# SEVENTH GRADE MATHEMATICS

# COMMON CORE STATE STANDARDS

# **7** MATH

# A Crosswalk to the Michigan Grade Level Content Expectations

# Introduction

In June 2010, the Michigan State Board of Education adopted the Common Core State Standards (CCSS) as the state K-12 content standards for Mathematics and English Language Arts.

The complete CCSS standards document can be found at www.michigan.gov/k-12 .

Districts are encouraged to begin this transition to instruction of the new standards as soon as possible to prepare all students for career and college. New assessments based on the Common Core State Standards will be implemented in 2014-2015. More information about Michigan's involvement in the CCSS initiative and development of common assessments can be found at <u>www.michigan.gov/k-12</u> by clicking the Common Core State Standards Initiative link

The CCSS for Mathematics are divided into two sets of standards: the Standards for Mathematical Practices and the Standards for Mathematical Content. This document is intended to show the alignment of Michigan's current mathematics Grade Level Content Expectations (GLCE) to the Standards for Mathematical Content to assist with the transition to instruction and assessment based on the CCSS.

It is anticipated that this initial work will be supported by clarification documents developed at the local and state level, including documents from national organizations and other groups. This document is intended as a conversation starter for educators within and across grades. While curriculum revisions will be guided by local curriculum experts, ultimately the alignment is implemented at the classroom level. Educators will need to unfold these standards in order to compare them to current classroom practice and identify adjustments to instruction and materials that support the depth of understanding implicit in these new standards.

The crosswalk between the Grade Level Content Expectations and the Standards for Mathematical Content is organized by Michigan Focal Points/CCSS Critical Areas. There is not an attempt to show one-to-one correspondence between expectations and standards because for the most part there is none at this level. The alignment occurs when looking across focal points/critical areas and/or across GLCE topics/CCSS domains.



www.michigan.gov/mde

(continued on next page)

# **Mathematical Practices**

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These standards appear in every grade level and are listed below:

#### **Mathematical Practices**

- 1. Make sense of problems, and persevere in solving them.
- 2. Reason abstractly and quantitatively.
- 3. Construct viable arguments, and critique the reasoning of others.
- 4. Model with mathematics.
- 5. Use appropriate tools strategically.
- 6. Attend to precision.
- 7. Look for, and make use of, structure
- 8. Look for, and express regularity in, repeated reasoning.

# **Organization of the Common Core State Standards**

Each CCSS grade level document begins with a description of the "critical areas". These Critical Areas are parallel to the Michigan Focal Points. Below is a comparison of the Michigan Focal Points to the Critical Areas for this grade.

Michigan 7th Grade Focal Points	Common Core State Standards <b>7th Grade Critical Areas</b>
Developing an understanding of and applying proportionality, including similarity	Developing understanding of and applying proportional relationships
Analyzing and representing linear functions and solving linear equations and systems of linear equations	Developing understanding of operations with rational numbers and working with expressions and linear equations
	Solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume
	Drawing inferences about populations based on samples

The standards themselves are organized by *Domains* (large groups that progress across grades) and then by *Clusters* (groups of related standards, similar to the *Topics in the Grade Level Content Expectations*).

 Cluster statement
 Number and Operations in Base Ten
 3.NBT

 Use place value understanding and properties of operations to perform multi-digit arithmetic.
 1.
 Use place value understanding to round whole numbers to the nearest 10 or 100.
 1.
 Use place value understanding to round whole numbers to the nearest 10 or 100.
 1.
 Ise place value understanding to round whole numbers to the nearest 10 or 100.
 1.
 Use place value, properties of operations, and/or the relationship between addition and subtraction.
 Ise place value, properties of operations, and/or the relationship between addition and subtraction.
 Ise place value, properties of 00 in the range 10-90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.
 Ise place value and properties of operations.
 Ise place value understanding to round whole numbers by multiples of 10 in the range 10-90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.
 Ise place value and properties of operations.

The table below shows the progression of the CCSS domains and clusters across the grade before, the target grade, and the following grade.

