

## 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 6 Indicators	Grade 7 Indicators	Grade 8 Indicators
<p><b><u>Problem Solving</u></b></p> <ol style="list-style-type: none"> <li>1. Apply and adapt a variety of appropriate strategies to solve problems:               <ul style="list-style-type: none"> <li>• create a mathematical model</li> <li>• draw a picture</li> <li>• act it out</li> <li>• look for a pattern</li> <li>• guess and check</li> <li>• make an organized list</li> <li>• make a simpler but similar problem</li> <li>• work backwards</li> <li>• use a formula</li> <li>• make a scale drawing</li> </ul> </li> <li>2. Understand when estimation, mental arithmetic, or paper and pencil calculation is more appropriate than technology.</li> <li>3. Use an appropriate tool when the numbers are not easily calculated mentally, when an exact answer is needed, or when computation involves several numbers.</li> <li>4. Consider alternative strategies and/or blend strategies.</li> </ol> <p><b><u>Reasoning and Proof</u></b></p> <ol style="list-style-type: none"> <li>1. Use models and logic to make conclusions.</li> <li>2. Adjust models as needed.</li> <li>3. Reason inductively by identifying patterns.</li> <li>4. Evaluate and analyze the mathematical thinking and strategies of others, orally and in writing.</li> <li>5. Include enough detail and clarity that the reader/listener can follow the explanation.</li> <li>6. Make multiple trials using manipulatives, drawings or paper and pencil.</li> <li>7. Look for a case that doesn't work; e.g., a counter-example.</li> </ol> <p><b><u>Communication</u></b></p> <ol style="list-style-type: none"> <li>1. Use developmentally appropriate mathematical</li> </ol>	<p><b><u>Problem Solving</u></b></p> <ol style="list-style-type: none"> <li>1. Apply and adapt a variety of appropriate strategies to solve problems:               <ul style="list-style-type: none"> <li>• create a mathematical model</li> <li>• draw a picture</li> <li>• act it out</li> <li>• look for a pattern</li> <li>• guess and check</li> <li>• make an organized list</li> <li>• make a simpler but similar problem</li> <li>• work backwards</li> <li>• use a formula</li> <li>• make a scale drawing</li> <li>• make and state assumptions</li> </ul> </li> <li>2. Understand when estimation, mental arithmetic, or paper and pencil calculation is more appropriate than technology.</li> <li>3. Use an appropriate tool when the numbers are not easily calculated mentally, when an exact answer is needed, or when computation involves several numbers.</li> <li>4. Consider alternative strategies and/or blend strategies.</li> </ol> <p><b><u>Reasoning and Proof</u></b></p> <ol style="list-style-type: none"> <li>1. Use models and logic to make conclusions.</li> <li>2. Adjust models as needed.</li> <li>3. Reason inductively by identifying patterns.</li> <li>4. Evaluate and analyze the mathematical thinking and strategies of others, orally and in writing.</li> <li>5. Include enough detail and clarity that the reader/listener can follow the explanation.</li> <li>6. Make multiple trials using manipulatives, drawings or paper and pencil.</li> <li>7. Look for a case that doesn't work; e.g., a counter-example.</li> <li>8. Recognize the characteristics of an acceptable argument/proof.</li> </ol>	<p><b><u>Problem Solving</u></b></p> <ol style="list-style-type: none"> <li>1. Apply and adapt a variety of appropriate strategies to solve problems:               <ul style="list-style-type: none"> <li>• create a mathematical model</li> <li>• draw a picture</li> <li>• act it out</li> <li>• look for a pattern</li> <li>• guess and check</li> <li>• make an organized list</li> <li>• make a simpler but similar problem</li> <li>• work backwards</li> <li>• use a formula</li> <li>• make a scale drawing</li> <li>• make and state assumptions</li> <li>• consider extensions and variations to the problem and solution</li> </ul> </li> <li>2. Understand when estimation, mental arithmetic, or paper and pencil calculation is more appropriate than technology.</li> <li>3. Use an appropriate tool when the numbers are not easily calculated mentally, when an exact answer is needed, or when computation involves several numbers.</li> <li>4. Consider alternative strategies and/or blend strategies.</li> </ol> <p><b><u>Reasoning and Proof</u></b></p> <ol style="list-style-type: none"> <li>1. Use models and logic to make conclusions.</li> <li>2. Adjust models as needed.</li> <li>3. Reason inductively by identifying patterns.</li> <li>4. Evaluate and analyze the mathematical thinking and strategies of others, orally and in writing.</li> <li>5. Include enough detail and clarity that the reader/listener can follow the explanation.</li> <li>6. Make multiple trials using manipulatives, drawings or paper and pencil.</li> <li>7. Look for a case that doesn't work; e.g., a counter-example.</li> </ol>

