.2e: solve open sentences by representing an expression in more than one way using the associative property of addition;

Example: Find two ways to add 5, 17, and 13 in this order.

2.M.2f: model and describe a problem situation using symbols and operations;

Example: Write an open sentence using symbols to model the following: Determine the number of girls in a class, if 15 in the class of the 26 students are boys.

2.M.2g: describe qualitative changes;

Example: Describe what happens to the taste of a fruit punch if more water is added.

2.M.2h: describe quantitative changes, especially those involving addition and subtraction;

Example: Describe how two teams can be made to have equal representations of boys and girls if one team has 5 boys and 7 girls while the other team has 7 boys and 5 girls.

Strand: **M3** **Geometry**

Standards: In Grade 2, all students should:

2.M.3a: predict the results of putting together and taking apart two-dimensional shapes;

Example: Use objects or drawings to find other shapes that can be made from a rectangle.

2.M.3b: find and name locations using simple relationships and in coordinate systems, e.g., grids, maps;

Example: If your house is located on a grid at A5 and the playground is located at C3, what directions could you give to get from your house to the playground?

2.M.3c: identify shapes that have been rotated (turned), reflected (flipped), and translated (slide). Describe direction of translations, e.g., left, right, down, up;

Example: Describe the attributes of a square. Rotate the square one quarter turn. Describe the attributes of the square now. Compare the two shapes.

2.M.3d: identify and create shapes with symmetry;

Example: Draw a triangle that has symmetry and then draw one that does not have symmetry. Describe differences between the two shapes.

Strand: **M4** **Measurement**

Standards: In Grade 2, all students should:

2.M.4a: tell time in five-minute intervals;

Example: Using a demonstration clock, tell me when your favorite television program begins and ends.

2.M.4b: describe and compare relationships of time, e.g., minutes in an hour, hours in a day, days in a week, months in a year;

Example: How many months in a year?

2.M.4c: decide which unit of measure is appropriate in a given situation;

Example: Would you use yards or inches to measure the length of your classroom? Explain your answer.

2.M.4d: make and use estimates of measurement, including time volume, weight, and area. Verify results;

Example: How many linker cubes would you need to put on one side of a balance scale to balance with ten pencils? Explain the results of your estimation and weighing.

2.M.4e: use repetition of a single unit to measure something larger than the unit;

Example: How many 1 gram units would you have to place on a pan scale to balance a stapler placed on the other side?

Strand: **M5** **Data Analysis and Probability**

Standards: In Grade 2, all students should:

2.M.5a: develop categories for sorting a collection of materials;

Example: How many different ways can you sort a collection of buttons?

2.M.5b: collect, organize, represent, and interpret data using pictographs, bar graphs, and tables;

Example: Make a table showing one of the ways you sorted your button collection. Select and make the best type of graph to represent your data.

2.M.5c: generate questions, collect and organize data to address the questions, and draw conclusions;

Example: Demonstrate a different way to organize your button collection. Explain the differences in data organization.

2.M.5d: read and interpret graphs and tables to identify main ideas, draw conclusions, and make predictions;

Example: If the following table shows the temperatures throughout the day, what temperature would you estimate for 6 p.m. and why?

10 a.m.	Noon	2:00 p.m.	4:00 p.m.	6:00 p.m.
65 degrees	72 degrees	76 degrees	74 degrees	? degrees

2.M.5e: describe events that are more likely, least likely, or equally likely to happen;

Example: Are you more likely to spin an odd or an even number on a spinner that has 6 equal sections with number 1, 2, 3, 4, 5, 6?

2.M.5f: use physical models and pictures to represent possible arrangements of two or three objects;

Example: Make pictures to show the possible types of two-topping pizzas that could be created from a list of 5 toppings.

2.M.5g: identify events that can have more than one outcome, e.g., predicting weather, tossing coins;

Example: What are the possible outcomes from rolling two dice?

Strand: **M1** **Numbers and Operations**

Standards: In Grade 3, all students should:

3.M.1a: read, write, and interpret the place value for each digit in whole numbers up to 10,000;

Example: Write 463 for the number stated verbally or written as "four hundred sixty-three." Explain that the 6 in 4<u>6</u>3 represents 6 tens or 60.

3.M.1b: read, write, and interpret the place value for each digit in decimal numbers between 0 and 1 through hundredths;

Example: Write .23 for the number stated verbally or written as "twenty-three hundredths." Explain that the 3 in .2<u>3</u> represents 3 hundredths.

3.M.1c: identify and generate equivalent forms of common fractions less than one whole, e.g., halves, thirds, quarters, fifths, and tenths; and explain their relationship to a whole;

Example: Draw pictures to show that 3/5, 6/10, and 9/15 are equivalent fractions.

3.M.1d: identify odd and even numbers up to 10,000, identify factors or multiples of a given number, and describe their characteristics;

Example: Find the even numbers: 37, 108, 253, 540, 739

3.M.1e: compare whole numbers, up to 10,000, using mathematical symbols (>, <, =) and words (greater than, less than, equal to) and arrange them in numerical order;

Example: What is the smallest whole number you can make using the digits 3, 9, 1? Use each digit exactly once.

3.M.1f: explain the relationship between multiplication and division as inverse operations;

Example: Use the inverse relationship of $3 \times 2 = 6$ to find other related facts:
Find __ × 3 = __, __ ÷ 3 = __, and __ ÷ __ = 3.

3.M.1g: explain and solve problems involving the sum or difference of two whole numbers up to 10,000;

Example: Subtract 236 from 632. Explain your method.

3.M.1h: explain and solve problems involving the multiplication of two whole numbers where factors are 99 or less;

Example: Multiply 36 times 52. Explain your method.

3.M.1i: demonstrate and explain multiplication and division through the use of representations and mathematical symbols where factors are 99 or less;

Example: Karen shared 10 cookies among 3 friends. Draw a picture to show how many cookies each friend receives. Karen eats 1 cookie for herself.

3.M.1j: develop and use strategies to estimate the results of whole number addition and subtraction and verify;

Example: Joan says that 72 – 29 = 57. Using estimation, explain why you think Joan's answer is right or wrong.

3.M.1k: solve multi-step problems for using mathematical tools and strategies involving addition, subtraction, and multiplication;

Example: You have $5.00. Can you buy two books that cost $2.15 each? What is the highest price of book for which three can be purchased? Explain your answer.

Strand: **M2** **Algebra**

Standards: In Grade 3, all students should:

3.M.2a: identify, describe using their own words, and extend the rules of repeating, number, and growing patterns;

Example: What is the next number: 4, 8, 16, 32, … ? Explain how you found your answer. What is the 8^{th} number in this pattern or sequence? Explain your answer.

3.M.2b: make predictions, identify relationships, and solve problems by using a relationship between two quantities;

Example: A small cup of ice cream costs 40 cents. Find the costs of 2, 3, 4, … cups of ice cream. What is the pattern? Continue the pattern to find the cost of ice cream 15 students.

3.M.2c: demonstrate mathematical relationships of quantity in the form of numeric expressions, equations, or inequalities with mathematical symbols;

Example: Joe's mom gave him money to buy four drinks that cost 65 cents each. He gave 40 cents change to his mom. Write an equation to find the amount of money Joe's mom originally gave him.

3.M.2d: solve open sentences by representing an expression in more than one way using the commutative and associative properties of multiplication;

Example: Multiply 8, 3, 6 in this order. Now multiply them in the order of 6, 3, 8. Which is easier and why?

3.M.2e: organize and order data in tables to discover patterns and make predictions;

Example: Keenan just started a jogging program. He jogs 4 miles the first week, 8 miles the second week, and 12 miles the third week. If he continues in the same pattern for two more weeks, how many miles will he jog the fifth week?

3.M.2f: identify and describe the difference between qualitative and quantitative changes;

Example: A survey asking 3rd graders' favorite ice cream flavors includes chocolate, vanilla, cookies and cream, and strawberry. Will the data collected in the survey be qualitative or quantitative? Explain your answer.

Strand: **M3** **Geometry**

Standard: In Grade 3, all students should:

3.M.3a: identify and compare two-dimensional shapes and three-dimensional objects using attributes and properties, e.g., sides and angles in two-dimensional shapes, faces and edges in three-dimensional objects;

Example: Draw a triangle on your paper. Describe using mathematical attributes and properties of two-dimensional shapes how you know it is a triangle.

3.M.3b: identify and describe the relative size of angles using right angles as a reference;

Example: In a collection of 3 different triangles, describe the size of angles of each triangle as *greater than, less than*, or *equal to* right angles.

3.M.3c: use coordinate systems to specify locations and describe paths;

Example: How do you use a coordinate grid to find a specific location on a map?

