



NORTH DAKOTA DEPARTMENT OF  
**PUBLIC INSTRUCTION**

North Dakota  
High School State Standards

**Geometry Pathway**

July 2017

## Overview

The North Dakota State Standards (NDSS) for Mathematics are organized by grade level in Grades K-8. At the high school level, the standards are organized by conceptual category (number and quantity, algebra, functions, geometry, modeling, and probability and statistics), showing the body of knowledge students should learn in each category to be college and career ready, and to be prepared to study more advanced mathematics. As North Dakota school districts consider how to implement the high school standards, an important consideration is how the high school NDSS might be organized into courses that provide a strong foundation for post-secondary success. To address this need, the NDSS writing committee has provided a possible pathway to implement the NDSS in the traditional courses of Algebra I, Geometry, Algebra II and Course IV.

In considering this document, it is important to note the following:

1. The pathway is a model, not a mandate. It illustrates a possible approach to organize the content of the NDSS into coherent and rigorous courses that lead to college and career readiness. Districts are not expected to adopt these courses as is; rather, they may use this pathway as a starting point for developing their own.
2. All college and career ready standards have been included in the pathway. Standards with a (+) are included to increase coherence but are not necessarily expected to be addressed on high stakes assessments.

While the focus of this document is on organizing the Standards for Mathematical Content into a pathway to college and career readiness, the content standards must also be connected to the Standards for Mathematical Practice to ensure that the skills needed for later success are developed. In particular, Modeling (defined by a \* in the NDSS) is defined as both a conceptual category for high school mathematics and a mathematical practice and is an important avenue for motivating students to study mathematics, for building their understanding of mathematics, and for preparing them for future success. Development of the pathway into instructional programs will require careful attention to modeling and the mathematical practices. Assessments based on the pathway should reflect both the content and mathematical practices standards.

Strategic use of technology is expected in all work. This may include employing technological tools to assist students in forming and testing conjectures, creating graphs and data displays, as well as determining and assessing lines of fit for data. Geometric constructions may also be performed using geometric software, as well as classical tools and technology aiding in three-dimensional visualization.

*Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics  
\* indicates modeling standards*

## Mathematical Practices

It should be noted that throughout each course, the following **mathematical practices** from the NDSS are to be emphasized:

### 1. Make sense of problems and persevere in solving them.

Mathematically proficient students:

- Explain to themselves the meaning of a problem and looking for entry points to its solution.
- Analyze givens, constraints, relationships, and goals.
- Make conjectures about the form and meaning of the solution attempt.
- Consider analogous problems, and try special cases and simpler forms of the original problem.
- Monitor and evaluate their progress and change course if necessary.
- Transform algebraic expressions or change the viewing window on their graphing calculator to get information.
- Explain correspondences between equations, verbal descriptions, tables, and graphs.
- Draw diagrams of important features and relationships, graph data, and search for regularity or trends.
- Use concrete objects or pictures to help conceptualize and solve a problem.
- Check their answers to problems using a different method.
- Ask themselves, “Does this make sense?”
- Understand the approaches of others to solving complex problems.

### 2. Reason abstractly and quantitatively.

Mathematically proficient students:

- Make sense of quantities and their relationships in problem situations.
  - ✓ *Decontextualize* (abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents) and
  - ✓ *Contextualize* (pause as needed during the manipulation process in order to probe into the referents for the symbols involved).
- Use quantitative reasoning that entails creating a coherent representation of quantities, not just how to compute them.
- Know and flexibly use different properties of operations and objects.

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### 3. Construct viable arguments and critique the reasoning of others.

Mathematically proficient students:

- Understand and use stated assumptions, definitions, and previously established results in constructing arguments.
- Make conjectures and build a logical progression of statements to explore the truth of their conjectures.
- Analyze situations by breaking them into cases.
- Recognize and use counterexamples.
- Justify their conclusions, communicate them to others, and respond to the arguments of others.
- Reason inductively about data, making plausible arguments that take into account the context.
- Compare the effectiveness of plausible arguments.
- Distinguish correct logic or reasoning from that which is flawed.
  - ✓ Elementary students construct arguments using objects, drawings, diagrams, and actions.
  - ✓ Later students learn to determine domains to which an argument applies.
- Listen or read the arguments of others, decide whether they make sense, and ask useful questions.

### 4. Model with mathematics.

Mathematically proficient students:

- Apply the mathematics they know to solve problems arising in everyday life, society, and the workplace.
  - ✓ In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community.
  - ✓ By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another.
- Simplify a complicated situation, realizing that these may need revision later.
- Identify important quantities in a practical situation.
- Map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas.
- Analyze those relationships mathematically to draw conclusions.
- Interpret their mathematical results in the context of the situation.
- Reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

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## 5. Use appropriate tools strategically.

Mathematically proficient students:

- Consider available tools when solving a mathematical problem.
- Are familiar with tools appropriate for their grade or course to make sound decisions about each of these tools.
- Detect possible errors by using estimations and other mathematical knowledge.
- Know that technology can enable them to visualize the results of varying assumptions, and explore consequences.
- Identify relevant mathematical resources and use them to pose or solve problems.
- Use technological tools to explore and deepen their understanding of concepts.

## 6. Attend to precision.

Mathematically proficient students:

- Try to communicate precisely to others.
- Use clear definitions in discussion with others and in their own reasoning.
- State the meaning of the symbols they choose, including using the equal sign consistently and appropriately.
- Specify units of measure and label axes to clarify the correspondence with quantities in a problem.
- Calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the context.
  - ✓ In the elementary grades, students give carefully formulated explanations to each other.
  - ✓ In high school, students have learned to examine claims and make explicit use of definitions.

## 7. Look for and make use of structure.

Mathematically proficient students:

- Look closely to discern a pattern or structure.
  - ✓ Young students might notice that three and seven more is the same amount as seven and three more.
  - ✓ Later, students will see  $7 \times 8$  equals the well-remembered  $7 \times 5 + 7 \times 3$ , in preparation for the distributive property.
  - ✓ In the expression  $x^2 + 9x + 14$ , older students can see the 14 as  $2 \times 7$  and the 9 as  $2 + 7$ .
- Step back for an overview and can shift perspective.
- See complicated things, such as some algebraic expressions, as single objects or composed of several objects.

## 8. Look for and express regularity in repeated reasoning.

Mathematically proficient students:

- Notice if calculations are repeated.
- Look both for general methods and for shortcuts.
- Maintain oversight of the process, while attending to the details.
- Continually evaluate the reasonableness of intermediate results.

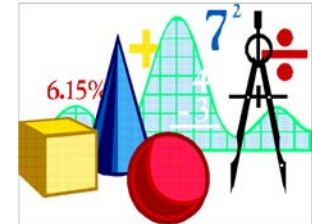
Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics

\* indicates modeling standards



North Dakota HIGH SCHOOL State Standards: *GEOMETRY*  
 Conceptual Category: **Number and Quantity**  
 Domain: **Quantities\*** (Mathematical Practices 1, 4 and 6)  
 Cluster: **Reason quantitatively and use units to solve problems**

# HS.N-Q



<b>Standard</b> HS.N-Q.1*  Use units as a way to understand problems and to guide the solution of multi-step problems (e.g., unit analysis).  Choose and interpret units consistently in formulas.  Choose and interpret the scale and the origin in graphs and data displays.	<b>Students can</b> <ul style="list-style-type: none"> <li>interpret units in the context of the problem</li> <li>use unit analysis to check the reasonability of your solution</li> <li>choose and interpret an appropriate scale given data to be represented on a graph or display</li> </ul>	<b>Resources</b>
<b>Vocabulary</b> <ul style="list-style-type: none"> <li>unit analysis</li> </ul>	<b>Annotations</b> Example: While driving in the United Kingdom (UK), a U.S. tourist puts 60 liters of gas in his car. The gas cost is £1.28 per liter. The exchange rate is £ 0.62978 for each US \$1.00. The price for a gallon of a gasoline in the United States is US \$3.05. The driver wants to compare costs for the same amount and the same type of gasoline in UK and in the United States if he pays in UK Pounds.	