Grade 6 Indicators	Grade 7 Indicators	Grade 8 Indicators
<p>language and vocabulary.</p> <ol style="list-style-type: none"> <li>Respond to instructions orally, visually and in writing as appropriate; e.g., tell, share, describe, demonstrate, compare, discuss, write.</li> <li>Respond clearly with sufficient detail so that thinking can be understood.</li> <li>Present thinking in a logical and organized in manner and explain to others how a problem was solved.</li> <li>Read and reread all of the given information and instructions to ensure understanding; e.g., identify key information needed to solve the problem.</li> <li>Interpret and summarize information from charts and graphs providing appropriate detail; e.g., describe patterns and contrasts.</li> <li>Communicate mathematical learning by combining various representations; e.g., words with diagrams, charts and graphs with verbal descriptions.</li> <li>Use the symbolic language of mathematics correctly, e.g. using = between two equal expressions, use <math>\angle</math> to name angles.</li> </ol> <p><u>Connections</u></p> <ol style="list-style-type: none"> <li>Use learning from one area of mathematics to understand another.</li> <li>Relate new and prior knowledge to make sense of new concepts being learned.</li> <li>Make connections between mathematics and everyday life.</li> <li>Apply a strategy or reference system that draws on previous learning in another context.</li> <li>Make connections between different representations; e.g., numeric, graphical, and/or algebraic.</li> </ol> <p><u>Representation</u></p> <ol style="list-style-type: none"> <li>Select an appropriate representation of a mathematical idea or situation: <ul style="list-style-type: none"> <li>physical model/manipulative</li> <li>picture/drawing/diagram</li> <li>numerical</li> <li>geometric</li> <li>graphical</li> <li>table/chart</li> </ul> </li> </ol>	<p><u>Grade 7 Indicators</u></p> <p><u>Communication</u></p> <ol style="list-style-type: none"> <li>Use developmentally appropriate mathematical language and vocabulary.</li> <li>Respond to instructions orally, visually and in writing as appropriate; e.g., tell, share, describe, demonstrate, compare, discuss, write.</li> <li>Respond clearly with sufficient detail so that thinking can be understood.</li> <li>Present thinking in a logical and organized in manner and explain to others how a problem was solved.</li> <li>Read and reread all of the given information and instructions to ensure understanding; e.g., identify key information needed to solve the problem.</li> <li>Interpret and summarize information from charts and graphs providing appropriate detail; e.g., describe patterns and contrasts.</li> <li>Communicate mathematical learning by combining various representations; e.g., words with diagrams, charts and graphs with verbal descriptions.</li> <li>Use the symbolic language of mathematics correctly, e.g. using = between two equal expressions, use <math>\angle</math> to name angles.</li> </ol> <p><u>Connections</u></p> <ol style="list-style-type: none"> <li>Use learning from one area of mathematics to understand another.</li> <li>Relate new and prior knowledge to make sense of new concepts being learned.</li> <li>Make connections between mathematics and everyday life.</li> <li>Apply a strategy or reference system that draws on previous learning in another context.</li> <li>Make connections between different representations; e.g., numeric, graphical, and/or algebraic.</li> </ol> <p><u>Representation</u></p> <ol style="list-style-type: none"> <li>Select an appropriate representation of a mathematical idea or situation: <ul style="list-style-type: none"> <li>physical model/manipulative</li> <li>picture/drawing/diagram</li> <li>numerical</li> </ul> </li> </ol>	<ol style="list-style-type: none"> <li>Recognize the characteristics of an acceptable argument/proof.</li> <li>Follow and understand an argument or proof presented by someone else.</li> </ol> <p><u>Communication</u></p> <ol style="list-style-type: none"> <li>Use developmentally appropriate mathematical language and vocabulary.