3.M.3d: verify if two-dimensional shapes have symmetry by drawing vertical, horizontal, and diagonal drawing lines;

Example: Write the capital letters of the alphabet and draw all the lines of symmetry that you see. Describe in your own words how you know these are lines of symmetry.

3.M.3e: build, draw, and analyze two-dimensional shapes;

Example: Create a parallelogram from triangle pattern blocks.

Strand: **M4** **Measurement**

Standards: In Grade 3, all students should:

3.M.4a: describe the relationship of units within the customary and metric measurement systems;

Example: How many minutes are in 2 hours?

3.M.4b: use accurate vocabulary to describe measurements of length, volume, and weight;

Example: Measure a table and record your answer using the correct label of measurement.

3.M.4c: select units, strategies, and tools to estimate and calculate perimeter and area of two-dimensional shapes;

Example: Find the perimeter of the top of your school desk. Describe your strategy for finding your answer.

3.M.4d: use measurement tools and techniques to construct a figure;

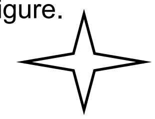
Example: Construct a cube. Describe the tools and methods you used.

3.M.4e: select standard units and tools to compare the attributes of two-dimensional shapes and three-dimensional objects;

Example: Compare a triangle and a pyramid.

3.M.4f: select units and develop strategies for estimating the perimeter of irregular two-dimensional shapes;

Example: Estimate the perimeter of this figure.



3.M.4g: measure temperature in Celsius and Fahrenheit;

Example: What is the temperature in the room?

3.M.4h: tell time to the nearest minute and find how much time has elapsed;

Example: You begin recess at 11:20 and finish recess at 11:43. How long is your recess?

Strand: **M5**
Standard:

Data Analysis and Probability

In Grade 3, all students should:

3.M.5a: develop and implement a plan to collect and organize data to address a given question;

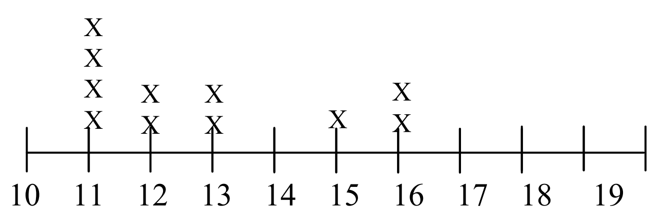
Example: Choose a question and develop a plan to collect data and analyze the results.

3.M.5b: translate information from one data representation to a graph or table, e.g., frequency table, bar graph, picture graph, line plot;

Example: Convert a tally chart into a bar graph.

3.M.5c: Analyze and interpret information by writing at least one statement to support a conclusion or prediction with evidence from data;

Example: Summarize the data from the following graph which represent third grade student times in seconds for a race.



3.M.5d:	organize and graphically display data using categories and intervals; **Example:** Using the rainfall data for the month, create a graphic display.
3.M.5e:	describe characteristics of graphically represented data, e.g., median, mode, range; **Example:** Using your rainfall graph, describe data characteristics you notice.
3.M.5f:	examine graphs and tables that display the same set of data to identify what each representation contributes to the interpretation of data and conclusions drawn; **Example:** Display the rainfall data in two additional ways and draw conclusions about the data.
3.M.5g:	represent the possible outcomes for a simple probability situation; **Example:** What is the probability of drawing a red marble from a bag containing four red marbles and three green marbles?

Strand: **M1** **Numbers and Operations**

Standards: In Grade 4, all students should:

4.M.1a: identify verbally and in writing the place value for each digit in whole numbers up to 1,000,000 and decimals between 0 and 1, up to thousandths;

Example: Write 463,022 for the number stated verbally or written as “four hundred sixty-three thousand twenty-two.” Explain that the 3 in 463,022 represents 3 thousand or 3,000.

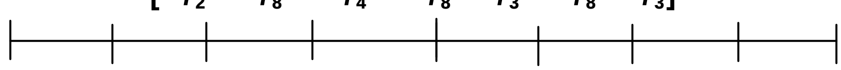
4.M.1b: identify and generate equivalent representations for the same number by decomposing and composing the whole number up to 1,000,000;

Example: Using expanded form, write an equivalent representation for 263,754.

4.M.1c: judge the size of fractions by using benchmarks, e.g., 0, ½, 1; and use the terms *greater than, less than*, or *equal to* or appropriate mathematical symbols >, <, or = to compare a fraction to the benchmark;

Example: Mrs. Johnson has a number line from 0 to 1 that hangs across the blackboard. At lunch time, someone came into class and took all the fractions off the number line! Help Ms. Johnson by putting the fractions back on the number line.

[$^1/_2$ $^3/_8$ $^1/_4$ $^7/_8$ $^3/_3$ $^5/_8$ $^0/_3$]



4.M.1d: identify and describe using their own words whole numbers according to their characteristics including primes, composites, and perfect squares;

Example: Between 4 and 14 find a number that is a square number; a prime number; a composite number.

4.M.1e: use models and symbols to recognize and generate equivalent forms of fractions, mixed numbers, and decimals;

Example: Using variety of models, show the relationship between the fraction ¼ and its decimal equivalent 0.25.

4.M.1f: use models to represent division problems as the inverse of multiplication, as partitioning, or as successive subtraction and describe the meaning of remainders;

Example: Fifteen pieces of candy are to be shared between 4 friends. Draw a picture to model this problem. What is the meaning of the remainder?

4.M.1g: use models and equivalence to add and subtract fractions with like denominators of 12 or less;

Example: Use fraction pieces to model $^{2}/_{3} – ^{1}/_{6}$.

4.M.1h: use models to add and subtract decimals through thousandths;

Example: Use coins to help you find $0.72 - $0.67.

4.M.1i: divide two-digit whole numbers by one-digit divisors;

Example: Divide 24 crackers equally among 6 children. Divide 24 crackers equally to find out how many children receive 6 cookies.

4.M.1j: use the inverse relationships of addition and subtraction, and multiplication and division to solve problems and verify solutions;

Example: Bill added 14 baseball cards to his collection. If he now has 132 cards, how many cards were in the original collection?

4.M.1k: use estimation to make predictions and check the reasonableness of result;

Example: You buy 2 CDs for $14.95 each. The cashier tells you that will be $49.90. Does that surprise you? Why or why not?

4.M.1l: identify, compare, and order the relative position of fractions and decimals on a number line;

Example: Draw a number line and label it with 0 and 5. Find the position of ½, 3/10, 6/5, 2.70, and 0.60 and label these numbers on the number line.

4.M.1m: demonstrate mastery in sums to 20 and related subtraction facts and multiplication through 12X12 and related division facts;

Example: multiply 9 times 8 without pencil and paper.

Strand: **M2** **Algebra**

Standards: In Grade 4, all students should:

4.M.2a: use models and words to describe, extend, and generalize repeating, number, and growing patterns and relationships;

Example: To make brownies you need 1 tablespoon of water for every 3 tablespoons of flour. Explain how you can find the number of tablespoons of water needed if you have 27 tablespoons of flour.

4.M.2b: represent and analyze repeating, number, and growing patterns using words, tables, and graphs;

Example: In a school food drive a local grocery store will donate 1 can for every 2 cans purchased. Create a table to show the first 5 donated cans and write an expression that generalizes for any number donated.

4.M.2c: represent and describe mathematical relationships using algebraic expressions, equations, or inequalities with mathematical symbols;

Example: A falcon flies 3 times as fast as a hummingbird. Write an equation that represents this relationship.

4.M.2d: apply order of operations and the commutative and associative properties of addition and multiplication to numeric expressions;

Example: Solve the number sentence 8 X 6 – 4 ÷ 2 = ?

4.M.2e: use and interpret variables, mathematical symbols, and properties of addition and multiplication (e.g., commutative, associative, and the distributive property) to write and simplify mathematical expressions and sentences;

Example: A cab charges $2.00 plus $0.75 per mile. Write an expression to represent these charges.

4.M.2f: write and solve algebraic equations or inequalities using variables that represent problem situations;

Example: The Arbor Club gives 7 small trees to every new member. How many trees are needed for 13 new members? Write and solve an equation that represents this problem.

4.M.2g: identify and describe patterns of change to make predictions that identify the relationship represented in a table or graph.

Example: Liz has recorded the number of laps she swam this week. Describe the pattern and predict how many laps she would swim for the rest of the week.

Day	MON	TUE	WED	THUR	FRI
Number of Laps	10	12	14		

Strand: **M3** **Geometry**

Standard: In Grade 4, all students should:

4.M.3a: identify, draw representations, and describe the relationships between and among points, lines, line segments, and rays using appropriate mathematical tools; e.g., intersecting, parallel, and perpendicular lines;

Example: Use the markings on a football field to identify two lines that are parallel. Place a rope across the parallel lines and identify any acute angles created by the rope and the parallel lines.

