

Mathematical Processes Standard

Students use mathematical processes and knowledge to solve problems. They apply the mathematical processes as they learn content from the other mathematical standards.

Grade 4 Indicators	Grade 5 Indicators	Grade 6 Indicators
<p><u>Problem Solving</u></p> <ol style="list-style-type: none"> Apply and adapt a variety of appropriate strategies to solve problems: <ul style="list-style-type: none"> create a mathematical model draw a picture act it out look for a pattern guess and check make an organized list make a simpler but similar problem work backwards Understand when estimation, mental arithmetic, or paper and pencil calculation is more appropriate than technology. <p><u>Reasoning and Proof</u></p> <ol style="list-style-type: none"> Use models and logic to make conclusions. Adjust models as needed. Reason inductively by identifying patterns. Evaluate and analyze the mathematical thinking and strategies of others, orally and in writing. Include enough detail and clarity that the reader/listener can follow the explanation. Make multiple trials using manipulatives, drawings or paper and pencil. <p><u>Communication</u></p> <ol style="list-style-type: none"> Use developmentally appropriate mathematical language and vocabulary. Respond to instructions orally, visually and in writing as appropriate; e.g., tell, share, describe, demonstrate, compare, discuss, write. Respond clearly with sufficient detail so that thinking can be understood. Present thinking in a logical and organized in manner and explain to others how a problem was solved. 	<p><u>Problem Solving</u></p> <ol style="list-style-type: none"> Apply and adapt a variety of appropriate strategies to solve problems: <ul style="list-style-type: none"> create a mathematical model draw a picture act it out look for a pattern guess and check make an organized list make a simpler but similar problem work backwards use a formula Understand when estimation, mental arithmetic, or paper and pencil calculation is more appropriate than technology. Use an appropriate tool when the numbers are not easily calculated mentally, when an exact answer is needed, or when computation involves several numbers. <p><u>Reasoning and Proof</u></p> <ol style="list-style-type: none"> Use models and logic to make conclusions. Adjust models as needed. Reason inductively by identifying patterns. Evaluate and analyze the mathematical thinking and strategies of others, orally and in writing. Include enough detail and clarity that the reader/listener can follow the explanation. Make multiple trials using manipulatives, drawings or paper and pencil. Look for a case that doesn't work; e.g., a counter-example. <p><u>Communication</u></p> <ol style="list-style-type: none"> Use developmentally appropriate mathematical language and vocabulary. Respond to instructions orally, visually and in writing as appropriate; e.g., tell, share, describe, demonstrate, compare, discuss, write. 	<p><u>Problem Solving</u></p> <ol style="list-style-type: none"> Apply and adapt a variety of appropriate strategies to solve problems: <ul style="list-style-type: none"> create a mathematical model draw a picture act it out look for a pattern guess and check make an organized list make a simpler but similar problem work backwards use a formula make a scale drawing Understand when estimation, mental arithmetic, or paper and pencil calculation is more appropriate than technology. Use an appropriate tool when the numbers are not easily calculated mentally, when an exact answer is needed, or when computation involves several numbers. Consider alternative strategies and/or blend strategies. <p><u>Reasoning and Proof</u></p> <ol style="list-style-type: none"> Use models and logic to make conclusions. Adjust models as needed. Reason inductively by identifying patterns. Evaluate and analyze the mathematical thinking and strategies of others, orally and in writing. Include enough detail and clarity that the reader/listener can follow the explanation. Make multiple trials using manipulatives, drawings or paper and pencil. Look for a case that doesn't work; e.g., a counter-example. <p><u>Communication</u></p> <ol style="list-style-type: none"> Use developmentally appropriate mathematical language and vocabulary.