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North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*  
 Conceptual Category: **Number and Quantity**  
 Domain: **Quantities\*** (Mathematical Practices 1, 4 and 6)  
 Cluster: **Reason quantitatively and use units to solve problems**

HS.N-Q



<p><b>Standard</b>          HS.N-Q.2*          Define appropriate quantities for the purpose of descriptive modeling.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>determine an appropriate quantity to model a situation</li> </ul>	<p><b>Resources</b>  <a href="#">Estimations and Approximations: The Money Munchers</a>   <a href="#">Yogurt</a>   <a href="#">Leaky Faucet</a></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>modeling</li> </ul>	<p><b>Annotations</b>          Example: When carpeting a room, students might consider whether it is best to use square feet or square yards. When considering a remodeling project, they might choose such units as cost per room, cost per month of the project, or cost per contractor. (ND)</p>	<p><b>Notes</b></p>

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 Domain: **Quantities\*** (Mathematical Practices 1, 4 and 6)  
 Cluster: **Reason quantitatively and use units to solve problems**

# HS.N-Q



<p><b>Standard</b>          HS.N-Q.3*          Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>choose a level of accuracy appropriate to the measuring tool or situation</li> </ul>	<p><b>Resources</b>  <a href="#">Estimations and Approximations: The Money Munchers</a>   <a href="#">Leaky Faucet</a>   <a href="#">Yogurt</a></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>significant digits</li> <li>precision: refers to how much information is conveyed by a number (in terms of the number of digits)</li> <li>accuracy: the degree to which a measurement conforms to the correct value or a standard</li> </ul>	<p><b>Annotations</b></p> <p>Example: When using a ruler, students choose to report their measurements based on the precision of the ruler (e.g., to the nearest 1/16 or the nearest 1/32).</p> <p>Example: If you are playing soccer and you always hit the left goal post instead of scoring, then you are not accurate; you are precise.</p> <p>Example: When using a ruler, students are able to measure accurately.</p> <p>Example: When calculating the cost of a road trip, students are given the cost of gasoline to the thousandths place. When reporting the cost of the trip, students determine what level of precision—to the hundredths place or to the thousandths place—is appropriate and why.</p>	<p><b>Notes</b></p>

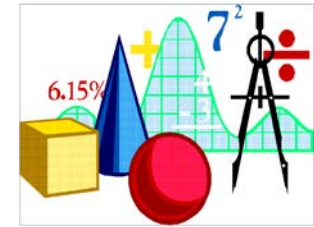
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 \* indicates modeling standards





North Dakota HIGH SCHOOL State Standards: *GEOMETRY*  
 Conceptual Category: **Algebra**  
 Domain: **Creating Equations and Inequalities**  
 Cluster: **Reason quantitatively and use units to solve problems**

# HS.A-CED



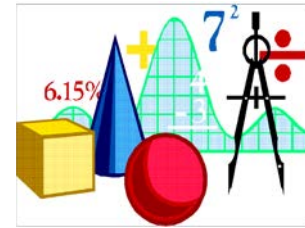
<p><b>Standard</b> HS.A-CED.4</p> <p>Rearrange formulas to isolate a quantity of interest, using the same reasoning as in solving equations.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>rearrange a formula to isolate a quantity</li> </ul>	<p><b>Resources</b></p>
<p><b>Vocabulary</b></p>	<p><b>Annotations</b>        Example: Rearrange Ohm's law <math>V = IR</math> to isolate resistance <math>R</math>.</p>	<p><b>Notes</b></p>

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North Dakota HIGH SCHOOL State Standards: *GEOMETRY*  
 Conceptual Category: **Functions**  
 Domain: **Trigonometric Functions**  
 Cluster: **Extend the domain of trigonometric functions using the unit circle**

# HS.F-TF



<b>Standard</b> HS.F-TF.1  Understand that the radian measure of an angle is the ratio of the length of the arc to the length of the radius of a circle.	<b>Students Can</b> <ul style="list-style-type: none"> <li>understand radian measure</li> </ul>	<b>Resources</b>
<b>Vocabulary</b> <ul style="list-style-type: none"> <li>radians</li> </ul>	<b>Annotations</b>	<b>Notes</b>

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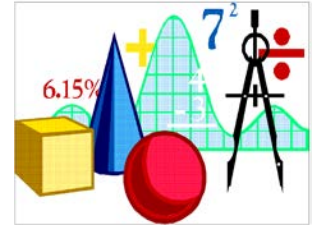
North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

Conceptual Category: **Geometry**

Domain: **Congruence**

Cluster: **Experiment with transformations in the plane**

**HS.G-CO**



<p><b>Standard</b> HS.G-CO.1</p> <p>Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, and plane.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>understand the definitions of angle, circle, perpendicular lines, parallel lines, and line segment based on the undefined notions of point, line, distance along a line, and length of an arc</li> <li>use the definitions of angle, circle, perpendicular lines, parallel lines, and line segment based on the undefined notions of point, line, distance along a line, and length of an arc</li> </ul>	<p><b>Resources</b></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>point</li> <li>line</li> <li>angle</li> <li>circle</li> <li>perpendicular lines</li> <li>parallel lines</li> <li>line segment</li> <li>distance</li> <li>arc length</li> <li>endpoint</li> </ul>	<p><b>Annotations</b></p> <p>Example: An angle is composed of two rays that share a common initial point.</p>	<p><b>Notes</b></p>

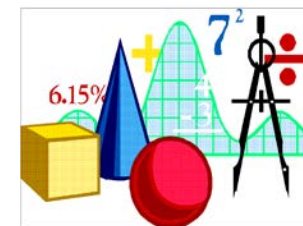
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North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*  
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 Domain: **Congruence**  
 Cluster: **Experiment with transformations in the plane**

# HS.G-CO



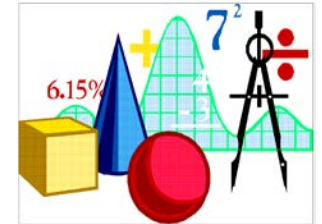
<p><b>Standard</b> HS.G-CO.2</p> <p>Represent transformations in the plane.</p> <p>Describe transformations as functions that take points in the plane as inputs and give other points as outputs.</p> <p>Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>represent rigid and size transformations of figures in a coordinate plane</li> <li>compare transformations that preserve distance and angle measure to those that do not</li> <li>describe transformations (to include translations and horizontal and vertical stretching) on a set of points as inputs to produce another set of points as outputs</li> </ul>	<p><b>Resources</b>  <a href="#">Representing and Combining Transformations</a></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>transformation</li> <li>rigid transformation</li> <li>translations</li> <li>dilations</li> <li>rotation</li> <li>reflection</li> </ul>	<p><b>Annotations</b></p>	<p><b>Notes</b></p>

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North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*  
 Conceptual Category: **Geometry**  
 Domain: **Congruence**  
 Cluster: **Experiment with transformations in the plane**

# HS.G-CO



<p><b>Standard</b>          HS.G-CO.3</p> <p>Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>describe the rotations and reflections of a rectangle, parallelogram, trapezoid, or regular polygon that map each figure onto itself</li> </ul>	<p><b>Resources</b>  <a href="#">Representing and Combining Transformations</a></p>
<p><b>Vocabulary</b></p>	<p><b>Annotations</b></p>	<p><b>Notes</b></p>

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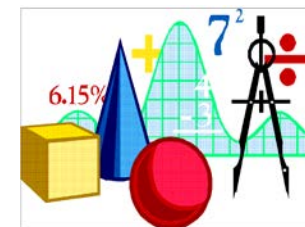
North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

Conceptual Category: **Geometry**

Domain: **Congruence**

Cluster: **Experiment with transformations in the plane**

# HS.G-CO



<p><b>Standard</b> HS.G-CO.4</p> <p>Develop or verify experimentally the characteristics of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>develop or verify the meaning of rotations, reflections, and translations based on angles, circles, perpendicular lines, parallel lines, and line segments</li> </ul>	<p><b>Resources</b></p>
<p><b>Vocabulary</b></p>	<p><b>Annotations</b> Example: Using patty paper or geometry software, develop/verify that the reflection line is the perpendicular bisector of the segment that connects the pre-image to its image.</p>	<p><b>Notes</b></p>