4.M.3b: identify and draw representations of right angles, obtuse angles, and acute angles using appropriate mathematical tools;

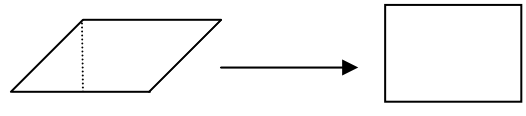
Example: Using a protractor, draw a 90^0, 125^0, and 45^0angle.

4.M.3c: identify and draw congruent figures using appropriate mathematical tools;

Example: Using a ruler and pencil, draw a rectangle that is congruent to a given rectangle.

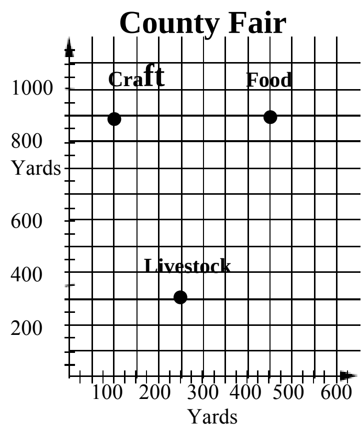
4.M.3d: describe the results of subdividing, combining, and transforming shapes;

Example: Describe how you can transform a parallelogram into a rectangle in order to determine its area.



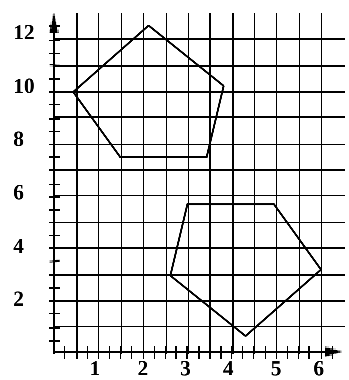
4.M.3e: find the distance between locations of points along horizontal and vertical lines of a coordinate grid;

Example: The grid below show the location of 3 areas at the County Fair. Determine the number of yards between the Crafts area and the Food area.



4.M.3f: predict and describe transformations (i.e., translation, reflection, and rotation) to show that two shapes are congruent;

Example: John wants to place one of the pentagons on top of the other to show congruence. Describe the transformations necessary to get one of the pentagons on top of the other.

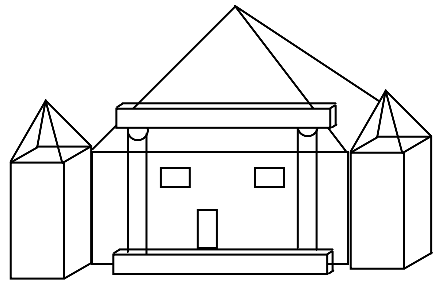


4.M.3g: identify and describe line and rotational symmetry in two-dimensional shapes and designs;

Example: What kinds of symmetries have the letters O and S?

4.M.3h: identify geometric solids which could be composed of other solids;

Example: Identify the figures used to construct the building.



Strand: **M4** **Measurement**

Standards: In Grade 4, all students should:

4.M.4a: recognize and describe that measurements are approximations;

Example: You are buying a ground cloth to cover the floor of your living room before you paint the room. How accurate should you be: to the nearest inch, foot, or yard? Explain in your own words how you know your answer is correct.

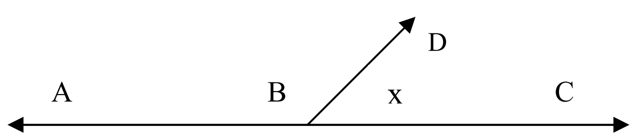
4.M.4b: measure with accuracy using both customary and metric systems of measurement;

Example: Measure the items listed below and record the measurement in both metric and customary. Be sure to record the units that you used.

	Metric
1. Height of a desk	____________________
2. Length of your foot	____________________
3. Width of the classroom	____________________
4. Length of a pencil	____________________
5. Width of the chalkboard	____________________
6. Length of your fingernail	____________________
7. __________________________ (item of your choice)	____________________

4.M.4c: recognize that the area is the measure of the space enclosed by a two-dimensional figure and that angles are figures made by two rays with the same endpoint;

Example: Name the rays that make up angle x.

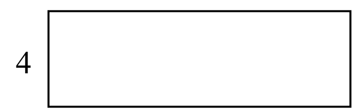


4.M.4d: determine the possible dimensions of rectangles when the area is constant;

Example: Using graph paper, draw a rectangle of area 24 units and label its dimensions (length and width). Can you draw other rectangles with the same area? If so, draw at least two other rectangles with different dimensions, and label the dimensions for each rectangle.

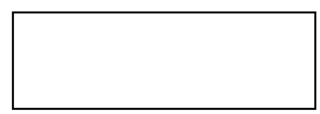
4.M.4e: estimate measurements of perimeter, area, and angle size;

Example: Given the rectangle with only one dimension, estimate the perimeter and area.



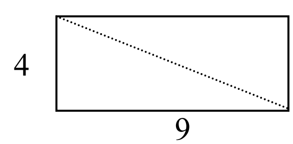
4.M.4f: use standard tools and units to include measure of perimeter and area of two-dimensional figures;

Example: Measure the sides of the rectangle and determine the perimeter and area.



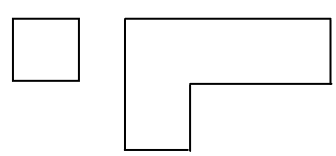
4.M.4g: describe strategies to determine the perimeter and area of right triangles;

Example: Explain one way to determine the area of the triangle.



4.M.4h: describe strategies for estimating the area of irregular shapes;

Example: If the square has sides of 4 cm, explain how you could estimate the area of the irregular figure.



4.M.4i: solve problems involving perimeter and areas of rectangles;

Example: Bob has bought a new rug for his room. The rug is 3 ft. wide and 5 ft. long. Find the area of the rug.

4.M.4j: know the process for counting coins and bills using standards monetary notations;

Example: Mario has two rabbits. He buys food for $7.67 and gives the clerk $10.00. How much change should Mario receive? How many and what kinds of bills and coins should be handed to him?

Strand: **M5** **Data Analysis and Probability**

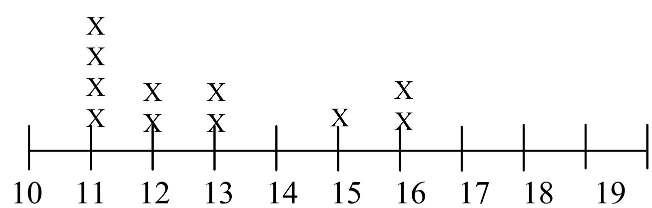
Standard: In Grade 4, all students should:

4.M.5a: describe how data collection methods affect the information that is gathered to address a question;

Example: If you were investigating the cost of airline fares, explain why you would want to examine more than one airline. How many airlines would you think appropriate?

4.M.5b: identify the median of a data set and describe what it indicates about the data set;

Example: The students in Ms. Janssen's class held a race yesterday to see who the fastest runner in the class was. Ms. Janssen kept track of everybody's time as they ran the length of the soccer field. When the race was over, the class made a graph of the results:
What is the median time and what does it indicate about the class times?



4.M.5c: use the median, mode, and range to compare and contrast the characteristics of related data sets;

Example: The students in Mr. Kleiman's class ran the same race. Their results are below. Compare the data with Ms. Janssen's class whose median time was 12 seconds and the range was 11-16 seconds. Which class was faster? Explain your reasoning.

Student	John	Meg	Derek	Jess	Carl	Buzz	Beca	Jo	Ana	Julia	Desh
Time	12 sec.	13 sec.	10 sec.	12 sec.	12 sec.	14 sec.	18 sec.	14 sec.	10 sec.	13 sec.	14 sec.

4.M.5d: select the appropriate data representation form for a diverse set of investigations and justify the choice in each case;

Example: Conduct an experiment to find the heights of individual bean plants growing for 3 weeks for each student in your class. Conduct a survey to find the favorite summer activity for each student in your class. Decide whether to use a bar, line, or pictograph to display each set of data. Explain in your own words how you selected a representation for each data set.

4.M.5e: identify the likelihood of an event occurring as impossible, equally likely, and certain. Recognize the numerical values of 0 (impossible) and 1 (certain);

Example: What is the probability of rolling an 8 on a standard die?

4.M.5f: conduct experiments to determine experimental probability of an event occurring for a given number of trials (no more than 12 trials), using models;

Example: Determine the probability of the event that when the names of 12 classmates are put in a shoebox, a name that begins with *R* will be drawn.