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<p>5. Read and reread all of the given information and instructions to ensure understanding; e.g., identify key information needed to solve the problem.</p> <p>6. Interpret and summarize information from charts and graphs providing appropriate detail; e.g., describe patterns and contrasts.</p> <p><u>Connections</u></p> <ol style="list-style-type: none"> 1. Use learning from one area of mathematics to understand another. 2. Relate new and prior knowledge to make sense of new concepts being learned. 3. Make connections between mathematics and everyday life. 4. Apply a strategy or reference system that draws on previous learning in another context. 5. Make connections between different representations; e.g., numeric, graphical, and/or algebraic. <p><u>Representation</u></p> <ol style="list-style-type: none"> 1. Select an appropriate representation of a mathematical idea or situation: <ul style="list-style-type: none"> • physical model/manipulative • picture/drawing/diagram • numerical • geometric • graphical • table/chart • graphical organizers/Venn diagram 2. Understand that more than one representation can be used to appropriately represent the same mathematical idea or situation. 3. Use multiple representations, as required; e.g., table/chart, graph. 4. Understand that there may be different variations of one representation; e.g., $4s$ is the same as $s + s + s + s$. <p><u>Reflection</u></p> <ol style="list-style-type: none"> 1. Reflect on mathematical concepts that have been learned using drawings, pictures and/or words: e.g., as a class group discussion and activity, create a simple classroom chart to show what has been learned. 	<p>3. Respond clearly with sufficient detail so that thinking can be understood.</p> <p>4. Present thinking in a logical and organized in manner and explain to others how a problem was solved.</p> <p>5. Read and reread all of the given information and instructions to ensure understanding; e.g., identify key information needed to solve the problem.</p> <p>6. Interpret and summarize information from charts and graphs providing appropriate detail; e.g., describe patterns and contrasts.</p> <p>7. Communicate mathematical learning by combining various representations; e.g., words with diagrams, charts and graphs with verbal descriptions.</p> <p><u>Connections</u></p> <ol style="list-style-type: none"> 1. Use learning from one area of mathematics to understand another. 2. Relate new and prior knowledge to make sense of new concepts being learned. 3. Make connections between mathematics and everyday life. 4. Apply a strategy or reference system that draws on previous learning in another context. 5. Make connections between different representations; e.g., numeric, graphical, and/or algebraic. <p><u>Representation</u></p> <ol style="list-style-type: none"> 1. Select an appropriate representation of a mathematical idea or situation: <ul style="list-style-type: none"> • physical model/manipulative • picture/drawing/diagram • numerical • geometric • graphical • table/chart • graphical organizers/Venn diagram • equation/algebraic expression/formula 2. Understand that more than one representation can be used to appropriately represent the same mathematical idea or situation. 3. Use multiple representations, as required; e.g., table/chart, graph. 	<p>2. Respond to instructions orally, visually and in writing as appropriate; e.g., tell, share, describe, demonstrate, compare, discuss, write.</p> <p>3. Respond clearly with sufficient detail so that thinking can be understood.</p> <p>4. Present thinking in a logical and organized in manner and explain to others how a problem was solved.</p> <p>5. Read and reread all of the given information and instructions to ensure understanding; e.g., identify key information needed to solve the problem.</p> <p>6. Interpret and summarize information from charts and graphs providing appropriate detail; e.g., describe patterns and contrasts.</p> <p>7. Communicate mathematical learning by combining various representations; e.g., words with diagrams, charts and graphs with verbal descriptions.</p> <p>8. Use the symbolic language of mathematics correctly, e.g. using = between two equal expressions, use \angle to name angles.</p> <p><u>Connections</u></p> <ol style="list-style-type: none"> 1. Use learning from one area of mathematics to understand another. 2. Relate new and prior knowledge to make sense of new concepts being learned. 3. Make connections between mathematics and everyday life. 4. Apply a strategy or reference system that draws on previous learning in another context. 5. Make connections between different representations; e.g., numeric, graphical, and/or algebraic. <p><u>Representation</u></p> <ol style="list-style-type: none"> 1. Select an appropriate representation of a mathematical idea or situation: <ul style="list-style-type: none"> • physical model/manipulative • picture/drawing/diagram • numerical • geometric • graphical • table/chart • graphical organizers/Venn diagram • equation/algebraic expression/formula

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<p>2. In a math journal reflect on mathematical concepts that have been learned using drawings, pictures, math symbols, vocabulary, and language appropriate to the topic. Use writing prompts such as:</p> <ul style="list-style-type: none"> • What did you do in math today? • What did you learn in math today? • Was what you learned easy or difficult? • What did you like or dislike about today's lesson? • What are some of the math words you used today? • What did you not understand in math today? • Describe uses for what you learned in math today. 	<p>4. Understand that there may be different variations of one representation; e.g., $2l + 2w$ is the same as $2(l + w)$.</p> <p><u>Reflection</u></p> <ol style="list-style-type: none"> 1. Reflect on mathematical concepts that have been learned using drawings, pictures and/or words: e.g., as a class group discussion and activity, create a simple classroom chart to show what has been learned. 2. In a math journal reflect on mathematical concepts that have been learned using drawings, pictures, math symbols, vocabulary, and language appropriate to the topic. Use writing prompts such as: <ul style="list-style-type: none"> • What did you do in math today? • What did you learn in math today? • Was what you learned easy or difficult? • What did you like or dislike about today's lesson? • What are some of the math words you used today? • What did you not understand in math today? • Describe uses for what you learned in math today. 	<ul style="list-style-type: none"> • scale drawing <ol style="list-style-type: none"> 2. Understand that more than one representation can be used to appropriately represent the same mathematical idea or situation. 3. Use multiple representations, as required; e.g., table/chart, graph. 4. Understand that there may be different variations of one representation; e.g., $2l + 2w$ is the same as $2(l + w)$. 5. Understand the role of constants and variables in formulas and patterning rules. <p><u>Reflection</u></p> <ol style="list-style-type: none"> 1. Reflect on mathematical concepts that have been learned using drawings, pictures and/or words: e.g., as a class group discussion and activity, create a simple classroom chart to show what has been learned. 2. In a math journal reflect on mathematical concepts that have been learned using drawings, pictures, math symbols, vocabulary, and language appropriate to the topic. Use writing prompts such as: <ul style="list-style-type: none"> • What did you do in math today? • What did you learn in math today? • Was what you learned easy or difficult? • What did you like or dislike about today's lesson? • What are some of the math words you used today? • What did you not understand in math today? • Describe uses for what you learned in math today.