</li> <li>Respond to instructions orally, visually and in writing as appropriate; e.g., tell, share, describe, demonstrate, compare, discuss, write.</li> <li>Respond clearly with sufficient detail so that thinking can be understood.</li> <li>Present thinking in a logical and organized in manner and explain to others how a problem was solved.</li> <li>Read and reread all of the given information and instructions to ensure understanding; e.g., identify key information needed to solve the problem.</li> <li>Interpret and summarize information from charts and graphs providing appropriate detail; e.g., describe patterns and contrasts.</li> <li>Communicate mathematical learning by combining various representations; e.g., words with diagrams, charts and graphs with verbal descriptions.</li> <li>Use the symbolic language of mathematics correctly, e.g. using = between two equal expressions, use <math>\angle</math> to name angles.</li> </ol> <p><u>Connections</u></p> <ol style="list-style-type: none"> <li>Use learning from one area of mathematics to understand another.</li> <li>Relate new and prior knowledge to make sense of new concepts being learned.</li> <li>Make connections between mathematics and everyday life.</li> <li>Apply a strategy or reference system that draws on previous learning in another context.</li> <li>Make connections between different representations; e.g., numeric, graphical, and/or algebraic.</li> </ol> <p><u>Representation</u></p>

Grade 6 Indicators	Grade 7 Indicators	Grade 8 Indicators
<ul style="list-style-type: none"> <li>• graphical organizers/Venn diagram</li> <li>• equation/algebraic expression/formula</li> <li>• scale drawing</li> </ul> <ol style="list-style-type: none"> <li>2. Understand that more than one representation can be used to appropriately represent the same mathematical idea or situation.</li> <li>3. Use multiple representations, as required; e.g., table/chart, graph.</li> <li>4. Understand that there may be different variations of one representation; e.g., <math>2l + 2w</math> is the same as <math>2(l + w)</math>.</li> <li>5. Understand the role of constants and variables in formulas and patterning rules.</li> </ol> <p><u>Reflection</u></p> <ol style="list-style-type: none"> <li>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.</li> <li>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"> <li>• What did you do in math today?</li> <li>• What did you learn in math today?</li> <li>• Was what you learned easy or difficult?</li> <li>• What did you like or dislike about today's lesson?</li> <li>• What are some of the math words you used today?</li> <li>• What did you not understand in math today?</li> <li>• Describe uses for what you learned in math today.</li> </ul> </li> </ol>	<ul style="list-style-type: none"> <li>• geometric</li> <li>• graphical</li> <li>• table/chart</li> <li>• graphical organizers/Venn diagram</li> <li>• equation/algebraic expression/formula</li> <li>• scale drawing</li> <li>• algorithm/logic model</li> </ul> <ol style="list-style-type: none"> <li>2. 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Grade 6 Indicators	Grade 7 Indicators	Grade 8 Indicators

## 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.*

Grade 6 Indicators	Grade 7 Indicators	Grade 8 Indicators
<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., <math>32 = 2 \times 2 \times 2 \times 2 \times 2 = 2^5</math>.</p> <p>7. Find the <u>greatest common factor</u> (GCF) and the <u>least common multiple</u> (LCM) of two given numbers using <u>prime factorization</u>.</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 (<math>14 \times 14</math>).</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 <math>&gt;</math>, <math>&lt;</math>, <math>\geq</math>, <math>\leq</math> or <math>=</math>.</p>	<p>1. Read and write large numbers in <u>standard form</u> and in <u>scientific notation</u>.</p> <p>2. Use the order of operations to simplify <u>numerical expressions</u>, with and without grouping symbols and exponents.</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. Demonstrate fluency with adding, subtracting, multiplying and dividing fractions and mixed numbers.</p> <p>5. Change percents to fractions and decimals.</p> <p>6. Use <math>&gt;</math>, <math>&lt;</math>, <math>\geq</math>, <math>\leq</math>, <math>=</math> to compare and order fractions, decimals and percents.</p> <p>7. Work flexibly with fractions, decimals, and percents to solve problems.