4.M.5g: list and count all possible combinations using one member from each of several sets;

Example: Ben wants to by some ice cream. He can choose from chocolate, vanilla, or strawberry and can have it in a cup, wafer cone, or waffle cone. List all the possible combinations from which he has to choose.

Strand: **M1** **Numbers and Operations**

Standards: In Grade 5, all students should:

5.M.1a: identify verbally and in writing the place value for each digit in decimals through millionths;

Example: Write the number 287.426271 in words.

5.M.1b: identify and represent equivalent forms of fractions with denominators of 12 or less, decimals, and percents;

Example: How can fractions and decimals which have different digits, such as 3/4 and 0.75, still have the same value?

5.M.1c: explain how decimals and percents are parts of a whole;

Example: If a 5^{th} grade class has 25 students and 15 are girls, represent the part of the class that is boys as a percentage.

5.M.1d: use models to show the ratio interpretation of a fraction as part-to-part and part-to-whole;

Example: Divide 25 muffins to represent the ratio 2:3.

5.M.1e: represent and compare numbers less than zero by extending the number line and using familiar applications (e.g., temperature), to demonstrate the usefulness of negative numbers;

Example: The temperature this morning was 18 degrees below zero and now it is 3 degrees below zero. Show on a number line how much has the temperature risen? Explain in your own words how you found your answer.

5.M.1f: identify and use the distributive property to simplify and/or perform computations;

Example: Explain how you know that 4(15 – 9) = 4 X 15 – 4 X 9.

5.M.1g: use order of operations, including the use of parentheses, to simplify numerical expressions;

Example: Simplify 5(6-2) + 4(8+2). Explain your strategy.

5.M.1h: explain why fractions need common denominators to be added or subtracted;

Example: If two medium pizzas are cut so that one has 4 equal slices and the other has 8 equal slices and you take one slice from each pizza, explain what portion of a pizza you have.

5.M.1i: use models to show an understanding of the concept of multiplication and division of fractions with denominators of 12 or less;

Example: If after a party you have ¾ of a pepperoni pizza and ½ of a cheese pizza left over, how much of a pizza would remain? Explain how you determined your answer.

5.M.1j: understand and compute positive integer powers of nonnegative integers as repeated multiplication;

Example: Sam asked the class: "What is the difference between the expression 4*3 and the expression 4^3?" How would you respond to Sam's question?

5.M.1k: divide whole numbers with two-digit divisors;

Example: Calculate 736 ÷ 23.

5.M.1l: use models and equivalent forms to add and subtract fractions with like and unlike denominators up to 12, expressing answers in simplest form;

Example: Draw a diagram to illustrate the sum ¼ + ⅝.

5.M.1m: use estimation strategies for the results of computations involving whole numbers, fractions with denominators of 12 or less, and decimals through millionths;

Example: What is an approximate value for ⅔ times 375. Explain how you arrived at your estimate.

5.M.1n: compute and perform multiplication and division of fractions with denominators of 12 or less and decimals;

Example: You have 3 ¾ pies left over from a dinner party. How many people can have ¼ of a pie each?

5.M.1o: understand and apply divisibility rules for 2, 3, 4, 5, 6, 9, and 10;

Example: The 82 members of the chorus stand in rows as they perform. Can singers stand in 3 equal rows?

Strand: **M2** **Algebra**

Standards: In Grade 5, all students should:

5.M.2a: express a general rule for a pattern by using visual representations, words, tables, graphs, or mathematical symbols;

Example: Using the table below, determine the late fee for a book that is 18 days overdue. Explain a rule that can be used to determine late fees.

Days overdue	2	4	6	…..	18
Fee	$0.30	$0.60	$0.90	…..	?

5.M.2b: explain the concept of variable (e.g., a letter standing for all numbers of a specific set, such as integers);

Example :Explain how variables are used in the formula for the area of a rectangle; A = L x W.

5.M.2c: use variables to represent unknown quantities in general rules when describing mathematical patterns and relationships;

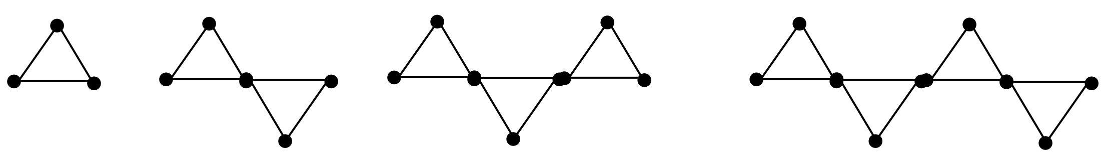
Example: If a library charges 30¢ per day for an overdue book, write an expression using variables to represent the charge for any given number of days late.

5.M.2d: apply order of operations and the commutative, associative properties for addition and multiplication and the distributive property to simplify algebraic expressions, equations, and inequalities;

Example: Simplify the expression 4X + 3(2X – 5).

5.M.2e: construct tables and graphs that accurately represent the relationship between two variables;

Example: Using the pattern below, construct a table that demonstrates the relationship between the number of triangles and the number of points needed to create the figure.



5.M.2f: identify, describe, and compare situations that represent constant or varying rates of change;

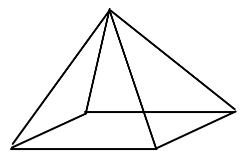
Example: Compare the two patterns below. Explain how they are the same and how are they different.
…4, 8, 12, 16, …
…4, 16, 64, 256, …

Strand: **M3** **Geometry**

Standard: In Grade 5, all students should:

5.M.3a: identify, describe and compare the properties of a three-dimensional objects (e.g., cylinder, cone, cube, square pyramid, and rectangular prism) by the number of faces, edges, or vertices;

Example: Tell how many face, edges, and vertices in the figure.



5.M.3b: identify and graph ordered pairs in the first quadrant of a coordinate system;

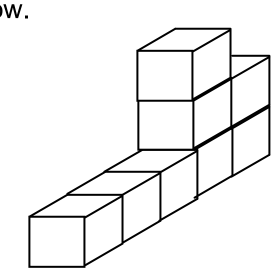
Example: Plot the points (2,1), (4,2), and (6,3). Describe what you notice about the graph of these ordered pairs.

5.M.3c: create patterns that result from drawing a combination of reflections (flips), rotations, and translations (slides) of geometric figures, including rotational symmetry;

Example: Draw a rectangle and then translate it 2 inches vertically across your paper. Draw the new rectangle in a different color.

5.M.3d: visualize and draw two-dimensional views of three-dimensional objects made from rectangular solids;

Example: Draw a picture to show the top, front, and right-hand side views of the picture below.



Strand: **M4** **Measurement**

Standards: In Grade 5, all students should:

5.M.4a: identify volume as the space inside a three-dimensional object as a measured in cubic units and use strategies to determine the surface areas and volumes of rectangular solids;

Example: Find the volume of a cereal box with length 36 cm, width 24 cm, height 9 cm.

5.M.4b: convert standard units of measurement within both customary and metric systems of measurement, e.g., inches to feet, centimeters to meters, etc.;

Example: Determine how many inches there are in 2 feet.

5.M.4c: develop and use strategies for estimating the volume of various three-dimensional objects;

Example: Jill wants to determine the volume of a box that contains Rubik's Cubes. If the cubes are 3 inches on a side and there are 3 rows of 4 cubes each on the top layer, explain how she can determine the volume.

5.M.4d: use standard measurement tools and units to measure volume;

Example: Measure the dimensions of a shoe box and determine its volume.

Strand: **M5** **Data Analysis and Probability**

Standard: In Grade 5, all students should:

5.M.5a: explain sampling techniques for gathering data;

Example: Describe how you would randomly survey shoppers in the mall to determine their preference in athletic shoe brands.

5.M.5b: select and use a graph that is appropriate for the type of data to be displayed;

Example: Conduct a survey to find the favorite magazines of the students in your class. Decide whether to use a bar, line, or picture graph to display the data. Describe how you decided which graph to use to display the results of your survey.

5.M.5c: describe the role of the mean as a balance point for the data set;

Example: Joey has an 85 average on his four mathematics tests. Describe what you know about Joey's mathematics test grades.

5.M.5d: recognize samples as subsets of larger populations;

Example: List 3 possible ways to divide your school population into distinct subsets.

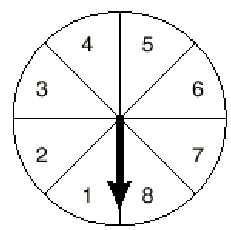
5.M.5e: use a sample to make projections for a larger population;

Example: The following information, gathered by 10 students in each class, reports the average amount of hours of watching television in a week. What projections can you make about the total school population?