Numbers, Number Sense and Operations Standard

Students demonstrate number sense, including an understanding of number systems and operations and how they relate to one another. Students compute fluently and make reasonable estimates using paper and pencil, technology-supported and mental methods.

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<p>1. Represent whole numbers to <u>hundred millions</u> place using numerals, words, and <u>expanded notation</u>.</p> <p>2. Compare and order numbers 1,000,000 to 100,000,000, using mathematical language and symbols: greater than, less than, equal to, >, <, =.</p> <p>3. <u>Round</u> whole numbers to a given place up to hundred millions.</p> <p>4. Add and subtract 4-digit whole numbers with and without <u>regrouping</u>.</p> <p>5. <u>Estimate</u> the results of whole number addition and subtraction problems using <u>rounding</u>, and <u>front end estimation</u>, and judge the reasonableness.</p> <p>6. Develop fluency multiplication and division facts to the 12's.</p> <p>7. Identify and represent <u>factors</u> and <u>multiples</u> of whole numbers 1 - 100.</p> <p>8. Multiply whole numbers by <u>powers</u> of 10 and multiples of 10.</p> <p>9. Multiply whole numbers by 1 and 2-digit <u>multipliers</u>.</p> <p>10. Divide 2, 3 and 4-digit numbers by a single digit number and by multiples of 10.</p> <p>11. Interpret the meaning of <u>remainders</u>.</p> <p>12. Estimate the results of whole number multiplication and division using <u>rounding</u> and <u>compatible numbers</u>.</p>	<p>1. Represent whole numbers to <u>hundred billions</u> place using numerals, words, and <u>expanded notation</u>.</p> <p>2. Compare and order numbers 1 billion to 100 billion using mathematical language and symbols: greater than, less than, equal to, >, <, =.</p> <p>3. Round whole numbers to a given place up to hundred billions.</p> <p>4. Add and subtract 5-digit whole numbers with and without regrouping.</p> <p>5. Estimate the results of whole number addition and subtraction problems using <u>rounding</u>, and <u>front end estimation</u>, and judge the reasonableness.</p> <p>6. Explain the meaning of <u>prime</u> and <u>composite</u> numbers.</p> <p>7. Multiply whole numbers by 2 and 3-digit <u>multipliers</u>.</p> <p>8. Divide 3, 4 and 5-digit numbers by 1 and 2-digit numbers and by <u>multiples</u> of 10.</p> <p>9. Interpret and explain, in oral and written form, the meaning of <u>remainders</u>.</p> <p>10. Estimate the results of whole number multiplication and division using rounding and <u>compatible numbers</u>.</p> <p>11. Recognize <u>perfect square numbers</u> and their <u>roots</u>.</p> <p>12. Use the order of operations, including parentheses, to simplify <u>numerical expressions</u>.</p>	<p>1. Write large numbers in <u>expanded form</u> using <u>powers</u> of 10.</p> <p>2. Use the <u>order of operations</u>, with and without grouping symbols, to simplify <u>numerical expressions</u>.</p> <p>3. Identify and apply the <u>commutative</u>, <u>associative</u>, <u>distributive</u>, <u>identity</u> and <u>zero properties</u> for addition and multiplication.</p> <p>4. Use <u>factors</u> and <u>exponents</u> to express whole numbers.</p> <p>5. Identify whole numbers as <u>prime</u> or <u>composite</u>.</p> <p>6. Express whole numbers, 1-100, using <u>prime factorization</u> and be able to express in <u>exponential form</u>; e.g., $32 = 2 \times 2 \times 2 \times 2 \times 2 = 2^5$.</p> <p>7. Find the <u>greatest common factor</u> (GCF) and the <u>least common multiple</u> (LCM) of two given numbers using prime factorization.</p> <p>8. Explain the meaning of <u>divisibility</u> and identify numbers that are divisible by 2, 3, 5, 6, 9, and 10.</p> <p>9. Recognize <u>perfect square numbers</u> and their <u>roots</u> up to 196 (14×14).</p> <p>10. Locate and label fractions and decimals on a number line.</p> <p>11. Generate equivalent forms of fractions and mixed numbers including reducing to <u>simplest form</u>.</p> <p>12. Compare and order fractions with like or unlike <u>numerators</u> and <u>denominators</u>. Using >, <, ≥, ≤ or =.</p>