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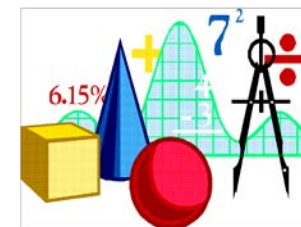
North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

Conceptual Category: **Geometry**

Domain: **Congruence**

Cluster: **Experiment with transformations in the plane**

# HS.G-CO



<p><b>Standard</b> HS.G-CO.5</p> <p>Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software.</p> <p>Specify a sequence of transformations that will carry a given figure onto another.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>draw the transformation (rotation, reflection, or translation) of a geometric figure using a variety of methods</li> <li>create a sequence of transformations that maps a given geometric figure onto another</li> </ul>	<p><b>Resources</b> <a href="#">Representing and Combining Transformations</a></p>
<p><b>Vocabulary</b></p>	<p><b>Annotations</b> Students must be able to perform a transformation as well as describe a series of transformations that have occurred.</p>	<p><b>Notes</b></p>

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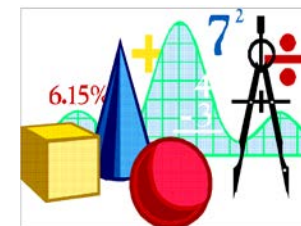
North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

Conceptual Category: **Geometry**

Domain: **Congruence**

Cluster: **Understand congruence in terms of rigid motions**

# HS.G-CO



<p><b>Standard</b> HS.G-CO.6</p> <p>Use geometric descriptions of rigid motions to predict the effect of a given rigid motion on a given figure.</p> <p>Use the definition of congruence in terms of rigid motions to decide if two figures are congruent.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>• use descriptions of rigid motion and transformed geometric figures to predict the effects rigid motion has on figures in the coordinate plane</li> <li>• use the fact that rigid transformations preserve size and shape to connect the idea and definition of congruence</li> </ul>	<p><b>Resources</b></p> <p><a href="#">Representing and Combining Transformations</a></p> <p><a href="#">Analyzing Congruence Proofs</a></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>• congruent: two plane or solid figures are congruent if one can be obtained from the other by rigid motion (a sequence of rotations, reflections, and translations).</li> <li>• rigid motion: a transformation of points in space consisting of a sequence of one or more translations, reflections, and/or rotations. Rigid motions are here assumed to preserve distances and angle measures.</li> </ul>	<p><b>Annotations</b></p> <p>Students must be able to predict and recognize rigid motions and use them to justify congruence.</p>	<p><b>Notes</b></p>

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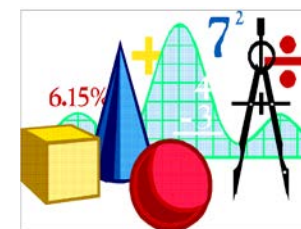
North Dakota *HIGH SCHOOL* State Standards *GEOMETRY*

Conceptual Category: **Geometry**

Domain: **Congruence**

Cluster: **Understand congruence in terms of rigid motions**

# HS.G-CO



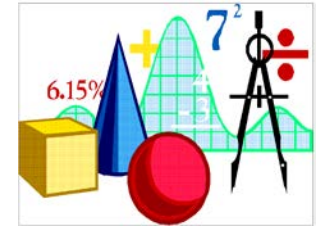
<p><b>Standard</b> HS.G-CO.7</p> <p>Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>use the definition of congruence, based on rigid motions, to show two triangles are congruent if and only if their corresponding sides and corresponding angles are congruent</li> </ul>	<p><b>Resources</b> <a href="#">Analyzing Congruence Proofs</a></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>corresponding sides</li> <li>corresponding angles</li> <li>congruent: two plane or solid figures are congruent if one can be obtained from the other by rigid motion (a sequence of rotations, reflections, and translations).</li> </ul>	<p><b>Annotations</b></p>	<p><b>Notes</b></p>

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics  
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North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*  
 Conceptual Category: **Geometry**  
 Domain: **Congruence**  
 Cluster: **Understand transformations in terms of rigid motions**

# HS.G-CO



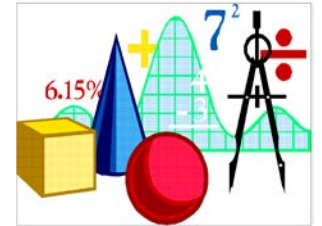
<p><b>Standard</b> HS.G-CO.8</p> <p>Prove two triangles are congruent using the congruence theorems such as ASA, SAS, and SSS.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>• Prove two triangles are congruent using ASA, SSS, and SAS</li> </ul>	<p><b>Resources</b></p> <p><a href="#">Evaluating Statements about Length and Area</a></p> <p><a href="#">Analyzing Congruence Proofs</a></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>• ASA</li> <li>• SSS</li> <li>• SAS</li> </ul>	<p><b>Annotations</b></p>	<p><b>Notes</b></p>

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North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*  
 Conceptual Category: **Geometry**  
 Domain: **Congruence**  
 Cluster: **Prove and apply geometric theorems**

# HS.G-CO



<p><b>Standard</b> HS.G-CO.9</p> <p>Prove and apply theorems about lines and angles.</p>	<p><b>Students Can</b> prove and apply theorems pertaining to lines and angles to include, but not limited to:</p> <ul style="list-style-type: none"> <li>vertical angles are congruent</li> <li>when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent</li> <li>points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints</li> </ul>	<p><b>Resources</b></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>transversal</li> <li>alternate interior angles</li> <li>corresponding angles</li> <li>perpendicular bisector</li> <li>equidistant</li> <li>vertical angles</li> </ul>	<p><b>Annotations</b> "Proof" may take on a variety of forms (flow, paragraph, 2-column, informal).</p> <p>Theorems include, but are not limited to: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.</p>	<p><b>Notes</b></p>

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics  
 \* indicates modeling standards



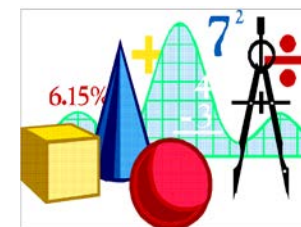
North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

Conceptual Category: **Geometry**

Domain: **Congruence**

Cluster: **Prove and apply geometric theorems**

# HS.G-CO



<p><b>Standard</b> HS.G-CO.10</p> <p>Prove and apply theorems about triangle properties.</p>	<p><b>Students Can</b> prove and apply theorems about triangles to include, but not limited to:</p> <ul style="list-style-type: none"> <li>• the measures of interior angles of a triangle have a sum of <math>180^\circ</math></li> <li>• base angles of isosceles triangles are congruent</li> <li>• the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length</li> <li>• the medians of a triangle meet at a point</li> </ul>	<p><b>Resources</b></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>• isosceles triangle</li> <li>• base angles</li> <li>• midpoint</li> <li>• median</li> </ul>	<p><b>Annotations</b> “Proof” may take on a variety of forms (flow, paragraph, 2-column, informal).</p> <p>Theorems include but are not limited to: Measures of interior angles of a triangle sum to <math>180^\circ</math>; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.</p>	<p><b>Notes</b></p>

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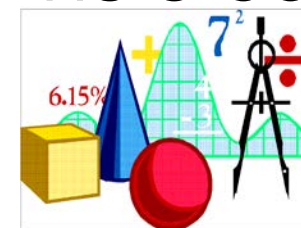
North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