Class	Ms. Jones	Mr. Smith	Mr. Bailey	Ms. Miles	Ms. Brown
Avg. Hrs of TV	18.5	21	16.7	19.8	22.1

5.M.5f: use common fractions to represent the probability of events that are neither certain nor impossible;

Example: The spinner shown is used to play a game. What is the probability that the arrow will land on a number greater than 5?



5.M.5g: compare theoretical and experimental outcomes in an experiment when the total number of possible outcomes is 12 or less;

Example: Bill rolled an even number on his die on 7 occasions. How does this relate to the theoretical probability of rolling an even number?

5.M.5h: make predictions based on experimental and theoretical probabilities.

Example: Marcie has 11 letter cards that spell the word MISSISSIPPI. If she picks 1 card without looking, what is the probability that it will have the letter S on it?

Strand: **M1** **Numbers and Operations**

Standards: In Grade 6, all students should:

6.M.1a: decompose and recompose whole numbers using factors and exponents;

Example: Find 3 different factor pairs for 180.

6.M.1b: find and use prime factorization of composite numbers;

Example: Explain why the least common multiple for 144 and 180 is 720.

6.M.1c: use simple expressions involving integers to represent and solve problems;

Example: The temperature in Bavaria this morning was -6^0 and now it is 3^0. How much has the temperature risen? Explain your answer.

6.M.1d: compare and order positive and negative decimals and fractions and find their locations on a number line;

Example: Place the following numbers correctly on a number line: ¼, .17, - ¼, -.17.

6.M.1e: interpret and use ratios in to show relative sizes of two quantities, using accurate notations, e.g., a/b, a to b, a:b;

Example: If there are 3 feet in a yard, write a ratio that represents the relationship using F for feet and Y for yards.

6.M.1f: use order of operations, including exponents, decimals, rational numbers, to simplify numerical expressions;

Example: Find the value of the expression: $^1/_2\,(12.4 - 5.2)^2$

6.M.1g: explain the meaning and effects of arithmetic operations with positive numbers to include fractions, decimals, and percents;

Example: Explain how you can divide two fractions and get a number greater than 1.

6.M.1h: perform fraction and decimal computations and justify the solutions;

Example: Use pictures to illustrate the sum of $^2/_3$ and $^1/_4$.

6.M.1i: estimate solutions to problems involving fractions and decimals;

Example: Explain why you can or cannot purchase a toy that is on sale for ¾ of the original price of $21 if you have $15.

6.M.1j: select and use mathematical methods and tools for computing with fractions and decimals;

Example: Explain how can you compute a 15% tip for bill which totals $28?

Strand: **M2** **Algebra**

Standards: In Grade 6, all students should:

6.M.2a: recognize and generate equivalent forms of algebraic expressions;

Example: In playing the game, "Thinking of a Number", Jill says that you end up with the same number if you follow either of the two directions. Use algebraic expressions to show that she is correct.
[1] Think of a number, subtract one, double the result, and add 6.
[2] Think of a number, add two, and double the result.

6.M.2b: explain how the commutative, associative and distributive properties generate equivalent forms;

Example: Use the commutative and distributive property to create an equivalent expression that may make the following computation a simple product: 29 ● 76 + 24 ● 29.

6.M.2c: solve simple linear equations and inequalities;

Example: John wants to buy candy bars for some of his friends. If candy bars are 75 ¢, what is the maximum number of friends he can buy candy bars for if he has $2.35?

6.M.2d: use symbolic algebra to represent situations, e.g., relationships found in geometry;

Example: A gallon of paint will cover 400 square feet of surface area. Write an inequality to determine the dimensions of a room for which the 4 walls can be painted using 1 gallon of paint. Use (W) to represent that width of a room, (L) to represent the length of a room, and (H) to represent the height of a room.

6.M.2e: evaluate simple expressions by replacing variables with given values, and use formulas in problem-solving situations;

Example: If $2WH + 2LH < 400$ represents the dimensions of a room (width, length, height) and 400 is the surface area a gallon of paint can cover, determine if a room 15X12X9 can be painted with one gallon of paint.

6.M.2f: create and interpret tables and graphs to draw conclusions and make predictions;

Example: The following chart lists calories in a serving of chicken tenders based on how many pieces are eaten. How many calories are in 17 chicken tenders?

Calories	Number Eaten
168	4
210	5
252	6
336	8

6.M.2g: create and compare representations that display constant and varying rates of change.

Example: A frog is stuck at the bottom of a well. Each day, the frog can climb up five feet but each night he slides back down 2 feet. The table Below lists his distance from the bottom of the well.

Day 1	5 feet	Night 1	3 feet
Day 2	8 feet	Night 2	6 feet

and so on …

If the well is 65 feet deep, create a graph that will illustrate when the frog is out of the well.

Strand: **M3** **Geometry**

Standards: In Grade 6, all students should:

6.M.3a: describe and classify two- dimensional and three-dimensional shapes using their defining properties;

Example: List all of the two-dimensional shapes can have all right angles.

6.M.3b: identify and plot points on a coordinate plane in all quadrants;

Example: Draw a square with two corners of a square located at the points (3,2) and (3,5).

6.M.3c: describe sizes, positions and orientations of shapes after rotations, reflections, and translations;

Example: Which capitol letters will retain their orientation when reflected across the Y axis?

6.M.3d: recognize, explain, and perform up to two transformations on two-dimensional shapes;

Example: Draw a trapezoid in with vertices at (1,3), (2,1), (4,1), and (5,3). Rotate the shape 45^0 clockwise and draw its reflections to the other 3 quadrants.

6.M.3e: draw and identify two-dimensional geometric figures with specific side length or angle measure;

Example: Draw a right triangle that has legs of length 3 and 4. Determine the length of the third side.

6.M.3f: describe and use properties of similarity and congruency with two-dimensional figures to solve problems;

Example: A photograph is enlarged from a 3”X 5” to a poster with width of 24”. What are the dimensions of the enlarged poster?

Strand: **M4** **Measurement**

Standards: In Grade 6, all students should:

6.M.4a: explain the relationship between area and perimeter of a rectangle when one attribute is changed and the other remains constant;

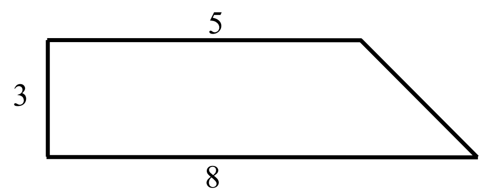
Example: A 6 X 3 rectangle has the same area and perimeter. What happens to the relationship between the area and perimeter when the width is increased to make it a square?

6.M.4b: select and use units of measurement to a given precision;

Example: Measure the segment to the nearest ⅛ of an inch.

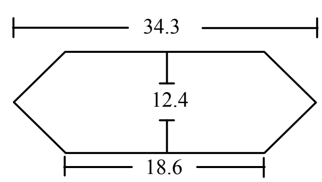
6.M.4c: create and use formulas to find the perimeters and areas of triangles and quadrilaterals, and to find the area and circumference of circles;

Example: Find the area of the following trapezoid:



6.M.4d: find the perimeter and area of irregular polygons;

Example: What is the area of a stained glass window with the dimensions shown?



6.M.4e: identify rate as a form of measurement based on time, e.g., mph, rpm, cc/min.:

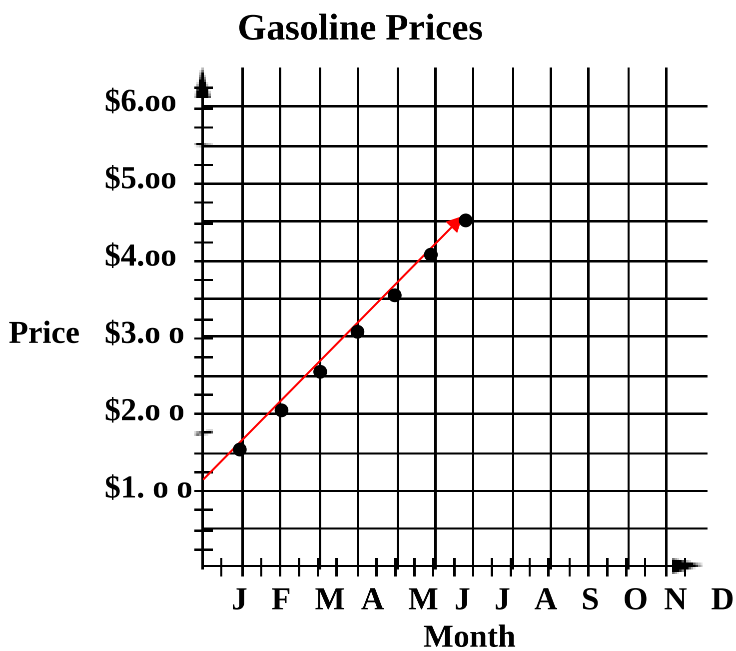
Example: Express the rate of a bicycle in km/hour if it has a tire with circumference of 2m that is making one revolution every second?