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<p>13. Identify and explain, in oral and written form, the <u>commutative</u> and associative properties of addition and multiplication.</p> <p>14. Identify and use the <u>distributive</u> property to mentally find a multiplication answer; e.g., $5 \times 47 = (5 \times 40) + (5 \times 7) = 200 + 35 = 235$.</p> <p>15. Identify <u>equivalent</u> forms of fractions using visual models, and by multiplying or dividing by a fractional form of one whole; e.g. $\frac{2}{3} \times \frac{4}{4} = \frac{8}{12}$ or $\frac{16}{24} \div \frac{8}{8} = \frac{2}{3}$.</p> <p>16. Use models and points of reference to compare commonly used fractions; e.g., “Is $\frac{1}{3}$ closer to 0 or 1 on a number line?”</p> <p>17. Add and subtract fractions with like <u>denominators</u>, sums less than 1.</p> <p>18. Represent decimal numbers for <u>tenths</u>, <u>hundredths</u>, and <u>thousandths</u> using physical or visual models, numerals, and words, and be able to identify and write the fraction equivalents; e.g., 0.235, $\frac{235}{100}$, two hundred thirty-five thousandths.</p> <p>19. Explain that ten tenths is the same as one whole in both fraction and decimal form.</p> <p>20. Add and subtract decimal numbers up to thousandths place and explain how place value is related to the proper alignment of the numerals.</p> <p>21. Explore numbers less than 0 by extending the number line, and through familiar applications; e.g. temperature, and owing money.</p> <p>22. Solve problems involving counting money and making change using coins and bills for amounts up to \$50.00.</p> <p>23. Estimate the results of computations involving fractions and decimals using a variety of strategies.</p>	<p>13. Use the <u>commutative</u>, <u>associative</u>, <u>distributive</u>, <u>identity</u>, <u>zero</u> and <u>inverse properties</u> to simplify and perform computations.</p> <p>14. Locate fractions and mixed numbers on a number line.</p> <p>15. Recognize and explain the meaning of <u>proper</u> and <u>improper fractions</u>.</p> <p>16. Change improper fractions to mixed numbers and change mixed numbers to improper fractions.</p> <p>17. Identify and generate <u>equivalent</u> forms of fractions including reducing to <u>simplest form</u>.</p> <p>18. Use visual models and equivalent forms to compare fractions.</p> <p>19. Add and subtract commonly used fractions with like and unlike <u>denominators</u>.</p> <p>20. Read and write decimal numbers to <u>ten-thousandths</u> place.</p> <p>21. Round decimals to the nearest whole number, tenth, hundredth and thousandth.</p> <p>22. Add and subtract decimal numbers up to ten-thousandths place and explain how place value is related to the proper alignment of the numerals.</p> <p>23. Multiply and divide decimal numbers involving 1 or 2 decimal places.</p> <p>24. Represent and compare numbers less than 0 by extending the number line and using familiar applications.</p> <p>25. Use models and visual representations to develop the concept of <u>ratio</u> as part to part and part to whole and the concept of percent as part to whole.</p> <p>26. Identify and generate equivalent forms of <u>fractions</u>, <u>decimals</u>, and <u>percents</u>.</p>	<p>13. Change <u>improper fractions</u> to <u>mixed numbers</u> and vice versa.</p> <p>14. Add and subtract fractions, whole numbers and mixed numbers.</p> <p>15. Explain the meaning of <u>reciprocals</u>, and write reciprocals of whole numbers, fractions and mixed numbers.</p> <p>16. Multiply and divide fractions, whole numbers and mixed numbers.</p> <p>17. Locate and label fractions and decimals on a number line.</p> <p>18. Demonstrate fluency in multiplying and dividing decimals by whole numbers and decimals.</p> <p>19. Estimate reasonable solutions to problems involving fractions and decimals; e.g., $\frac{7}{8} + \frac{12}{13} \approx 2$ and $4.23 \times 5.8 \approx 25$</p> <p>20. Use models and pictures to relate concepts of <u>ratio</u> and <u>proportion</u>.</p> <p>21. Use ratios and proportions to represent quantitative relationships and to solve problems.</p> <p>22. Convert among fractions, decimals, and percents.</p> <p>23. Use $<$, $>$, \leq, \geq, $=$ to compare and order fractions, decimals, and percents,</p> <p>24. Find a given percent of a number and solve related problems.</p> <p>25. Represent and compare <u>positive</u> and <u>negative</u> numbers on a number line.</p> <p>26. Use simple expressions involving integers to represent and solve problems; e.g., if a running back loses 15 yards on the first carry but gains 8 yards on the second carry, what is the net gain/loss? $-15 + 8 = -7$</p>

Measurement Standard

Students estimate and measure to a required degree of accuracy and precision by selecting and using appropriate units, tools and technologies.