Conceptual Category: **Geometry**

Domain: **Congruence**

Cluster: **Prove and apply geometric theorems**

# HS.G-CO



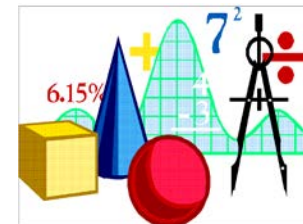
<p><b>Standard</b> HS.G-CO.11</p> <p>Prove and apply theorems about parallelograms.</p>	<p><b>Students Can</b> prove and apply theorems about parallelograms to include, but not limited to:</p> <ul style="list-style-type: none"> <li>• opposite sides are congruent</li> <li>• opposite angles are congruent</li> <li>• the diagonals of a parallelogram bisect each other</li> <li>• rectangles are parallelograms with congruent diagonals</li> </ul>	<p><b>Resources</b></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>• parallelogram</li> <li>• diagonal</li> <li>• bisect</li> <li>• rectangle</li> <li>• rhombus</li> <li>• quadrilateral</li> <li>• square</li> </ul>	<p><b>Annotations</b></p> <p>“Proof“ may take on a variety of forms (flow, paragraph, 2-column, informal).</p> <p>Theorems include but are not limited to: Opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and rectangles are parallelograms with congruent diagonals.</p>	<p><b>Notes</b></p>

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 \* indicates modeling standards



North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*  
 Conceptual Category: **Geometry**  
 Domain: **Congruence**  
 Cluster: **Make geometric constructions**

# HS.G-CO



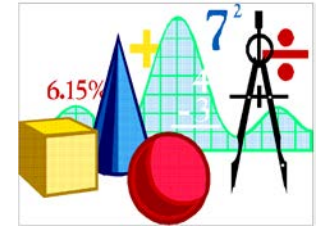
<p><b>Standard</b> HS.G-CO.12</p> <p>Make basic geometric constructions with a variety of tools and methods.</p>	<p><b>Students Can</b></p> <p>Use a variety of methods and tools to:</p> <ul style="list-style-type: none"> <li>• copy a segment</li> <li>• copy an angle</li> <li>• bisect a segment</li> <li>• bisect an angle</li> <li>• construct perpendicular lines, including the perpendicular bisector of a line segment</li> <li>• construct a line parallel to a given line through a point not on the line</li> </ul>	<p><b>Resources</b></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>• perpendicular bisector</li> </ul>	<p><b>Annotations</b></p> <p>Tools may include compass and straightedge, string, reflective devices, paper folding or dynamic geometric software.</p>	<p><b>Notes</b></p>

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 \* indicates modeling standards



North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*  
 Conceptual Category: **Geometry**  
 Domain: **Congruence**  
 Cluster: **Make geometric constructions**

# HS.G-CO

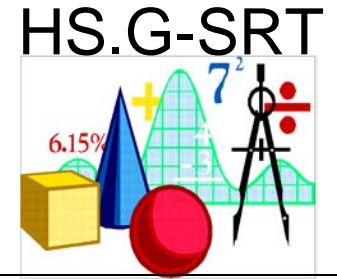


<p><b>Standard</b>        (+)HS.G-CO.13</p> <p>Apply basic constructions to create polygons such as equilateral triangles, squares, and regular hexagons inscribed in circles.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>• construct an equilateral triangle inscribed in a circle</li> <li>• construct a square inscribed in a circle</li> <li>• construct a regular hexagon inscribed in a circle</li> </ul>	<p><b>Resources</b></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>• inscribed</li> <li>• hexagon</li> <li>• regular</li> <li>• equilateral</li> </ul>	<p><b>Annotations</b>        Students can use technology or compass and straightedge to accomplish the construction.</p>	<p><b>Notes</b></p>

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North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*  
 Conceptual Category: **Geometry**  
 Domain: **Similarity, Right Triangles and Trigonometry**  
 Cluster: **Understand similarity**



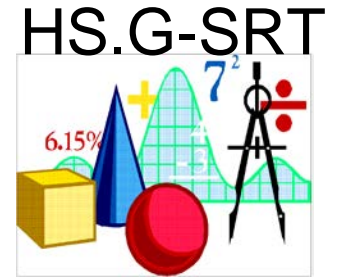
<p><b>Standard</b> HS.G-SRT.1</p> <p>Verify experimentally the properties of dilations given by a center and a scale factor:</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>• verify experimentally the properties of dilations given by a center and a scale factor</li> <li>• verify experimentally that a dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged</li> <li>• verify experimentally, that when performing dilations of a line segment, the image segment becomes longer or shorter based on the ratio given by the scale factor</li> </ul>	<p><b>Resources</b></p> <p><a href="#">Calculating Volumes of Compound Objects</a></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>• dilation</li> <li>• center</li> <li>• scale factor</li> <li>• pre-image</li> <li>• image</li> </ul>	<p><b>Annotations</b></p>	<p><b>Notes</b></p>

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 \* indicates modeling standards





North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*  
 Conceptual Category: **Geometry**  
 Domain: **Similarity, Right Triangles and Trigonometry**  
 Cluster: **Understand similarity**



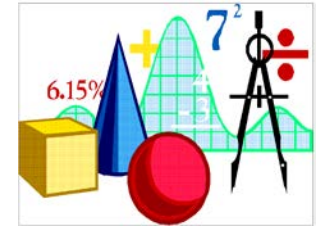
<p><b>Standard</b> HS.G-SRT.2</p> <p>Given two figures, use transformations to decide if they are similar.</p> <p>Apply the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>develop the definition of similarity using the idea of dilation transformations</li> <li>determine whether two figures are similar</li> <li>explain similarity based on the equality of corresponding angles and the proportionality of corresponding sides</li> </ul>	<p><b>Resources</b></p> <p><a href="#">Calculating Volumes of Compound Objects</a></p> <p><a href="#">Hopewell Geometry</a></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>proportion</li> <li>similar</li> </ul>	<p><b>Annotations</b></p>	<p><b>Notes</b></p>

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 \* indicates modeling standards



North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*  
 Conceptual Category: **Geometry**  
 Domain: **Similarity, Right Triangles, and Trigonometry**  
 Cluster: **Understand similarity**

# HS.G-SRT

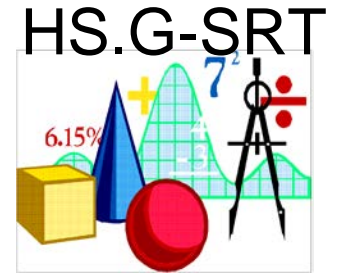


<p><b>Standard</b> HS.G-SRT.3</p> <p>Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>use the properties of similarity transformations to prove triangles are similar by AA criterion</li> </ul>	<p><b>Resources</b></p> <p><a href="#">Calculating Volumes of Compound Objects</a></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>AA similarity</li> </ul>	<p><b>Annotations</b></p> <p>“Establish” may mean justify or prove the AA Similarity Theorem.</p>	<p><b>Notes</b></p>

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North Dakota *HIGH SCHOOL State Standards: GEOMETRY*  
 Conceptual Category: **Geometry**  
 Domain: **Similarity, Right Triangles, and Trigonometry**  
 Cluster: **Prove theorems involving similarity**



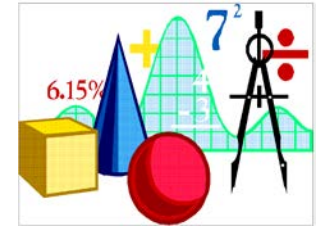
<b>Standard</b> HS.G-SRT.4  Prove similarity theorems about triangles.	<b>Students Can</b> <ul style="list-style-type: none"> <li>• Use triangle similarity to prove a line parallel to one side of a triangle divides the other two proportionally, and it's converse</li> </ul>	<b>Resources</b> <p><a href="#">Calculating Volumes of Compound Objects</a></p> <p><a href="#">Proof of Pythagorean Thm with Triangle Similarity</a></p>
<b>Vocabulary</b>	<b>Annotations</b>	<b>Notes</b>

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics  
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North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*  
 Conceptual Category: **Geometry**  
 Domain: **Similarity, Right Triangles, Trigonometry**  
 Cluster: **Prove theorems involving similarity**