</p> <p>8. Develop meaning for percents greater than 100 and less than 1.</p> <p>9. Estimate, compute and solve problems involving proportions.</p> <p>10. Find a number (whole) when a percent of it is known; e.g., the number 24 is 40% of _____.</p> <p>11. Find the percent (%) one number is of another; e.g., 24 is _____ % of 60.</p> <p>12. Find a percent (part) of a number; e.g., 40% of 60 is _____.</p> <p>13. Compute <u>discount</u>, <u>rate of discount</u>, and <u>sale</u></p>	<p>1. Explain the meaning of exponents that are negative or 0.</p> <p>2. Read and write large numbers and numbers between zero and one in <u>scientific notation</u>.</p> <p>3. Add, subtract, multiply, divide and compare numbers written in scientific notation,</p> <p>4. Apply the order of operations to simplify expressions and perform computations involving <u>integer exponents</u> and <u>radicals</u>.</p> <p>5. Use the <u>inverse</u> and <u>identity properties</u> to solve equations.</p> <p>6. Recognize <u>perfect square numbers</u> and their <u>roots</u> up to 900 (<math>30 \times 30</math>).</p> <p>7. Approximate the square root of non-perfect square numbers; e.g., the square root of 200 is between 14 and 15.</p> <p>8. Write square roots in simplest form; e.g., <math>\sqrt{576} = 24</math>, <math>\sqrt{40} = \sqrt{4 \times 10} = 2\sqrt{10}</math>.</p> <p>9. Perform computations (<math>+</math>, <math>-</math>, <math>\times</math>, <math>\div</math>) involving square roots.</p> <p>10. Demonstrate fluency with performing computations involving <u>integers</u> and <u>rational exponents</u>.</p> <p>11. Recognize that <u>natural numbers</u>, <u>whole numbers</u>, <u>integers</u>, <u>rational numbers</u> and <u>irrational numbers</u> are <u>subsets</u> of the <u>real number system</u>.</p>

Grade 6 Indicators	Grade 7 Indicators	Grade 8 Indicators
<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., <math>\frac{7}{8} + \frac{12}{13} \approx 2</math> and <math>4.23 \times 5.8 \approx 25</math></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 <math>&lt;</math>, <math>&gt;</math>, <math>\leq</math>, <math>\geq</math>, <math>=</math> 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? <math>-15 + 8 = -7</math></p>	<p><u>prices</u>.</p> <p>14. Find the <u>total cost</u> of an item or service including sales tax and/or tip.</p> <p>15. Compute total cost of an item bought on an <u>installment plan</u>.</p> <p>16. Compute percent increase and percent decrease.</p> <p>17. Compute <u>commission</u>, <u>sales</u>, and <u>rate of commission</u>.</p> <p>18. Complete a household <u>budget</u>, write checks and deposits, and balance a checkbook.</p> <p>19. Describe the difference between <u>rational</u> and <u>irrational numbers</u>.</p> <p>20. Use <math>&gt;</math>, <math>&lt;</math>, and <math>=</math> to compare <u>integers</u>.</p> <p>21. Explain the meaning and effect of adding, subtracting, multiplying and dividing integers; e.g., how adding two integers can result in a lesser value.</p> <p>22. Simplify <u>numerical expressions</u> involving integers and use integers to solve real-life problems.</p> <p>23. Use the <u>order of operations</u> and <u>properties</u> to simplify numerical expressions involving integers, fractions and decimals.</p> <p>24. Define and use the symbol for <u>absolute value</u>.</p> <p>25. Recognize <u>perfect square numbers</u> and their <u>roots</u> up to 400 (<math>20 \times 20</math>).</p> <p>26. Approximate the square root of non-perfect square numbers; e.g., the square root of 130 is between 11 and 12.</p> <p>27. Write square roots in simplest form; e.g., <math>\sqrt{225} = 15</math>, <math>\sqrt{27} = \sqrt{9 \times 3} = 3\sqrt{3}</math></p>	<p>12. Explain and use the inverse and identity properties and use inverse relationships (addition/subtraction, multiplication/division, squaring/square roots) in problem solving situations.</p> <p>13. Determine when an estimate is sufficient and when an exact answer is needed in problem situations, and evaluate estimates in relation to actual answers; e.g., very close, less than, greater than.</p> <p>14. Estimate, compute and solve problems involving rational numbers, including ratio, proportion and percent, and judge the reasonableness of solutions.</p>

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	28. Estimate, compute and solve problems involving <u>proportions</u> , <u>scaling</u> , <u>ratios</u> , <u>absolute value</u> , <u>square roots</u> and <u>exponents</u> .	