Grade 4	Grade 5	Grade 6
<p>1. Identify and use <u>customary</u> units and <u>metric</u> units to measure length; inches, <u>feet</u>, <u>yards</u>, <u>miles</u>, <u>millimeters</u>, <u>centimeters</u>, <u>decimeters</u>, <u>meters</u>, <u>kilometers</u>.</p> <p>2. Use a ruler to measure objects and draw line segments to the nearest inch, $\frac{1}{2}$ in., $\frac{1}{4}$ in., and $\frac{1}{8}$ in.</p> <p>3. Use a ruler to measure objects and draw line segments to the nearest centimeter and nearest millimeter.</p> <p>4. Convert units of length within the same system; e.g., inches to feet, feet to yards, meters to centimeters, meters to millimeters, centimeters to millimeters.</p> <p>5. Identify and use <u>customary</u> units and <u>metric</u> units to measure <u>capacity</u>; <u>cups</u>, <u>pints</u>, <u>quarts</u>, <u>half gallons</u>, <u>gallons</u>, <u>milliliters</u>, <u>centiliters</u>, <u>deciliters</u>, <u>liters</u>.</p> <p>6. Convert units of capacity within the same system; e.g., cups to pints, pints to quarts, quarts to gallons, liters to milliliters, liters to centiliters, liters to deciliters.</p> <p>7. Identify and use <u>customary</u> units, and <u>metric</u> units to measure weight; <u>pounds</u>, <u>ounces</u>, <u>tons</u>, <u>milligrams</u>, <u>grams</u>, <u>kilograms</u>.</p> <p>8. Convert units of weight with the same system; e.g., pounds to ounces, grams to milligrams, kilograms to grams.</p> <p>9. Develop and use strategies to find <u>perimeter</u> of simple shapes using string or links.</p> <p>10. Identify and select appropriate units to measure perimeter - linear units; e.g., inches, feet, centimeters, meters.</p>	<p>1. Identify <u>customary</u> units of length, capacity and weight.</p> <p>2. Use a ruler to measure objects and draw line segment to the nearest inch, $\frac{1}{2}$ in., $\frac{1}{4}$ in., $\frac{1}{8}$ in., $\frac{1}{16}$ in.</p> <p>3. Identify <u>metric</u> units of length, capacity and weight.</p> <p>4. Identify the six <u>metric prefixes</u> and explain their meanings; create a <u>metric chart</u> for length, capacity and weight.</p> <p>5. Convert units of length, capacity, weight and time to other units in the same measurement system. Change a smaller unit of measure to a larger unit, and vice versa; e.g., hours to minutes, grams to kilograms using \times and \div.</p> <p>6. Develop and use formulas for calculating the perimeter and area of squares, rectangles, parallelograms, and triangles; e.g., using graph paper, geoboards.</p> <p>7. Draw a polygon with a given perimeter or area; e.g. draw a rectangle that has a perimeter of 18 cm; draw a rectangle that has an area of 16 sq. cm.</p> <p>8. Develop and use a formula for calculating the volume of rectangular prisms and cubes; using cm cubes or inch cubes.</p> <p>9. Explain the difference between <u>linear units</u>, <u>square units</u> and <u>cubic units</u>.</p> <p>10. Demonstrate that two rectangles can have different perimeters with the same area, or different areas with the perimeter.</p>	<p>1. Identify, use, and perform operations with both <u>metric</u> and <u>customary units</u> of measure.</p> <p>2. Use a ruler to measure objects and draw line segments to the nearest $\frac{1}{16}$ in.</p> <p>3. Convert units of length, capacity, weight and time to other units in the same measurement system. Change a smaller unit of measure to a larger unit, and vice versa using multiplication and division; e.g., gallons to cups, milliliters to liters.</p> <p>4. Develop and use <u>formulas</u> for calculating the <u>perimeter</u> and <u>area</u> of squares, rectangles, and triangles, and parallelograms.</p> <p>5. Explain the difference between perimeter and area of two-dimensional shapes, and identify the appropriate units for measuring them.</p> <p>6. Demonstrate that two shapes may have the same perimeter with different areas or may have the same area with different perimeters.</p> <p>7. Draw a polygon with a given perimeter or area; e.g. draw a rectangle that has a perimeter of 18 cm; draw a rectangle that has an area of 16 sq. cm.</p> <p>8. Describe what happens to the perimeter and area of a two-dimensional shape when the measurements of the shape are changed; e.g. length of sides are doubled, tripled or halved.</p> <p>9. Explain the difference between <u>surface area</u> and <u>volume</u> of three-dimensional shapes, and identify the appropriate units to use for measuring them.</p>

Grade 4	Grade 5	Grade 6
<p>11. Develop and use strategies to find <u>area</u> using tiles or a grid (graph paper); e.g., count squares to find the area of regular or irregular shapes on a grid.</p> <p>12. Identify and select appropriate units to measure area - square units; e.g., square tiles, <u>square inches</u>, square centimeters.</p> <p>13. Develop and use strategies to find <u>volume</u> using cubes; e.g., layer cubes in a box.</p> <p>14. Identify and select appropriate units to measure volume - <u>cubic units</u>; e.g., cubes, cubic inches, cubic centimeters.</p> <p>15. Read, record and compare temperature in degrees <u>Fahrenheit</u> and degrees <u>Celsius</u>.</p> <p>16. Calculate <u>elapsed time</u> using a clock (15 min. and 5 min. intervals).</p> <p>17. Use appropriate measuring tools and techniques to construct a figure; e.g., construct a rectangle with a length of $5\frac{1}{4}$ inches and width of $3\frac{1}{2}$ inches; fill a measuring cup to the $\frac{3}{8}$ cup mark.</p>	<p>11. Develop an understanding that the <u>circumference</u> of a circle is about three times the length of its <u>diameter</u>.</p> <p>12. Calculate <u>elapsed time</u> in hours and minutes between two given times. same</p> <p>13. Explore measuring and drawing angles using a <u>protractor</u>.</p>	<p>10. Develop and use formulas to calculate the surface area and volume of cubes and rectangular prisms using <u>geometric model</u>, <u>geometric nets</u> and common materials.</p> <p>11. Understand the concept and know the value of pi; e.g., ratio of <u>circumference</u> to <u>diameter</u> equals pi (3.14...)</p> <p>12. Develop and use formulas for determining the circumference and area of circles and to determine the area of sectors; e.g., $\frac{1}{2}$ circle, $\frac{1}{3}$ circle.</p> <p>13. Estimate lengths using string or links, areas using tiles or grid and volumes using cubes.</p> <p>14. Explore <u>scale drawings</u> and maps; e.g., learn how scale drawings represent larger or smaller objects.</p>