# HS.G-SRT



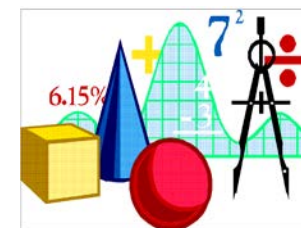
<p><b>Standard</b> HS.G-SRT.5</p> <p>Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>• use similarity criteria to solve real world problems involving geometric figures</li> <li>• use congruence criteria to solve real world problems involving geometric figures</li> </ul>	<p><b>Resources</b></p> <p><a href="#">Calculating Volumes of Compound Objects</a></p> <p><a href="#">Hopewell Geometry</a></p>
<p><b>Vocabulary</b></p>	<p><b>Annotations</b></p>	<p><b>Notes</b></p>

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North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*  
 Conceptual Category: **Geometry**  
 Domain: **Similarity, Right Triangles, and Trigonometry**  
 Cluster: **Define trigonometric ratios and solve problems involving right triangles**

## HS.G-SRT



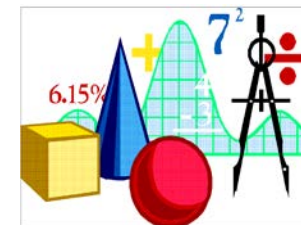
<p><b>Standard</b> HS.G-SRT.6</p> <p>Understand how the properties of similar right triangles allow the trigonometric ratios to be defined, and determine the sine, cosine, and tangent of an acute angle in a right triangle.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>show that the side ratios are the same in similar right triangles, which leads to the definition of trigonometric ratios for acute angles</li> <li>determine the sine, cosine and tangent of an acute angle in a right triangle</li> </ul>	<p><b>Resources</b></p> <p><a href="#">Calculating Volumes of Compound Objects</a></p> <p><a href="#">Geometry Problems: Circles and Triangles</a></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>trigonometry</li> <li>sine</li> <li>cosine</li> <li>tangent</li> </ul>	<p><b>Annotations</b></p> <p>Example: Verify experimentally that the side ratios in similar right triangles are dependent upon the measure of an acute angle in the triangle, due to the preservation of angle measure in similarity. Use this discovery to develop definitions of the trigonometric ratios for acute angles.</p>	<p><b>Notes</b></p>

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 \* indicates modeling standards



North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*  
 Conceptual Category: **Geometry**  
 Domain: **Similarity, Right Triangles, and Trigonometry**  
 Cluster: **Define trigonometric ratios and solve problems involving right triangles**

# HS.G-SRT



<p><b>Standard</b> HS.G-SRT.7</p> <p>Explain and use the relationship between the sine and cosine of complementary angles.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>• use the relationship between the sine and cosine of complementary angles to solve problems</li> <li>• explain the relationship between the sine and cosine of complementary angles</li> </ul>	<p><b>Resources</b></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>• complementary angles</li> </ul>	<p><b>Annotations</b></p>	<p><b>Notes</b></p>

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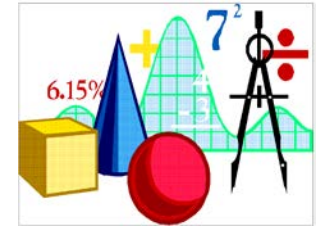
North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

Conceptual Category: **Geometry**

Domain: **Similarity, Right Triangles, and Trigonometry**

Cluster: **Define trigonometric ratios and solve problems involving right triangles**

# HS.G-SRT



<p><b>Standard</b> HS.G-SRT.8*</p> <p>Use special right triangles (<math>30^\circ</math>-<math>60^\circ</math>-<math>90^\circ</math> and <math>45^\circ</math>-<math>45^\circ</math>-<math>90^\circ</math>), trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>apply trigonometric ratios, special right triangle ratios and the Pythagorean Theorem to solve real world problems involving right triangles</li> </ul>	<p><b>Resources</b></p> <p><a href="#">Calculating Volumes of Compound Objects</a></p> <p><a href="#">Geometry Problems: Circles and Triangles</a></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>special right triangles</li> </ul>	<p><b>Annotations</b></p>	<p><b>Notes</b></p>

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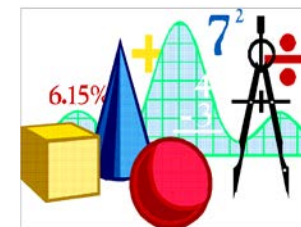
North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

Conceptual Category: **Geometry**

Domain: **Similarity, Right Triangles, Trigonometry**

Cluster: **Apply trigonometry to general triangles**

# HS.G-SRT



<p><b>Standard</b> (+)HS.G-SRT.10*</p> <p>Solve unknown sides and angles of non-right triangles using the Laws of Sines and Cosines.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>use the Laws of Sines and Cosines to solve for unknown sides and angles of non-right triangles</li> </ul>	<p><b>Resources</b></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>Law of Sines</li> <li>Law of Cosines</li> </ul>	<p><b>Annotations</b></p>	<p><b>Notes</b></p>

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics

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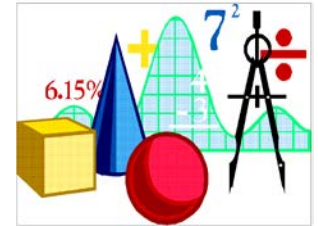
North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

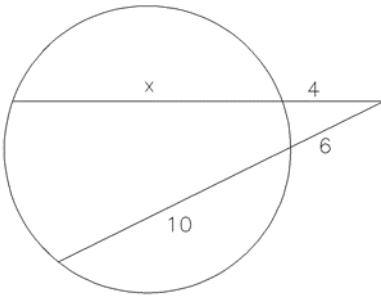
Conceptual Category: **Geometry**

Domain: **Circles**

Cluster: **Understand and apply theorems about circles**

# HS.G-C



<p><b>Standard</b> HS.G-C.1</p> <p>Understand and apply theorems about relationships with line segments and circles including radii, diameter, secants, tangents, and chords.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>Understand relationships with lines segments and circles including: radii, diameter, secant, tangent and chord</li> </ul>	
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>radii</li> <li>diameter</li> <li>secant</li> <li>tangent</li> <li>chord</li> </ul>	<p><b>Annotations</b> Example: solve for x Solution: <math>x = 20</math></p> 	<p><b>Notes</b></p>

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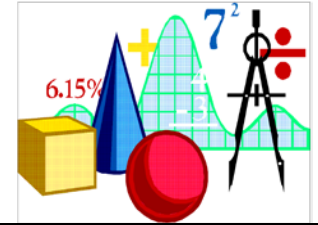
North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

Conceptual Category: **Geometry**

Domain: **Circles**

Cluster: **Understand and apply theorems about circles**

# HS.G-C



<p><b>Standard</b> HS.G-C.2</p> <p>Understand and apply theorems about relationships with angles formed by radii, diameter, secants, tangents, and chords.</p> <p>Understand and apply properties of angles for a quadrilateral inscribed in a circle.</p>	<p><b>Students Can</b></p> <p>understand the properties of angles for a quadrilateral inscribed in a circle</p> <p>use definitions, properties, and theorems to identify and describe relationships among inscribed angles, radii, and chords, including:</p> <ul style="list-style-type: none"> <li>• central, inscribed, and circumscribed angles</li> <li>• show that inscribed angles on a diameter are right angles</li> <li>• show that the radius of a circle is perpendicular to the tangent where the radius intersects the circle</li> </ul>	<p><b>Resources</b></p> <p><a href="#">Geometry Problems: Circles and Triangles</a></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>• radius</li> <li>• chord</li> <li>• central angle</li> <li>• circumscribed angle</li> <li>• tangent</li> </ul>	<p><b>Annotations</b></p> <p>Solve for x. (solution: <math>x = 25^\circ</math>)</p>	<p><b>Notes</b></p>

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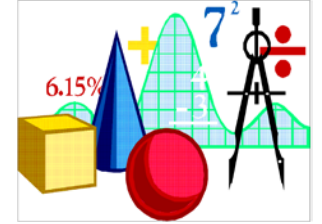
North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