Strand: **M5** **Data Analysis and Probability**

Standards: In Grade 6, all students should:

6.M.5a: read and use graphical representations to make predictions and/or draw conclusions;

Example: Use the graph below to predict the price of gasoline by December.



6.M.5b: formulate questions, design a study, and evaluate the data to reach a conclusion about characteristics shared by two populations or different characteristics that exist within a population;

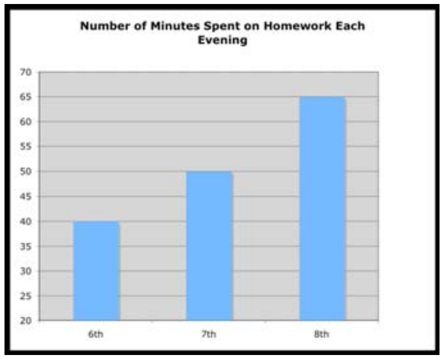
Example: Explain what you can do to determine the expected minimum wage by the time you graduate from high school?

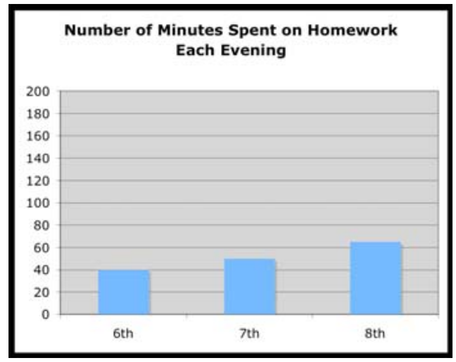
6.M.5c: identify the measures of central tendency and spread of a data set to describe the set;

Example: If a set of test scores range from 63 to 87 with a mean of 79, what statements can you make about the class grades as a whole?

6.M.5d: explain the effects of scale and/or interval changes in graphs that lead to misunderstandings;

Example: Leah, an 8th grader, wants to make a graph to show how much time typical middle school students at her school spend on homework. She wants to use one graph to show her teacher to convince him that he should not give 8th graders so much homework. Which of the following graphs would best suit her argument?





6.M.5e: select, construct, interpret, and justify the appropriate graphical representation of data;

Example: Explain which of the following sets of data would be best illustrated in a circle graph: Distance a paper airplane travels on 10 trials; Growth of a plant over 3 months; Color of eyes for the students in your classroom.

6.M.5f: use 0, 1, and ratios between 0 and 1 to represent the probability of outcomes for an event;

Example: Express the likelihood of being born in a month that ends in R as a ratio, if all the you are equally likely to be born in any one of the 12 months.

6.M.5g: describe and model all possible outcomes of simple events, e.g., tree diagrams, organized lists;

Example: The local sandwich shop has the following options: type of bread (white, wheat, rye), type of meat (turkey, ham, roast beef), and two options for addition (tomato, bacon). List all of the types of sandwiches that the sandwich shop will make.

6.M.5h: explain why the sum of the probabilities of all possible outcomes of a particular event is one;

Example: The probability of rolling a die and getting an odd number is $^{3}/_{6}$. What is the probability of rolling an even number? Why is the sum of these probabilities 1?

Strand: **M1** **Numbers and Operations**

Standards: In Grade 7, all students should:

7.M.1a: use, interpret, and compare numbers in several equivalent forms such as integers, fractions, decimals, and percents;

Example: Represent the number of Red stripes found on the U.S. flag as a fraction, ratio, decimal, and percent of the total number of stripes.

7.M.1b: solve problems that involve percent greater than 100 or less than 1;

Example: If you invest money in a savings account at 3% annually, determine the relationship of the amount in the account at the end of one year to the amount or the original deposit.

7.M.1c: identify and use ratio and proportion to represent quantitative relationships;

Example: "They measured my right thumb, and desired no more; for by a mathematical computation, that twice round the thumb is once round the wrist; and so on to the neck and the waist ..." Jonathan Swift's *Gulliver's Travels* includes some ratios that the Lilliputians used to estimate sizes in order to construct clothes for Gulliver. Determine the accuracy of the Lilliputian's measurements by comparing them to your personal measurements.

7.M.1d: describe the difference between rational and irrational numbers;

Example: For the numbers $\sqrt{2}$ and $\sqrt{9}$ explain which one is rational and which is irrational and why?

7.M.1e: calculate and find approximations of square roots;

Example: Which is the best approximation of $\sqrt{45}$; 6.2, 6.7, 7.1, or 7.5?

7.M.1f: explain the relationship, meaning, and effects of arithmetic operations with the set of integers;

Example: Explain the validity of the following statement: If you add any number to a positive integer, the sum is always positive.

7.M.1g: use order of operations and properties to simplify numerical expressions involving integers, fractions, decimals and exponents;

Example: Find the value of $(-2)^2 + 4(\frac{1}{2} + 3)$.

7.M.1h: simplify numerical expressions and solve real-life problems using the set of integers;

Example: If the temperature in Anchorage is -12° on March 1 and follows the pattern of increasing 5° for 3 days then dropping 2° on the 4^{th} day, what will be the temperature on March 31?

7.M.1i: estimate and solve problems including ratios, proportions and percents, and justify reasoning;

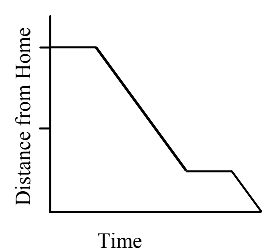
Example: If a store advertizes a sale of 50% off for a jacket on Monday and then reduces the price another 50% on Saturday, is the jacket now free? Why or why not?

Strand: **M2** **Algebra**

Standards: In Grade 7, all students should:

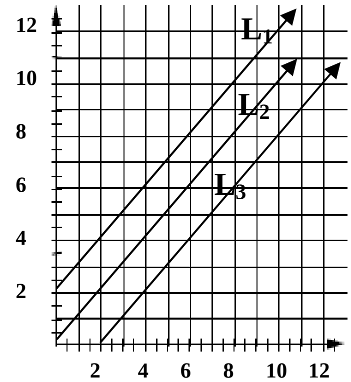
7.M.2a: represent and analyze relations and functions with tables, graphs, words, algebraic expressions, and equations;

Example: Write a story involving someone on a trip returning to their home that matches the information in the graph that is illustrated to the right.



7.M.2b: explain relationships between graphs of lines and the corresponding equation;

Example: Which of the following lines represents the equation Y Y= X + 2 ?



7.M.2c: generate equivalent forms of algebraic expressions by combining like terms;

Example: Show that 6x + 2 is equivalent to (7x -5) - (x + 3).

7.M.2d: use variables and operations to write an expression, equation, or inequality that represents a verbal description;

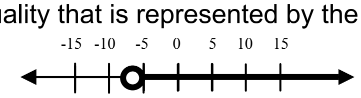
Example: Jerry noticed that to find the sum of the first 10 whole numbers he could add them in the following pairs: 1 + 10, 2 +9, 3 + 8, 4 + 7, 5 + 6 which is 5 groups of 11 to yield 55. Write an expression that will yield the sum of the first N whole numbers when N is an even number.

7.M.2e: model and solve equations using inverse operations;

Example: Solve the following equation for x: 4 x - 7 = 12

7.M.2f: represent linear equations and inequalities by plotting points;

Example: Write an inequality that is represented by the following set:



7.M.2g: analyze functional relationships to explain how a change in one quantity results in a change in the other;

Example: From the following table, determine the cost of 22 pencils.

Number of Pencils	Cost
5	$ 1.55
12	$ 3.72
19	$ 5.89
22	

7.M.2h: identify and explain the use of variables;

Example: Provide an example of how a variable can be used to represent the rule for a general arithmetic pattern.

Strand: **M3** **Geometry**

Standards: In Grade 7, all students should:

7.M.3a: identify and apply conditions that show two geometrical figures are congruent and what congruence means about the relationships between the sides and angles of the two figures;

Example: If you cut out two congruent scalene triangles and flip one over, do they remain congruent? Explain your answer.

7.M.3b: use proportional reasoning to describe and express relationships between similar and congruent figures;

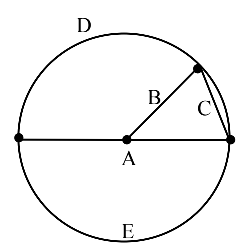
Example: Using square pattern blocks, Bill has created a 3X3 model of a rectangle. If Bob wants to make a similar model that is 4 times as large, how many squares will he need?