Geometry and Spatial Sense Standard

Students identify, classify, compare and analyze characteristics, properties and relationships of one-, two- and three-dimensional geometric figures and objects. Students use spatial reasoning, properties of geometric objects, and transformations to analyze mathematical situations and solve problems.

Grade 4 Indicators	Grade 5 Indicators	Grade 6 Indicators
<p>1. Identify similarities and differences of <u>quadrilaterals</u>; e.g., <u>squares</u>, <u>rhombuses</u>, <u>rectangles</u>, <u>parallelograms</u>, and <u>trapezoids</u>.</p> <p>2. Classify two and three-dimensional shapes according to their properties; e.g., develop vocabulary and definitions, compare and model plane and three-dimensional solids.</p> <p>3. Identify and create shapes that show <u>symmetry</u>; e.g., use pattern blocks, geoboards.</p> <p>4. Identify and create shapes that are <u>similar</u>, and shapes that are <u>congruent</u>; e.g. use tangrams, pattern blocks, and geoboards.</p> <p>5. Identify <u>angles</u> as <u>right</u>, <u>acute</u> or <u>obtuse</u>.</p> <p>6. Model and describe <u>intersecting</u>, <u>parallel</u> and <u>perpendicular</u> lines and <u>line segments</u>.</p> <p>7. Identify <u>points</u>, <u>lines</u>, and <u>planes</u> in the environment.</p> <p>8. Describe and define <u>point</u>, <u>line</u>, <u>line segment</u>, <u>ray</u>, and <u>plane</u>.</p> <p>9. Describe, identify and model <u>reflections (flips)</u>, <u>rotations (turns)</u> and <u>translations (slides)</u> using concrete materials; e.g. using geoboards.</p> <p>10. Specify locations and plot <u>ordered pairs</u> on a <u>coordinate plane</u>, using the <u>first quadrant</u>.</p>	<p>1. Identify and define <u>parts of a circle</u>, and determine the relationship to each other; <u>center</u>, <u>radius</u>, <u>diameter</u>, <u>chord</u>, <u>circumference</u>.</p> <p>2. Draw circles using a <u>compass</u> given a radius or diameter.</p> <p>3. Identify and draw <u>lines</u>, <u>line segments</u>, <u>rays</u>, <u>angles</u>, <u>skew lines</u>, <u>parallel lines</u> and <u>perpendicular lines</u>.</p> <p>4. Label <u>parts of an angle</u>; <u>vertex</u>, <u>rays</u>, <u>interior</u> and <u>exterior</u>.</p> <p>5. Explore measuring and drawing angles using a <u>protractor</u>.</p> <p>6. Identify angles as <u>right</u>, <u>acute</u>, <u>obtuse</u>, or <u>straight</u>.</p> <p>7. Identify and define triangles based on angle measures (<u>acute</u>, <u>right</u>, <u>obtuse</u>), and side lengths (<u>isosceles</u>, <u>equilateral</u>, <u>scalene</u>).</p> <p>8. Name a given angle using the single letter form and the three letter form; e.g. $\angle B$ or $\angle ABC$.</p> <p>9. Identify <u>polygons</u> with <u>up to 8 sides</u>.</p> <p>10. Predict and describe the results of <u>slides</u>, <u>flips</u> and <u>turns</u> of two-dimensional shapes.</p> <p>11. Identify and create shapes that show <u>symmetry</u>; e.g., use pattern blocks, geoboards, graph paper, dot paper.</p> <p>12. Identify and create shapes that are <u>similar</u>, and shapes that are <u>congruent</u>; e.g., use tangrams, pattern blocks, geoboards, graph paper, dot paper.</p>	<p>1. Identify and analyze characteristics and properties of <u>polygons</u> with <u>up to 10 sides</u>.</p> <p>2. Identify and define triangles based on angle measures (<u>acute</u>, <u>right</u>, <u>obtuse</u>), and side lengths (<u>isosceles</u>, <u>equilateral</u>, <u>scalene</u>) and classify using multiple criteria; e.g., right scalene triangle.</p> <p>3. Measure and draw angles using a <u>protractor</u>.</p> <p>4. Given two angle measures of a triangle, find the measure of the third angle.</p> <p>5. Apply <u>transformations</u> and use <u>symmetry</u> to analyze mathematical situations; e.g., define, locate, and draw images of figures by <u>translation</u>, <u>reflection</u>, and <u>rotation</u>.</p> <p>6. Draw circles with a <u>compass</u> when given a <u>radius</u> or <u>diameter</u>.</p> <p>7. Draw various 2 and 3 dimensional figures given specified dimensions.</p> <p>8. Draw <u>similar figures</u> that model <u>proportional relationships</u>; e.g., model similar figures with a 1 to 2 relationship by sketching two of the same figure, one with corresponding sides twice the length of the other.</p> <p>9. Predict what three-dimensional object will result from folding a <u>two-dimensional net</u>, and confirm the prediction by folding the net.</p> <p>10. Find the distance between points along <u>horizontal</u> and <u>vertical lines</u> of a <u>coordinate system</u>.</p>