Conceptual Category: **Geometry**

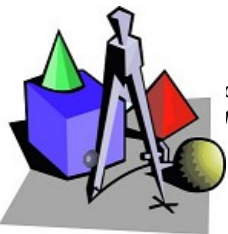
Domain: **Circles**

Cluster: **Understand and apply theorems about circles**

HS.G-C



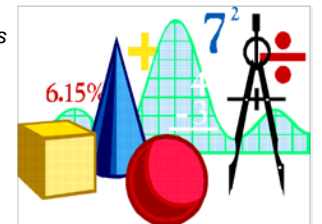
<p><b>Standard</b> HS.G-C.3</p> <p>Construct the incenter and circumcenter of a triangle. Relate the incenter and circumcenter to the inscribed and circumscribed circles.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>• construct the inscribed circle of a triangle</li> <li>• construct the circumscribed circle of a triangle</li> <li>• relate the incenter and circumcenter to the inscribed and circumscribed circles.</li> </ul>	<p><b>Resources</b></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>• inscribed circle</li> <li>• circumscribed circle</li> <li>• incenter</li> <li>• circumcenter</li> </ul>	<p><b>Annotations</b> Students may use technology to perform the constructions.</p>	<p><b>Notes</b></p>



North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

*Additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics standards*

HS.G-C



Conceptual Category: **Geometry**

Domain: **Circles**

Cluster: **Understand and apply theorems about circles**

<p><b>Standard</b> (+) HS.G-C.4</p> <p>Construct a tangent line from a point outside a given circle to the circle.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"><li>• construct a tangent line from a point outside a given circle to the circle</li></ul>	<p><b>Resources</b></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"><li>• tangent line</li></ul>	<p><b>Annotations</b></p>	<p><b>Notes</b></p>

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics

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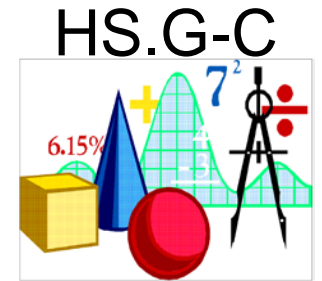


North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

Conceptual Category: **Geometry**

Domain: **Circles**

Cluster: **Find arc lengths and areas of sectors of circles**



<p><b>Standard</b> HS.G-C.5</p> <p>Explain and use the formulas for arc length and area of sectors of circles.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>• explain that the length of the arc intercepted by an angle is proportional to the radius, identifying the constant of proportionality as the radian measure of the angle (arc length = <math>r\theta</math>)</li> <li>• find the arc length of a circle</li> <li>• find the area of a sector</li> </ul>	<p><b>Resources</b></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>• sector</li> <li>• area</li> <li>• radian</li> </ul>	<p><b>Annotations</b></p>	<p><b>Notes</b></p>

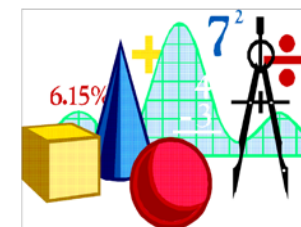
Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics

\* indicates modeling standards

# HS.G-GPE



North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*  
 Conceptual Category: **Geometry**  
 Domain: **Expressing Geometric Properties with Equations**  
 Cluster: **Use coordinates to verify simple geometric theorems algebraically**



<p><b>Standard</b> HS.G-GPE.4</p> <p>Use coordinates to verify simple geometric theorems algebraically.</p> <p>Use coordinates to verify algebraically that a given set of points produces a particular type of triangle or quadrilateral.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>• use coordinate geometry to verify geometric theorems algebraically</li> <li>• use coordinate geometry to verify that a set of points produces a specific type of triangle or quadrilateral</li> </ul>	<p><b>Resources</b>  <a href="#">Finding Equations of Parallel and Perpendicular Lines</a></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>• coordinate geometry</li> </ul>	<p><b>Annotations</b></p> <p>Example: Given a rhombus with vertices at (2,0), (-2,0), (0,3) and (0,-3), verify that the diagonals are perpendicular.</p> <p>This standard allows for a coordinate proof.</p> <p>Example: Verify algebraically whether a figure defined by four given points in the coordinate plane is a rectangle.</p>	<p><b>Notes</b></p>

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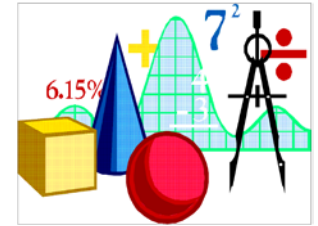
North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

Conceptual Category: **Geometry**

Domain: **Expressing Geometric Properties with Equations**

Cluster: **Use coordinates to verify simple geometric theorems algebraically**

# HS.G-GPE



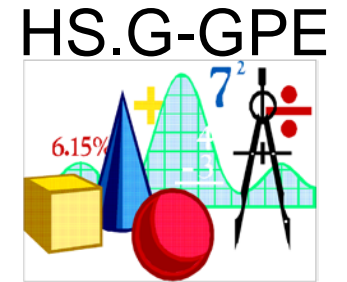
<p><b>Standard</b> HS.G-GPE.5</p> <p>Develop and verify the slope criteria for parallel and perpendicular lines.</p> <p>Apply the slope criteria for parallel and perpendicular lines to solve geometric problems using algebra.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>develop slope criteria for parallel and perpendicular lines</li> <li>use slope to prove that lines are parallel or perpendicular</li> <li>solve geometric problems using slope of parallel and perpendicular lines</li> </ul>	<p><b>Resources</b></p> <p><a href="#">Finding Equations of Parallel and Perpendicular Lines</a></p>
<p><b>Vocabulary</b></p>	<p><b>Annotations</b></p> <p>Example: Find the equation of a line parallel or perpendicular to a given line that passes through a given point.</p>	<p><b>Notes</b></p>

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\* indicates modeling standards



North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*  
 Conceptual Category: **Geometry**  
 Domain: **Expressing Geometric Properties with Equations**  
 Cluster: **Use coordinates to verify simple geometric theorems algebraically**



<b>Standard</b> HS.G-GPE.6  Use coordinates to find the midpoint or endpoint of a line segment.  (+) Find the point on a directed line segment between two given points that partitions the segment in a given ratio.	<b>Students Can</b> <ul style="list-style-type: none"> <li>• find a midpoint or an endpoint</li> <li>• find the point on a directed line segment between the two given points that divides the segment into a given ratio</li> </ul>	<b>Resources</b>
<b>Vocabulary</b> <ul style="list-style-type: none"> <li>• midpoint</li> <li>• directed line segment</li> </ul>	<b>Annotations</b> (+) Example: Find the coordinate pair that is $\frac{2}{3}$ the distance from the point (2,3) to (-4,7).	<b>Notes</b>

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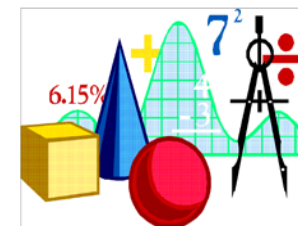
North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

Conceptual Category: **Geometry**

Domain: **Expressing Geometric Properties with Equations**

Cluster: **Use coordinates to verify simple geometric theorems algebraically**

# HS.G-GPE



<p><b>Standard</b> HS.G-GPE.7*</p> <p>Use coordinates to compute perimeters of polygons and areas of triangles, parallelograms, trapezoids and kites.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>use coordinate geometry and the distance formula to find the perimeter of polygons and the area of triangles, parallelograms, trapezoids and kites</li> </ul>	<p><b>Resources</b></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>distance formula</li> <li>perimeter</li> <li>polygon</li> <li>trapezoid</li> <li>kite</li> </ul>	<p><b>Annotations</b></p>	<p><b>Notes</b></p>

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics

\* indicates modeling standards



North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*


Conceptual Category: **Geometry**

Domain: **Geometric Measurements and Dimension**

Cluster: **Explain surface area and volume formulas and use them to solve problems**