## Measurement Standard

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

Grade 6	Grade 7	Grade 8
<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 <math>\frac{1}{16}</math> 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>	<p>1. Identify, use, and perform operations with both <u>metric</u> and <u>customary units</u> of measure.</p> <p>2. Understand relationships among units and convert from one to another within same system to include <u>linear</u> measurement, <u>area</u> and <u>volume</u>; e.g., feet to yards, square feet to square yards, cubic feet to cubic yards.</p> <p>3. Compare <u>Fahrenheit</u> temperature to <u>Celsius</u> temperature and know basic conversions.</p> <p>4. Use appropriate levels of precision when estimating and calculating with measurements.</p> <p>5. Develop and use formulas to determine area of triangles, parallelograms, and trapezoids.</p> <p>6. Use formulas for determining the circumference and area of circles and to determine the area of <u>sectors</u>; e.g., <math>\frac{1}{2}</math> circle, <math>\frac{1}{3}</math> circle.</p> <p>7. Develop and use formulas to find the <u>surface area</u> and <u>volume</u> of prisms, cylinders, and pyramids.</p> <p>8. Develop strategies to find the area of <u>composite shapes</u> using the areas of squares, rectangles, triangles, parallelograms, circles, and <u>sectors</u>.</p> <p>9. Explain the difference between <u>surface area</u> and <u>volume</u> and demonstrate that two objects may have the same surface area, but different volumes or vice versa.</p> <p>10. Describe what happens to the surface area and volume of a three-dimensional figure when the measurements are changed; e.g., length of sides are doubled or halved.</p>	<p>1. Identify, use, compare, and perform operations with both <u>metric</u> and <u>customary units</u> of measure.</p> <p>2. Convert units from one measuring system to another; e.g., lbs. to kg, inches to cm, liters to gallons, miles to kilometers.</p> <p>3. Develop and use formulas to convert <u>Fahrenheit</u> temperatures to <u>Celsius</u> temperatures.</p> <p>4. Use appropriate levels of precision when estimating and calculating with measurements and explain reasoning in writing.</p> <p>5. Select appropriate methods for estimating measurements.</p> <p>6. Find the area of <u>composite shapes</u> and <u>complex shapes</u> using the areas of squares, rectangles, triangles, parallelograms, trapezoids and circles.</p> <p>7. Derive and justify formulas for <u>surface area</u> and <u>volume</u> using geometric models and common materials.</p> <p>8. Develop and use formulas to find the surface area and volume of prisms, cylinders, pyramids, cones and spheres using <u>geometric models</u>, <u>geometric nets</u> and common materials.</p> <p>9. Solve and determine the reasonableness of the results for problems involving <u>distance</u>, <u>rate</u>, and <u>time</u>.</p> <p>10. Apply proportional reasoning to solve problems involving <u>indirect measurements</u> or rates.</p> <p>11. Find the sum of the <u>interior</u> and <u>exterior angles</u> of regular <u>convex polygons</u> with and without measuring the angles with a protractor.</p>

Grade 6	Grade 7	Grade 8
<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., <math>\frac{1}{2}</math> circle, <math>\frac{1}{3}</math> 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>	<p>11. Select appropriate units for measuring derived measurements; e.g., miles per hour, revolutions per minute.</p> <p>12. Use proportions to make and read <u>scale drawings</u> and models.</p>	<p>12. Use proportions to make and read scale drawings and models.</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 6 Indicators	Grade 7 Indicators	Grade 8 Indicators
<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>	<p>1. Determine when one set of figures is a <u>subset</u> of another; e.g., all squares are rectangles.</p> <p>2. Develop a set of properties that eliminate all but the desired figure; e.g., only squares are quadrilaterals with all sides congruent and all angles congruent.</p> <p>3. Recognize and define <u>complementary</u> and <u>supplementary angles</u>.</p> <p>4. Construct congruent line segments and angles using a <u>compass</u> and a <u>straight edge</u>.</p> <p>5. <u>Bisect</u> line segments and angles using a <u>compass</u> and <u>straight edge</u>.</p> <p>6. Build 3D models of <u>prisms</u>, <u>cylinders</u>, <u>pyramids</u>, investigate their properties and identify their <u>nets</u>.</p> <p>7. Draw representations of three-dimensional geometric objects from different views.