Grade 4 Indicators	Grade 5 Indicators	Grade 6 Indicators
	<p>13. Use physical models to determine the sum of <u>interior angles</u> of triangles and quadrilaterals.</p> <p>14. Extend understanding of a coordinate system to include points when x values may be negative numbers. Specify locations and plot <u>ordered pairs</u> on a <u>coordinate plane</u>, using <u>quadrant I</u> and <u>quadrant II</u>.</p>	<p>11. Extend understanding of a coordinate system to include points when x and y values may be negative numbers. Specify locations and plot <u>ordered pairs</u> on a <u>coordinate plane</u>, using all <u>four quadrants</u>.</p>

Patterns, Functions and Algebra Standard

Students use patterns, relations and functions to model, represent and analyze problem situations that involve variable quantities, Students analyze, model and solve problems using various representations such as tables, graphs and equations.

Grade 4 Indicators	Grade 5 Indicators	Grade 6 Indicators
<p>1. Analyze and extend increasing or decreasing <u>arithmetic</u> (+ and -), and <u>geometric patterns</u> (x and \div) with or without a calculator, and describe the rules in words.</p> <p>2. Analyze, represent and describe patterns, <u>functions</u> and mathematical relationships using words, tables and graphs.</p> <p>3. Use patterns to make predictions, identify relationships, and solve problems.</p> <p>4. Represent the idea of a variable as an <u>unknown quantity</u>; e.g., use a letter or symbol.</p> <p>5. Use rules and variables to describe patterns and other mathematical relationships</p> <p>6. Express mathematical relationships as <u>equations</u> and <u>inequalities</u>.</p> <p>7. Construct a table of values as a tool to solve problems associated with <u>mathematical</u> or <u>functional relationships</u>.</p> <p>8. Investigate ways a change in one <u>variable</u> relates to a change in a second variable by simulating an input/output machine; e.g., “x +12 machine” means if 8 goes in 20 comes out, or 1 sandwich costs \$0.99, so 2 cost _____</p> <p>9. Describe how change in one variable affects the value of a related variable; e.g., as one increases the other increases, or as one increases the other decreases.</p>	<p>1. Describe, extend and determine a general rule for <u>arithmetic</u> and <u>geometric patterns</u>.</p> <p>2. Use calculators or computers to develop patterns and generalize them using tables and graphs.</p> <p>3. Use rules to describe patterns, <u>functions</u> and other <u>mathematical relationships</u>.</p> <p>4. Use variables as unknown quantities in general rules when describing patterns and other relationships.</p> <p>5. Write simple <u>expressions</u> and <u>equations</u> using variables to represent problem situations.</p> <p>6. Find the solutions of open sentences including equalities and inequalities.</p> <p>7. Investigate how a change in one variable relates to a change in a related variable; e.g., describe how the rate of growth varies over time, based upon data in a table or graph,</p> <p>8. Use representations such as tables, graphs and equations to model situations and to solve problems, especially those that involve <u>linear relationships</u>.</p>	<p>1. Represent and analyze patterns, rules and functions using physical materials, tables and graphs.</p> <p>2. Use words and symbols to describe arithmetic and geometric patterns and be able to find the next <u>term</u> of a pattern.</p> <p>3. Identify, formulate, and graph functions with graph paper, a computer, or a graphing calculator.</p> <p>4. Produce and interpret graphs that represent the relationship between two variables.</p> <p>5. Identify and describe situations with <u>constant</u> or <u>varying rates of change</u>, and compare them.</p> <p>6. Use technology to analyze change; e.g., use computer applications or graphing calculators to display and interpret <u>rate of change</u>.</p> <p>7. Evaluate simple <u>expressions</u> by replacing variables with given values, and use formulas in problem-solving situations.</p> <p>8. Recognize and generate equivalent forms of algebraic expressions, and explain how the <u>commutative</u>, <u>associative</u> and <u>distributive properties</u> can be used to generate equivalent forms; e.g., perimeter as $2(l + w)$ or $2l + 2w$.</p> <p>9. Solve simple <u>linear equations</u> and <u>inequalities</u> using physical models, paper and pencil, tables and graphs.</p>

Data Analysis and Probability Standard

Students pose questions and collect, organize, represent, interpret and analyze data to answer those questions. Students develop and evaluate inferences, predictions and arguments that are based on data.