# HS.G-GMD



<b>Standard</b> HS.G-GMD.1  Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone.	<b>Students Can</b> <ul style="list-style-type: none"> <li>explain a derivation of the formulas for circumference of a circle and area of a circle</li> <li>explain a derivation of the formulas for volume of a cylinder, pyramid and cone</li> </ul>	<b>Resources</b> <a href="#">Calculating Volumes of Compound Objects</a>  <a href="#">Evaluating Statements about Enlargements (2D and 3D)</a>
<b>Vocabulary</b> <ul style="list-style-type: none"> <li>volume</li> <li>cylinder</li> <li>pyramid</li> <li>cone</li> <li>Cavalier's Principle: 2D: Suppose two regions in a plane are included between two parallel lines in that plane. If every line parallel to these two lines intersects both regions in line segments of equal length, then the two regions have equal areas. 3D: Suppose two regions in three-space (solids) are included between two parallel planes. If every plane parallel to these two planes intersects both regions in cross-sections of equal area, then the two regions have equal volumes.</li> </ul>	<b>Annotations</b> May use dissection arguments, Cavalier's Principle or informal limit arguments.  Example: The area of a circle can be deduced by rearranging sectors of two semi-circles to form a rough rectangle.  Area :  $= r \cdot \frac{1}{2} \cdot \text{Circumference}$ $= r \cdot \frac{1}{2} \cdot 2\pi r$ $= \pi r^2$	<b>Notes</b>

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics  
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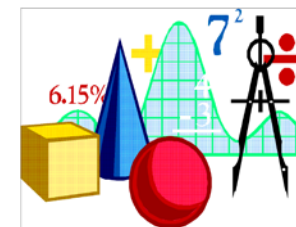
North Dakota *HIGH SCHOOL* State Standards: GEOMETRY

Conceptual Category: **Geometry**

Domain: **Geometric Measurements and Dimension**

Cluster: **Explain surface area and volume formulas and use them to solve problems**

# HS.G-GMD



<p><b>Standard</b> HS.G-GMD.2</p> <p>Calculate the surface area for prisms, cylinders, pyramids, cones and spheres to solve problems.</p>	<p><b>Students can</b></p> <ul style="list-style-type: none"> <li>calculate the surface area for prisms, cylinders, pyramids, cones and spheres to solve problems</li> </ul>	<p><b>Resources</b></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>prism</li> <li>cylinder</li> <li>pyramid</li> <li>cone</li> <li>sphere</li> </ul>	<p><b>Annotations</b></p>	<p><b>Notes</b></p>

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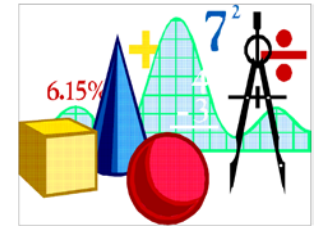
# HS.G-GMD

North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

Conceptual Category: **Geometry**

Domain: **Geometric Measurements and Dimension**

Cluster: **Explain surface area and volume formulas and use them to solve problems**



<p><b>Standard</b> HS.G-GMD.3*</p> <p>Know and apply volume formulas for prisms, cylinders, pyramids, cones, and spheres to solve problems.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>• solve problems by using volume formulas for cylinders, pyramids, cones and spheres</li> </ul>	<p><b>Resources</b></p> <p><a href="#">Calculating Volumes of Compound Objects</a></p> <p><a href="#">Evaluating Statements about Enlargements (2D and 3D)</a></p>
<p><b>Vocabulary</b></p>	<p><b>Annotations</b></p>	<p><b>Notes</b></p>

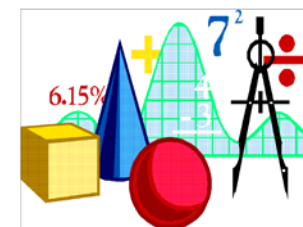
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North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*  
 Conceptual Category: **Geometry**  
 Domain: **Geometric Measurements and Dimension**  
 Cluster: **Visualize relationships between two-dimensional and three-dimensional objects**

# HS.G-GMD



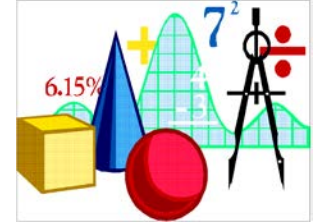
<b>Standard</b> HS.G-GMD.4  Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.	<b>Students Can</b> <ul style="list-style-type: none"> <li>identify two-dimensional cross-sections of three-dimensional objects</li> <li>identify three-dimensional objects created by rotating two-dimensional objects</li> </ul>	<b>Resources</b>
<b>Vocabulary</b> <ul style="list-style-type: none"> <li>cross-section</li> </ul>	<b>Annotations</b>	<b>Notes</b>

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North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*  
 Conceptual Category: **Geometry**  
 Domain: **Modeling with Geometry\***  
 Cluster: **Apply geometric concepts in modeling situations**

# HS.G-MG



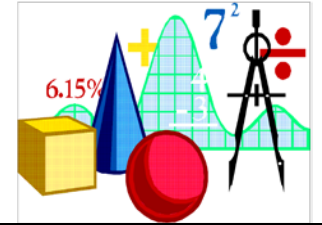
<b>Standard</b> HS.G-MG.1*  Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).	<b>Students Can</b> <ul style="list-style-type: none"> <li>use geometric shapes, their measures, and their properties to describe objects</li> </ul>	<b>Resources</b>
<b>Vocabulary</b>	<b>Annotations</b>	<b>Notes</b>

*Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics*  
 \* indicates modeling standards



North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*  
 Conceptual Category: **Geometry**  
 Domain: **Modeling with Geometry\***  
 Cluster: **Apply geometric concepts in modeling situations**

# HS.G-MG



<p><b>Standard</b>          HS.G-MG.2*</p> <p>Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>• use the concept of density when referring to situations involving area and volume models, such as persons per square mile</li> </ul>	<p><b>Resources</b></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>• density</li> </ul>	<p><b>Annotations</b></p>	<p><b>Notes</b></p>

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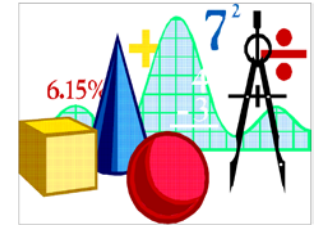
North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

Conceptual Category: **Geometry**

Domain: **Modeling with Geometry\***

Cluster: **Apply geometric concepts in modeling situations**

# HS.G-MG



<p><b>Standard</b> HS.G-MG.3*</p> <p>Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>• solve problems by designing an object or structure that satisfies certain constraints, such as minimizing cost or the enlargement of a picture using a grid, ratios, and proportions</li> </ul>	<p><b>Resources</b></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>• constraint</li> </ul>	<p><b>Annotations</b></p> <p>Example: Students design a soft drink package that minimizes surface area and cost.</p> <p>Example: Design an art sculpture composed of at least 4 solids. Calculate the amount of material used to build it.</p>	<p><b>Notes</b></p>

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\* indicates modeling standards





North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

Conceptual Category: **Statistics and Probability**

Domain: **Conditional Probability and the Rules of Probability\***

Cluster: **Understand independence and conditional probability and use them to interpret data**

# HS.S-CP



<p><b>Standard</b> HS.S-CP.1*</p> <p>Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>define a sample space and events within the sample space</li> <li>identify subsets from sample space given defined events, including unions, intersections and complements of events</li> </ul>	<p><b>Resources</b> <a href="#">Resource: Progressions for the Common Core State Standards HS Statistics &amp; Probability</a></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>sample space</li> <li>union</li> <li>intersection</li> <li>complement</li> </ul>	<p><b>Annotations</b> Example: Given a classroom of 30 students, list the subset for students in the room who are blonde and have blue eyes.</p>	<p><b>Notes</b></p>

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North Dakota *HIGH SCHOOL* State Standard: *GEOMETRY*

Conceptual Category: **Statistics and Probability**

Domain: **Conditional Probability and the Rules of Probability\***

Cluster: **Understand independence and conditional probability and use them to interpret data**