</p> <p>8. Apply <u>theorems</u> about the sum of interior angles of <u>regular polygons</u>; e.g., determine the sum of interior angles of a regular pentagon.</p> <p>9. Determine the measure of each interior angle of a regular polygon.</p> <p>10. Use <u>proportional reasoning</u> to describe and express relationships between parts and attributes of <u>similar</u> and <u>congruent figures</u>.</p> <p>11. Determine and use <u>scale factors</u> for similar figures to solve problems using proportional reasoning.</p> <p>12. Perform <u>translations</u>, <u>reflections</u>, <u>rotations</u> and <u>dilations</u> of two-dimensional figures using a variety of methods; e.g., paper folding, tracing, graph paper.</p>	<p>1. Build 3D models of <u>prisms</u>, <u>cylinders</u>, <u>pyramids</u>, and <u>cones</u> and investigate their properties.</p> <p>2. Identify and draw nets for a variety of <u>prisms</u>, <u>pyramids</u>, <u>cylinders</u> and <u>cones</u>.</p> <p>3. Define and use the terms <u>parallel</u>, <u>perpendicular</u>, and <u>transversal</u>.</p> <p>4. Define and identify types of angles; <u>adjacent</u>, <u>vertical</u>, <u>alternate interior</u>, <u>alternate exterior</u>, and <u>corresponding</u>.</p> <p>5. Determine the angle measures of angles created by parallel lines and a transversal.</p> <p>6. Apply theorems about the sum of <u>interior</u> and <u>exterior angles</u> of regular polygons.</p> <p>7. Understand and use the <u>Pythagorean Theorem</u> formula to solve problems involving right triangles.</p> <p>8. Find the missing side lengths of a <u>45-45-90 degree triangle</u> given the length of one side.</p> <p>9. Find the missing side lengths of a <u>30-60-90 degree triangle</u> given the length of one side.</p> <p>10. Define, locate, and draw images of figures by <u>translation</u>, <u>reflection</u>, <u>rotation</u>, and <u>scaling</u>.</p> <p>11. Draw the results of <u>translations</u>, <u>reflections</u>, <u>rotations</u> and <u>dilations</u> of objects in a coordinate plane.</p> <p>12. Represent and analyze shapes using <u>coordinate geometry</u>; e.g., given three vertices and the type of quadrilateral, find the coordinates of the fourth vertex.</p>

Grade 6 Indicators	Grade 7 Indicators	Grade 8 Indicators
<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>	<p>13. Explore the meaning of and use the <u>Pythagorean Theorem</u> to find the missing side length of a right triangle given the other two sides.</p> <p>14. Apply properties of <u>congruent or similar triangles</u> to solve problems involving missing side lengths and angle measures.</p>	<p>13. Use proportions in several forms to solve problems involving similar figures (<u>part to part</u>, <u>part to whole</u>, <u>corresponding sides between figures</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 6 Indicators	Grade 7 Indicators	Grade 8 Indicators
<ol style="list-style-type: none"> <li>1. Represent and analyze patterns, rules and functions using physical materials, tables and graphs.</li> <li>2. Use words and symbols to describe arithmetic and geometric patterns and be able to find the next <u>term</u> of a pattern.</li> <li>3. Identify, formulate, and graph functions with graph paper, a computer, or a graphing calculator.</li> <li>4. Produce and interpret graphs that represent the relationship between two variables.</li> <li>5. Identify and describe situations with <u>constant</u> or <u>varying rates of change</u>, and compare them.</li> <li>6. Use technology to analyze change; e.g., use computer applications or graphing calculators to display and interpret <u>rate of change</u>.</li> <li>7. Evaluate simple <u>expressions</u> by replacing variables with given values, and use formulas in problem-solving situations.</li> <li>8. Recognize and generate equivalent forms of algebraic expressions, and explain how the <u>commutative, associative and distributive properties</u> can be used to generate equivalent forms; e.g., perimeter as <math>2(l + w)</math> or <math>2l + 2w</math>.</li> <li>9. Solve simple <u>linear equations</u> and <u>inequalities</u> using physical models, paper and pencil, tables and graphs.</li> </ol>	<ol style="list-style-type: none"> <li>1. Represent and analyze patterns, rules and functions with words, tables, graphs, and simple variable expressions</li> <li>2. Use words and symbols to describe arithmetic and geometric patterns and be able to find the next term of a pattern.</li> <li>3. Recognize and explain when numerical patterns are <u>linear</u> or <u>nonlinear</u> progressions; e.g., 1,3,5,7... is linear and 1, 3, 4, 8, 16... is nonlinear.</li> <li>4. Identify, formulate, and graph functions with graph paper, a computer or a graphing calculator.