Grade 4 Indicators	Grade 5 Indicators	Grade 6 Indicators
<p>1. Create a plan for collecting data for a specific purpose.</p> <p>2. Represent and interpret data using <u>tables</u>, <u>bar graphs</u>, <u>line plots</u> and <u>line graphs</u>.</p> <p>3. Interpret and construct <u>Venn diagrams</u> to sort and describe data.</p> <p>4. Compare different <u>representations</u> of the same data to evaluate orally and in writing how well each representation shows important aspects of the data.</p> <p>5. Identify the <u>median</u> of a set of data and describe what it indicates about the data.</p> <p>6. Identify the <u>range</u> of a set of data.</p> <p>7. Use <u>range</u>, <u>median</u> and <u>mode</u> to make comparisons about related sets of data.</p> <p>8. Describe the characteristics of a set of data based on <u>graphical representations</u>; e.g., <u>range of the data</u>, <u>clumps of data</u> and <u>holes in the data</u>.</p> <p>9. Represent the likelihood of <u>possible outcomes</u> for <u>chance situations</u>; e.g., probability of selecting a red marble from a bag containing 3 red and 5 white marbles.</p> <p>10. Place events in order of likelihood and use a diagram of appropriate language to compare the chance of each event occurring; e.g., <u>impossible</u>, <u>unlikely</u>, <u>equally likely</u>, <u>certain</u>.</p> <p>11. Conduct simple <u>probability experiments</u> and draw conclusions from the results; e.g., rolling number cubes or drawing marbles from a bag.</p>	<p>1. Design investigations to address a question and consider how data collection methods affect the nature of the data set.</p> <p>2. Select and use a graph that is appropriate for the type of data to be displayed; e.g. <u>numerical</u> vs. <u>categorical data</u>, <u>discrete</u> vs. <u>continuous data</u>).</p> <p>3. Read, interpret and represent data using <u>frequency tables</u>, <u>bar graphs</u>, <u>line graphs</u>, <u>line plots</u>, and <u>circle graphs</u>.</p> <p>4. Read and interpret increasingly complex displays of data, such as <u>double bar graphs</u>.</p> <p>5. Identify and use <u>measures of central tendency</u>, including <u>mean</u>, <u>median</u>, <u>mode</u> and <u>range</u>, to evaluate and analyze data.</p> <p>6. List and explain all possible outcomes of simple experiments or problems situations using methods such as <u>lists</u>, <u>arrays</u> and <u>tree diagrams</u>; e.g., number of arrangements for 3 or 4 items; number of possible sandwiches combinations from 4 meats, 2 cheeses, 3 bread choices.</p> <p>7. Describe the <u>probability</u> of an event using <u>ratios</u> in all three forms; e.g., $\frac{1}{2}$, 1 to 2, 1:2.</p> <p>8. Use 0, 1 and ratios between 0 and 1 to represent the probability of outcomes for an event, and associate the ratio with the likelihood of the outcome; e.g., probability of rolling a six with a single die.</p> <p>9. Compare the <u>theoretical results</u> with the <u>experimental results</u> of a simple experiment; e.g., what should happen (theoretical/expected results) compared to what actually did happen (experimental/actual results).</p>	<p>1. Read, interpret and construct <u>picture</u>, <u>bar</u>, <u>line</u>, <u>circle</u> and <u>coordinate graphs</u>, <u>tables</u>, and <u>histograms</u>.</p> <p>2. Select, create and use graphical representations that are appropriate for the type of data collected.</p> <p>3. Compare orally and in writing representations of the same data in different types of graphs, such as a bar graph and circle graph.</p> <p>4. Give an oral and written analysis of a set of data by using and comparing <u>measures of central tendency</u> (<u>mean</u>, <u>median</u> and <u>mode</u>) and <u>measures of spread</u> (<u>range</u>).</p> <p>5. Describe the <u>frequency distribution</u> of a set of data, as shown in a histogram or frequency table, by general appearance or shape; e.g., number of <u>modes</u>, <u>middle of data</u>, and <u>level of symmetry</u>, <u>outliers</u>.</p> <p>6. Read, develop, interpret, and use tables, charts, and graphs to identify patterns, note trends, draw conclusions, make predictions, and explore effect of <u>changing scale</u>.</p> <p>7. Design an experiment to test a <u>theoretical probability</u> and explain how the results may vary.</p> <p>8. Use conjectures to formulate new questions, plan new studies, and detect misuses of <u>statistical</u> or <u>numerical information</u>.</p> <p>9. List and explain all possible outcomes of simple experiments or problems situations using methods such as <u>lists</u>, <u>arrays</u> and <u>tree diagrams</u>.</p> <p>10. Develop an understanding of the difference between the between <u>single events</u> and <u>compound events</u>.</p>

Grade 4 Indicators	Grade 5 Indicators	Grade 6 Indicators
<p>12. List and count all <u>possible combinations</u> using one member from each of several sets; e.g., make a <u>tree diagram</u> to show the number of possible outfits from 3 shirts, 2 shorts and 2 pairs of shoes.</p> <p>13. Relate the concepts of <u>impossible</u> and <u>certain-to-happen</u> events to the numerical values of 0 (impossible) and 1 (certain).</p>	<p>10. Make predictions, in oral and written form, based on experimental and <u>theoretical probabilities</u>.</p>	