7.M.3c: classify and identify triangles by side and angle measurement and polygons as regular or irregular and/or by the number of sides;

Example: Explain why you can classify an equilateral triangle as an isosceles triangle but not as a scalene triangle.

7.M.3d: recognize and explain the following attributes of a circle, i.e., radius, diameter, arc, chord, semicircle, and central angle;

Example: Name each of the labeled parts for the circle in the figure.



7.M.3e: use coordinate geometry to represent special geometric shapes, such as regular polygons and polygons with pairs of parallel or perpendicular sides;

Example: Determine what shape if formed using the vertices (-2,2), (-2,-2), (2,-2), (2,2).

7.M.3f: determine the length of a side of a figure drawn on a coordinate plane with vertices having the same x or y coordinates;

Example: Find the area of a rectangle whose vertices are located at (-2,2), (-2,5), (2,-2), (2,5).

7.M.3g: demonstrate that congruence, similarity, and line or rotational symmetry of an object are retained in figures resulting from transformations.

Example: If a square has vertices of (-2,2), (-2,-2), (2,-2), (2,2) the x-axis and y-axis provide lines of symmetry. If the square is rotated 45^0 clockwise, describe the corresponding lines of symmetry.

Strand: **M4** **Measurement**

Standards: In Grade 7, all students should:

7.M.4a: select and use appropriate tools and units of measure when measuring and calculating angles, surface areas, and volumes of rectangular prisms;

Example: Measure the dimensions of a box and calculate the surface area and volume.

7.M.4b: analyze the structure and uniformity of the metric system and contrast with the customary system;

Example: List one advantage the metric system has over the customary system.

7.M.4c: identify and apply formulas to determine the surface area and volume of rectangular prisms;

Example: Determine how many centimeter cubes would fill a bracelet box that measures 5cm X 20cm X 4cm.

7.M.4d: Recognize and differentiate between surface area and volume, and demonstrate that two objects may have the same surface area, but different volumes—or may have the same volume, but different surface areas;

Example: Find the dimensions of a rectangular prism that has the same volume as a 12 inch cube and compare their surface areas.

7.M.4e: use ratios and proportions to solve problems involving scale factors;

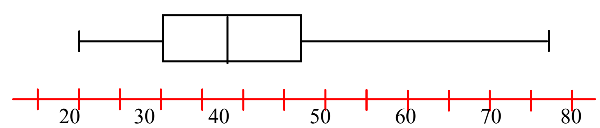
Example: Determine the number of square feet of carpet that will be needed to cover the floor of a room, if a blueprint uses the dimensions 4 in X 10 in for a room that is actually 10 feet wide.

Strand: **M5** **Data Analysis and Probability**

Standards: In Grade 7, all students should:

7.M.5a create and interpret box and whisker plots, stem and leaf plots, scatter plots, and other appropriate types of graphs;

Example: The following Box and Whiskers plot provides the data for age ranges within a company. Determine the quartile an employee of age 35 would fall.



7.M.5b: analyze the effect of graphing decisions on graphical representation, e.g., scaling, types of graphs;

Example: Joy created a bar graph to represent the types of music preferred by her classmates. She decided that the bar graph did not allow her to compare a given genre to the rest of the data as a whole. What advantages are there to Joy using a pie chart?

7.M.5c: find, interpret, and appropriately use quartile, interquartile range, and outliers;

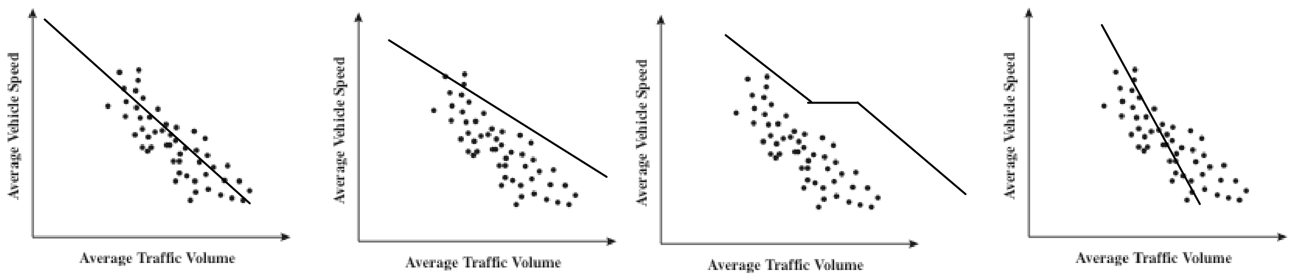
Example: What inferences can be made between two similar data sets if the interquartile range on the first set of data is nearly twice that of the second set of data?

7.M.5d: explain how measures of central tendency are affected by extremes;

Example: In trying to analyze which college majors would earn the most salary a researcher noticed that the Sociology, which included Michael Jordan whose earns multimillion dollars per year, seemed to be higher than some other professional degrees. What causes this skewing and how can it be accommodated in the data?

7.M.5e: find and make predictions based on the line of best fit;

Example: The data for the average traffic volume and average vehicle speed on a certain freeway for 50 days in 1999 has been put in a scatter plot. Which of the following shows the best line of fit?



7.M.5f: identify possible misuses of measures of central tendency;

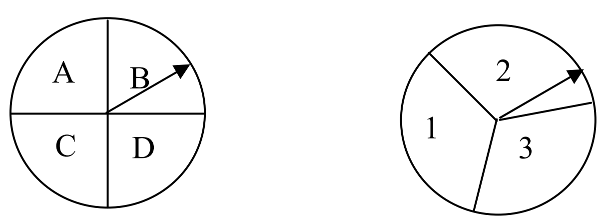
Example: The weekly salaries of six employees at McDonalds are $165, $220, $100, $190, $100, $195. Which measure of central tendency would be a misrepresentation of the data?

7.M.5g: use proportionality and probability to make and test conjectures about the results of experiments and simulations;

Example: Which vowel do you think is used most often? Take a page of your history book and count the number of times each vowel is used to test your conjecture.

7.M.5h: describe multiple outcomes of compound independent events, e.g., using tree diagrams and organized lists;

Example: Determine all the possible outcomes if you spin each of the following spinners once.



Strand: **M1** **Numbers and Operations**

Standards: In Grade 8, all students should:

8.M.1a: use the law of exponents for integer exponents;

Example: Write $2^2 \times 2^3$ as $2 \times 2 \times 2 \times 2 \times 2$ and then as a single power of 2. Explain what you are doing.

8.M.1b: explain the meaning of exponents that are negative and zero;

Example: Stephanie thinks that 4^{-1} is the same as -4. Provide an explanation that will convince her that 4^{-1} is actually ¼.

8.M.1c: use scientific, exponential, and calculator notation to express very large or small numbers;

Example: The distance from the sun to Pluto is 38 time the distance from the Sun to Earth. IF the distance from the sun to earth is 93 million miles, write the distance from the Sun to Pluto in scientific notation.

8.M.1d: expand scientific notation to include negative exponents;

Example: The mass of an electron is $9.10\ 938\text{X}10^{-31}$ kg. Write this in expanded form.

8.M.1e: explain and use the additive and multiplicative identities and the additive and multiplicative inverses;

Example: Show how inverses are used to solve the equation 10 = 2X + 3.

8.M.1f: apply order of operations to simplify expressions and perform operations involving numbers written in exponential notation or radical form;

Example: Evaluate the expression: $21 \div 7 + \frac{1}{2}\,(31 - 27)^{-3}$

8.M.1g: estimate and solve problems that include rational numbers, ratios, and proportions;

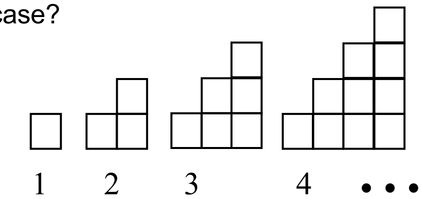
Example: Jane was preparing to go to Germany for 3 months as an exchange student. She needed to change some U.S. Dollars into Euros. If the exchange rate is currently $1.5453 for each Euro, how many Euros can she get for $500?

Strand: **M2** **Algebra**

Standards: In Grade 8, all students should:

8.M.2a: identify and describe patterns and sequences by finding the nth term;

Example: If this pattern were to continue, how many squares are needed for the nth staircase?



8.M.2b: identify functions as linear or nonlinear and contrast their properties using tables, graphs, or equations;

Example: Using the data in the table below, explain why the relation between the side of a square and its area is not linear.