</li> <li>5. Express numbers and <u>variable expressions</u> using exponents.</li> <li>6. Recognize a variety of uses for variables; e.g. placeholder for an unknown quantity in an equation, generalization for a pattern, formula.</li> <li>7. Recognize and combine like <u>algebraic terms</u>.</li> <li>8. Justify that two forms of an algebraic expression are equivalent, and recognize when an expression is simplified; e.g., <math>4m = m + m + m + m</math> or <math>a \times 5 + 4 = 5a + 4</math></li> <li>9. <u>Evaluate expressions</u> by replacing variables with given values, and use formulas in problem-solving situations.</li> <li>10. Translate word phrases into <u>algebraic expressions</u>.</li> <li>11. Use order of operations with regard to <u>algebraic logic</u>.</li> </ol>	<ol style="list-style-type: none"> <li>1. Generalize patterns and sequences by describing how to find the <i>n</i>th term.</li> <li>2. Represent, analyze, and generalize a variety of patterns and functions with tables, graphs, words, and symbolic rules.</li> <li>3. Identify, formulate, identify, and graph functions with graph paper, a computer or a graphing calculator.</li> <li>4. Identify functions as <u>linear</u> or <u>nonlinear</u> based on information given in a table, graph or equation.</li> <li>5. <u>Evaluate algebraic expressions</u> when given replacement values.</li> <li>6. Translate word phrases into algebraic expressions and simplify them.</li> <li>7. Use <u>symbolic algebra</u> (algebraic expressions, equations and inequalities), graphs and tables to represent situations and solve problems.</li> <li>8. Use order of operations with regard to arithmetic and algebraic logic to simplify algebraic expressions and to solve equations and inequalities.</li> <li>9. Extend the uses of variables to include <u>covariants</u> where <i>y</i> depends on <i>x</i>.</li> <li>10. Define and use terms <u>monomial, binomial, trinomial, polynomial, term, variable, exponent, factor, and coefficient</u>.</li> <li>11. Use physical models to add and subtract monomials and polynomials, and to multiply a polynomial by a monomial.</li> </ol>

Grade 6 Indicators	Grade 7 Indicators	Grade 8 Indicators
	<p>12. Create visual representations of equation-solving processes that model the use of <u>inverse operations</u>.</p> <p>13. Solve <u>one-step linear equations and inequalities</u> involving +, -, x and ÷.</p> <p>14. Graph linear equations and inequalities on a number line or a coordinate plane.</p> <p>15. Use computers or graphing calculators to analyze change; e.g., distance-time relationships.</p>	<p>12. Use a calculator to extend the concepts of inverse operations.</p> <p>13. Solve multiple step linear equations and inequalities involving +, -, x and ÷, graphically, symbolically and using a graphing calculator.</p> <p>14. Solve <u>2 by 2 systems</u> of linear equations graphically and by simple substitution.</p> <p>15. Interpret the meaning of the solution of a 2 by 2 system of equations; e.g., point, line, no solution.</p> <p>16. Solve simple <u>quadratic equations</u> graphically; e.g., <math>y = x^2 - 16</math></p> <p>17. Compute and interpret <u>slope</u>, <u>midpoint</u> and <u>distance</u> given a set of ordered pairs.</p> <p>18. Plot points in the <u>Cartesian plane</u> and determine the slope of the line they form.</p> <p>19. Describe the relationship between the graph of a line and its equation, including being able to explain the meaning of slope as a constant rate of change and y-intercept in real-world problems.</p> <p>20. Analyze change in various contents such as <u>linear</u> vs. <u>nonlinear</u>, <u>continuous</u> vs. <u>non-continuous</u>.</p> <p>21. Use graphing calculators or computers to analyze change; e.g., interest compounded over time as a nonlinear growth pattern.</p> <p>22. Add, subtract, multiply and divide monomials, polynomials (division of polynomials by monomials only).</p> <p>23. Simplify rational expressions by eliminating common factors and applying properties of integer exponents.</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 6 Indicators	Grade 7 Indicators	Grade 8 Indicators