HS.S-CP



<p><b>Standard</b> HS.S-CP.2*</p> <p>Understand that event A is independent from event B if the probability of event A does not change in response to the occurrence of event B.</p> <p>Apply the formula <math>P(A \text{ and } B) = P(A) \cdot P(B)</math> given that event A and B are independent.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>determine whether two events A and B are independent using the probability of A and B occurring together and the probabilities of A and B</li> </ul> $P(A \text{ and } B) = P(A)P(B)$ <ul style="list-style-type: none"> <li>identify whether two events are independent</li> </ul>	<p><b>Resources</b></p> <p><a href="#">Evaluating Statements About Probability</a></p> <p><a href="#">Resource: Progressions for the Common Core State Standards HS Statistics &amp; Probability</a></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>independent events</li> </ul>	<p><b>Annotations</b></p> <p>Understand that two events, A and B, are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.</p>	<p><b>Notes</b></p>

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North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

Conceptual Category: **Statistics and Probability**

Domain: **Conditional Probability and the Rules of Probability\***

Cluster: **Understand independence and conditional probability and use them to interpret data**

# HS.S-CP



<p><b>Standard</b> HS.S-CP.3*</p> <p>Understand that the conditional probability of an event <math>A</math> given <math>B</math> is the probability that event <math>A</math> will occur given the knowledge that event <math>B</math> has already occurred.</p> <p>Apply the formula <math>P(A \text{ given } B) = P(A \text{ and } B)/P(B)</math> given a conditional probability situation.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>show that the conditional probability of <math>A</math> given <math>B</math> as <math>P(A \text{ and } B)/P(B)</math></li> <li>show that <math>A</math> and <math>B</math> are independent when the conditional probability of <math>A</math> given <math>B</math> is the same as the probability of <math>A</math>, and the conditional probability of <math>B</math> given <math>A</math> is the same as the probability of <math>B</math></li> </ul>	<p><b>Resources</b></p> <p><a href="#">Evaluating Statements About Probability</a></p> <p><a href="#">Resource: Progressions for the Common Core State Standards HS Statistics &amp; Probability</a></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>conditional probability</li> <li>multiplication principle</li> </ul>	<p><b>Annotations</b></p>	<p><b>Notes</b></p>

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North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

Conceptual Category: **Statistics and Probability**

Domain: **Conditional Probability and the Rules of Probability\***

Cluster: **Understand independence and conditional probability and use them to interpret data**

# HS.S-CP



<p><b>Standard</b> HS.S-CP.4*</p> <p>Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>construct and interpret two-way frequency tables of data for two categorical variables</li> <li>calculate probabilities from the table and use probabilities from the table to evaluate independence of two variables</li> </ul>	<p><b>Resources</b></p> <p><a href="#">Two-way Frequency Table Resource:</a></p> <p><a href="#">Resource: Progressions for the Common Core State Standards HS Statistics &amp; Probability</a></p>
<p><b>Vocabulary</b></p>	<p><b>Annotations</b></p> <p>Example: Collect data from a random sample of students in your school on their favorite subject among mathematics, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in 10th grade. Do the same for other subjects and compare the results.</p>	<p><b>Notes</b></p>

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\* indicates modeling standards



North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

Conceptual Category: **Geometry**

Domain: **Conditional Probability and the Rules of Probability\***

Cluster: **Understand independence and conditional probability and use them to interpret data**

**HS.S-CP**



<p><b>Standard</b> HS.S-CP.5*</p> <p>Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>recognize and explain the concepts of independence and conditional probability in everyday situations</li> </ul>	<p><b>Resources</b>  <a href="#">Evaluating Statements About Probability</a>   <a href="#">Resource: Progressions for the Common Core State Standards HS Statistics &amp; Probability</a></p>
<p><b>Vocabulary</b></p>	<p><b>Annotations</b>          Example: Compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.</p>	<p><b>Notes</b></p>

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\* indicates modeling standards



## North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

Conceptual Category: **Statistics and Probability**

Domain: **Conditional Probability and Rules of Probability\***

Cluster: **Use the rules of probability to compute probabilities of compound events in a uniform probability model**



<p><b>Standard</b> HS.S-CP.6*</p> <p>Find the conditional probability of A given B and interpret the answer in terms of the model.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>calculate conditional probabilities using the definition: “the conditional probability of A given B as the fraction of B’s outcomes that also belong to A”</li> <li>interpret the conditional probability in context</li> </ul>	<p><b>Resources</b></p> <p><a href="#">Evaluating Statements About Probability</a></p> <p><a href="#">Resource: Progressions for the Common Core State Standards HS Statistics &amp; Probability</a></p>
<p><b>Vocabulary</b></p>	<p><b>Annotations</b></p> <p>Example: A math teacher gave her class two tests. 25% of the class passed both tests and 42% of the class passed the first test. What percent of those who passed the first test also passed the second test?</p> <p>Solution:  <math>P(A \text{ and } B) = P(\text{passed both}) = 0.25</math>  <math>P(A) = P(\text{passed the first test}) = 0.42</math></p> <p>Find <math>P(B)</math> given that <math>P(A)</math> is true =  <math>P(A \text{ and } B)/P(A) =</math>  <math>0.25 / 0.42 = 0.6 = 60\%</math></p> <p>Therefore 60% of those students who passed the first test also passed the second test.</p>	<p><b>Notes</b></p>

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics

\* indicates modeling standards



North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*  
 Conceptual Category: **Statistics and Probability**  
 Domain: **Conditional Probability and Rules of Probability\***  
 Cluster: **Use the rules of probability to compute probabilities of compound events in a uniform probability model**

# HS.S-CP



<p><b>Standard</b>          HS.S-CP.7*</p> <p>Apply the Addition Rule,  <math>P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)</math>, and interpret the answer in terms of the model.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>• identify two events as disjoint (mutually exclusive)</li> <li>• calculate probabilities using the Addition Rule</li> <li>• interpret the probability in context</li> </ul>	<p><b>Resources</b>  <a href="#">Resource: Progressions for the Common Core State Standards HS Statistics &amp; Probability</a></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>• disjoint events</li> <li>• mutually exclusive events</li> <li>• Addition Rule</li> </ul>	<p><b>Annotations</b></p>	<p><b>Notes</b></p>

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics  
 \* indicates modeling standards



North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*

Conceptual Category: **Statistics and Probability**

Domain: **Conditional Probability and Rules of Probability\***

Cluster: **Use the rules of probability to compute probabilities of compound events in a uniform probability model**

# HS.S-CP



<p><b>Standard</b> HS.S-CP.8*</p> <p>Apply the general Multiplication Rule in a uniform probability model, <math>P(A \text{ and } B) = P(A)P(B A) = P(B)P(A B)</math>, and interpret the answer in terms of the model.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>calculate and interpret in context probabilities using the general Multiplication Rule</li> </ul>	<p><b>Resources</b></p> <p><a href="#">Resource: Progressions for the Common Core State Standards HS Statistics &amp; Probability</a></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>Multiplication Rule</li> </ul>	<p><b>Annotations</b></p>	<p><b>Notes</b></p>

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics

\* indicates modeling standards





North Dakota *HIGH SCHOOL* State Standards: *GEOMETRY*  
 Conceptual Category: **Statistics and Probability**  
 Domain: **Conditional Probability and Rules of Probability\***  
 Cluster: **Use the rules of probability to compute probabilities of compound events in a uniform probability model**

# HS.S-CP



<p><b>Standard</b> HS.S-CP.9*</p> <p>Use permutations and combinations to determine the number of outcomes in terms of the model.</p>	<p><b>Students Can</b></p> <ul style="list-style-type: none"> <li>determine the number of outcomes in a model using permutations or combinations.</li> </ul>	<p><b>Resources</b></p> <p><a href="#">Resource: Progressions for the Common Core State Standards HS Statistics &amp; Probability</a></p>
<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>permutation</li> <li>combination</li> </ul>	<p><b>Annotations</b></p>	<p><b>Notes</b></p>

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics  
 \* indicates modeling standards