Length of side of a square	Area of square
1	1
2	4
3	9
4	16
5	25

8.M.2c: analyze relationships between linear equations and their graphs by connecting the meaning of intercepts and slope to the context of the situation;

Example: The linear equation $y = 20x + 7$ represents the total cost of fees for rock-climbing at 'Soaring Heights' adventure store. If a full-day equipment rental is $7, explain what the x and the 20 in the equation might represent.

8.M.2d: use symbolic algebra to represent situations and to solve problems involving linear and nonlinear relationships;

Example: A person paddles a canoe 24 miles downstream in 2 hours. Write an equation that will allow you to determine the distance from the start at any point in time.

8.M.2e: recognize, generate, and justify equivalent forms of algebraic expressions;

Example: Show that $3(4x + 5x – 1) + 2(x + 3)$ and $29x + 3$ are equivalent.

8.M.2f: solve linear equations and inequalities;

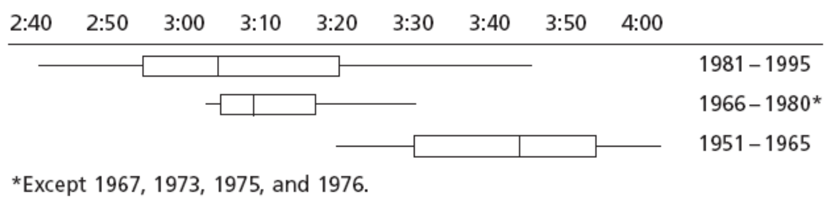
Example: Graph the solution set on the number line for $2 - 3x > 12$.

8.M.2g: represent situations using systems of linear equations and solve graphically;

Example: Brandon and Rayna are driving on the same road to a sushi restaurant. Rayna starts from her home, which is 5 miles closer to the restaurant than Brandon's starting location. Rayna drives at a speed of 50 mph, while Brandon drives at a speed of 65 mph. Explain under what circumstances Brandon will arrive at the restaurant first. Write a system of linear equations that describes the situation and use the graphs to explain your solution.

8.M.2h: represent and solve problems using various representations, e.g., graphs, tables, and equations;

Example: The box-and-whisker plots below show winning times (hours:minutes) for the Indianapolis 500 race in selected years.



In the years from 1951–1965, the slowest time was 3 h 57 min. Explain how the slowest time changed through the years 1951–1995. How did winning times change during that period? How did the median times change in the same period?

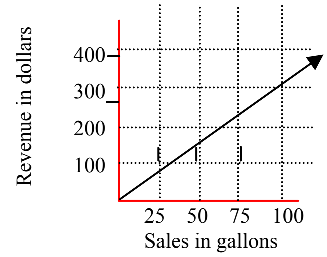
8.M.2i: connect the rate of change to the slope of a line;

Example: The table provides data for the distance a ball will roll down a ramp based on the height of the ramp from which it is releases. Explain the rate of change in context of the problem.

Ramp Height	Distance
20 cm	58 cm
30 cm	94 cm
40 cm	130 cm
50 cm	166 cm

8.M.2j: analyze changes in linear relationships using graphs;

Example: The following graph depicts the revenue from ice cream sales based on number of gallons sold. Determine the price per gallon of ice cream.



8.M.2k: describe and compare how changes in a linear equation affect the related graph;

Example: Compare the graphs for the following 2 equations:

Y = 5 x – 3 and Y = 3 – 5x

Strand: **M3** **Geometry**

Standards: In Grade 8, all students should:

8.M.3a: know and apply relationships among the angles, side lengths, perimeters, areas, and volumes of similar objects;

Example: Explain what happens to the volume of a cube if its dimensions are tripled.

8.M.3b: verify the Pythagorean Theorem;

Example: Example: Use the length and width of your classroom to calculate the distance across the room diagonally. Check by measuring.

8.M.3c: apply the Pythagorean Theorem to determine if a triangle is a right triangle or to find a missing side of a right triangle;

Example: Tell which of the following can be the dimensions for a right triangle.

3 – 4 – 5; 5 – 10 -15; 7 – 24 - 25

8.M.3d: identify and describe angle relationships formed by parallel lines cut by a transversal using appropriate terminology, e.g., alternate interior, alternate exterior, supplementary, vertical angles, corresponding angles, complementary, consecutive interior;

Example: Explain how you would know that if a transversal is perpendicular to one of two parallel lines that it must also be perpendicular to the other.

8.M.3e: plot ordered pairs of rational numbers on the coordinate plane in all four quadrants;

Example: In a coordinate plane, draw a rectangle whose area is 18 and has a vertex in each of the four quadrants.

8.M.3f: use geometric models to represent and explain numerical and algebraic relationships;

Example: Use an array model to illustrate the multiplication problems below.

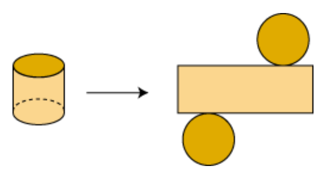
2 X 3 $\frac{3}{4}$ X $\frac{5}{8}$

Strand: **M4** **Measurement**

Standards: In Grade 8, all students should:

8.M.4a: calculate the surface area and volume of selected prisms, pyramids and cylinders;

Example: Determine the surface area of a cylinder by determining the area of its net.



8.M.4b: use formulas to a specified level of precision in finding the surface area and volume of prisms, pyramids and cylinders and the volume of spheres and cones;

Example: Determine the difference in air volume needed for a men's basketball and a women's basketball, if the circumference of the men's ball is 76.2 cm and the circumference of the women's ball is 72.4 cm.

8.M.4c: find the sum of the interior and exterior angles of regular convex polygons with and without the use of a protractor;

Example: Determine the sum of the angles of a Stop Sign (regular octagon).

8.M.4d: solve simple rate problems;

Example: Determine the better buy, a small drink (12 oz) for $1.00, a medium drink (20 oz) for $1.50 or a large drink (32 oz) for $2.50.

Strand: **M5** **Data Analysis and Probability**

Standards: In Grade 8, all students should:

8.M.M5a: know and use the correct graphical representations for discrete and continuous data;

Example: Explain why a line graph is not an appropriate representation for categorical data such as favorite colors.

8.M.5b: find, interpret, and use measures of center, quartile, and interquartile range to compare two sets of data;

Example: Explain why quartile is a better measure than interquartile range for comparing the population with lowest incomes to the population with the highest incomes.

8.M.5c: find the equation of a line of best fit for data represented as a scatter plot;

Example: Create a scatter plot and determine an equation for the line of best fit for the data collected on time it takes to have a line of people stand up, raise their hands, and sit back down in completing what is commonly termed as a Wave.

Number of people	1	15	20	25	30	35	40	45	50
Time to complete a wave (in seconds)	8	18	25	32	38	44	50	55	62

8.M.5d: compare sampling methods and analyze effects of random versus biased sampling and justify conclusions;

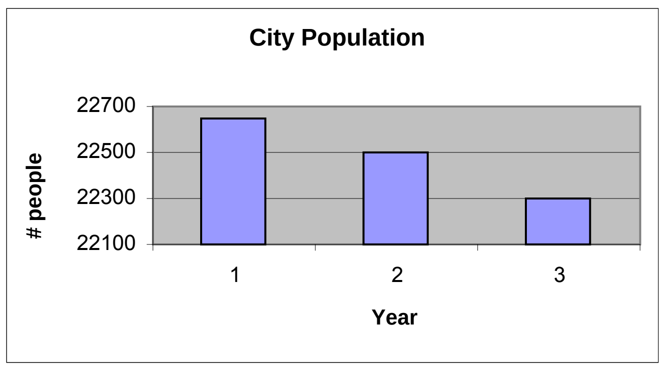
Example: If you were going to try to determine the average number of hours spent on homework for students in your school, describe how you could conduct a sampling without asking each student for information.

8.M.5e: construct convincing and appropriate arguments for a conclusion based on analysis of data presented;

Example: Describe data that you could collect to support an argument to eliminate block scheduling in your school.

8.M.5f: identify faulty arguments or common errors in data analysis;

Example: A city planner uses the following chart to demonstrate significant population decrease over the last 3 years. Explain why the decrease may not be as significant as the bar graph illustrates.



8.M.5g: compute the probability of the occurrence of independent and simple dependent events;

Example: Determine the probability of drawing a Red Face Card from a regulation deck of playing cards.

8.M.5h: differentiate between permutations and combinations;

Example: Your class is conducting a probability experiment involving drawing colored balls from a bag containing 5 red, 5 black, 3 white, and 2 blue balls. Explain what the probability of you drawing a red ball is if you are the third student to draw a ball and two students prior have drawn a red ball and a white ball. How is the probability changed if each of the previous students replaced their balls after they made a draw.