<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>	<p>1. Read, interpret, and construct <u>picture</u>, <u>bar</u>, <u>line</u>, <u>circle</u> and <u>coordinate</u> (all four quadrants) <u>graphs</u>, <u>tables</u> and <u>histograms</u>. Include <u>double bar</u> and <u>double line graphs</u>.</p> <p>2. Read, interpret and construct <u>box-and-whisker plots</u>, and <u>stem-and-leaf plots</u>.</p> <p>3. Analyze how decisions about graphing affect the graphical representation; e.g., scale, size of classes in a histogram, number of categories in a circle graph.</p> <p>4. Find the <u>mean</u>, <u>median</u>, <u>mode</u>, and <u>range</u> and determine which <u>measure of central tendency</u> is most appropriate.</p> <p>5. Analyze a set of data by using and comparing measures of central tendency (mean, median and mode) and measures of spread (<u>range</u>, <u>quartile</u>, <u>interquartile range</u>), and describe how the inclusion or exclusion of <u>outliers</u> affects those measures.</p> <p>6. Compare data from two or more samples to determine how sample selection can influence results.</p> <p>7. Identify misuses of statistical data in articles, advertisements, and other media.</p> <p>8. Collect data to design a statistical experiment to study a problem.</p> <p>9. Construct convincing arguments based on analysis of data and interpretation of graphs.</p> <p>10. Explain the difference between <u>single events</u> and <u>compound events</u> and find the probability of single events or compound events occurring.</p>	<p>1. Read, interpret, and construct <u>picture</u>, <u>bar</u>, <u>line</u>, <u>circle</u> and <u>coordinate</u> (all four quadrants) <u>graphs</u>, <u>tables</u> and <u>histograms</u>. Include <u>double bar</u> and <u>double line graphs</u>.</p> <p>2. Read, interpret and construct <u>box-and-whisker plots</u>, <u>stem-and-leaf plots</u> and <u>scatterplots</u>.</p> <p>3. Make <u>conjectures</u> about possible relationships in a scatterplot and approximate <u>line of best fit</u>.</p> <p>4. 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>5. Evaluate different graphical representations of the same data to determine which one is the most appropriate representation for an identified purpose; e.g., line graph for change over time, circle graph for part to whole comparison, scatterplot for relationship between two <u>variants</u>.</p> <p>6. Find the mean, median, mode, and range and determine which measure of central tendency is most appropriate.</p> <p>7. Explain the mean's sensitivity to <u>extremes</u> and its use in comparison with the median and mode.</p> <p>8. Compare two sets of data using measures of central tendency (mean, mode, median) and measures of spread (<u>range</u>, <u>quartiles</u>, <u>interquartile range</u>, <u>percentiles</u>).</p> <p>9. Use conjectures to formulate new questions, plan new studies, and detect misuses of statistical or numerical information.</p>

Grade 6 Indicators	Grade 7 Indicators	Grade 8 Indicators
	<p>11. Make predictions, test the predictions and compare the <u>actual results</u> to the <u>predicted results</u>.</p> <p>12. Identify <u>permutations</u> and <u>combinations</u> and the relationships between them.</p> <p>13. Perform calculations and simplify <u>factorials</u> expressions; e.g., <math>4! = 4 \times 3 \times 2 \times 1 = 24</math>.</p> <p>14. Explain and define the <u>fundamental counting principle</u>.</p> <p>15. Determine the number of possible permutations and/or combinations for a situation using the fundamental counting principle.</p>	<p>10. Collect data to design a statistical experiment to study a problem.</p> <p>11. Identify different ways of selecting samples, such as <u>survey response</u>, <u>random sample</u>, <u>representative sample</u> and <u>convenience sample</u>.</p> <p>12. Describe how the relative size of a sample compared to the target population affects the validity of predictions.</p> <p>13. Differentiate between <u>discrete</u> and <u>continuous data</u> and appropriate ways to represent each.</p> <p>14. Find the probability of <u>single events</u> or <u>compound events</u> occurring.</p> <p>15. Explain the difference between <u>independent</u> and <u>dependent events</u>.</p> <p>16. Demonstrate an understanding that the probability of either of two <u>disjoint events</u> occurring can be found by adding the probabilities; e.g., “What is the probability of drawing a heart or a diamond from a deck of cards?”, and that the probability of one independent or dependent event following another can be found by multiplying the probabilities; e.g., “What is the probability of drawing a heart then a diamond from a deck of cards.</p> <p>17. Perform calculations and simplify <u>factorial expressions</u>; e.g., <math>5! = 5 \times 4 \times 3 \times 2 \times 1 = 120</math>, <math>8!/6! = 8 \times 7 = 56</math></p> <p>18. Identify <u>permutations</u>, <u>combinations</u>, the <u>counting principle</u> and the relationships among them.</p> <p>19. Use formulas to calculate combinations and permutations</p> <p>20. Calculate the number of possible outcomes for a situation, recognizing and accounting for when items may occur more than once or when order is important.</p>