6th Grade	7th Grade	8th Grade
RATIOS AND PROPORTIONAL RELA	TIONSHIPS (RP)	
• Understand ratio concepts and use ratio reasoning to solve problems.	• Analyze proportional relationships and use them to solve real-world and mathematical problems.	
EXPRESSIONS AND EQUATIONS (EE	)	
<ul> <li>Apply and extend previous understandings of arithmetic to algebraic expressions.</li> <li>Reason about and solve one-variable equations and inequalities.</li> <li>Represent and analyze quantitative relationships between dependent and independent variables.</li> </ul>	<ul> <li>Use properties of operations to generate equivalent expressions.</li> <li>Solve real-life and mathematical problems using numerical and algebraic expressions and equations.</li> </ul>	<ul> <li>Work with radicals and integer exponents.</li> <li>Understand the connections between</li> <li>Proportional relationships, lines, and linear equations.</li> <li>Analyze and solve linear equations and pairs of simultaneous linear equations.</li> <li>FUNCTIONS (F)</li> <li>Define, evaluate, and compare functions.</li> <li>Use functions to model relationships between quantities.</li> </ul>
THE NUMBER SYSTEM (NS)		
<ul> <li>Apply and extend previous understandings of multiplication and division to divide fractions by fractions.</li> <li>Compute fluently with multi-digit numbers and find common factors and multiples.</li> <li>Apply and extend previous understandings</li> </ul>	• Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.	• Know that there are numbers that are not rational, and approximate them by rational numbers.
of numbers to the system of rational numbers.		
STATISTICS AND PROBABILITY (SP	)	
<ul><li>Develop understanding of statistical variability.</li><li>Summarize and describe distributions.</li></ul>	<ul> <li>Use random sampling to draw inferences about a population.</li> <li>Draw informal comparative inferences about two populations.</li> <li>Investigate chance processes and develop, use, and evaluate probability models.</li> </ul>	• Investigate patterns of association in bivariate data.
GEOMETRY (G)		
• Solve real-world and mathematical problems involving area, surface area, and volume.	<ul> <li>Draw, construct and describe geometrical figures and describe the relationships between them.</li> <li>Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.</li> </ul>	<ul> <li>Understand congruence and similarity using physical models, transparencies, or geometry software.</li> <li>Understand and apply the Pythagorean Theorem.</li> <li>Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.</li> </ul>

# Alignment of Michigan Content Expectations to Common Core Standards by Michigan Focal Point

#### **Michigan Content Expectations**

### **Focal Point**

ratios, and proportions

miles per hour. [Core]

situations in tables. [Core]

representations. [Core]

speed. [Core]

speed. [Core]

Developing an understanding of and applying proportionality, including similarity

Understand and solve problems involving rates,

N.FL.07.03 Calculate rates of change including

N.MR.07.04 Convert ratio quantities between

different systems of units, such as feet per second to

N.FL.07.05 Solve proportion problems using such

fractions, and solving the proportion equation a/b =

c/d; know how to see patterns about proportional

A.PA.07.01 Recognize when information given in a

A.RP.07.02 Represent directly proportional and

graphs, and formulas, and translate among these

A.PA.07.04 For directly proportional or linear

situations, solve applied problems using graphs and

equations, e.g., the heights and volume of a container

with uniform cross-section; height of water in a tank

degrees Fahrenheit; distance and time under constant

A.PA.07.05 Recognize and use directly proportional

relationships of the form y = mx, and distinguish from

being filled at a constant rate; degrees Celsius and

linear relationships using verbal descriptions, tables,

methods as unit rate, scaling, finding equivalent

Understand and apply directly proportional

table, graph, or formula suggests a directly

proportional or linear relationship. [Core]

relationships and relate to linear relationships

# **Common Core State Standards**

# **Critical Area**

Developing understanding of and applying proportional relationships

# **COMMON CONTENT**

Analyze proportional relationships and use them to solve real-world and mathematical problems

# Mathematical **Practices**

- I. Make sense of problems, and persevere in solving them.
- 2. Reason abstractly and quantitatively.
- 3. Construct viable arguments, and critique the reasoning of others.
- 4. Model with mathematics.
- 5. Use appropriate tools strategically.
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- 7. Look for, and make use of, structure.
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# 7. RP.I Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction (1/2)/(1/4) miles per hour, equivalently 2 miles per hour.

7. RP.2 Recognize and represent proportional relationships between quantities.

a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.

b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.

c. Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn.

d. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate.

7. RP.3 Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

relationship between two quantities one quantity is a constant multiple of the other quantity. [Core]

### **Common Core State Standards**

## **CONTENT THAT IS DIFFERENT**

#### Content moving out of 7th grade

#### Understand derived quantities

**N.MR.07.02** Solve problems involving derived quantities such as density, velocity, and weighted averages. [Extended]

# Understand and apply directly proportional relationships and relate to linear relationships

**A.PA.07.03** Given a directly proportional or other linear situation, graph and interpret the slope and intercept(s) in terms of the original situation; evaluate y = mx + b for specific x values, e.g., weight vs. volume of water, base cost plus cost per unit. [Core]

#### 8th Grade

High School

Understand the connections between proportional relationships, lines, and linear equations.

Apply geometric concepts in modeling situations

square mile, BTUs per cubic foot).

G.MG.2 Apply concepts of density based on area

and volume in modeling situations (e.g., persons per

8. EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.

**8. EE.6** Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b.

# Understand and solve problems about inversely proportional relationships

**A.PA.07.09** Recognize inversely proportional relationships in contextual situations; know that quantities are inversely proportional if their product is constant, e.g., the length and width of a rectangle with fixed area, and that an inversely proportional relationship is of the form y = k/x where k is some non-zero number. [Extended]

**A.RP.07.10** Know that the graph of y = k/x is not a line, know its shape, and know that it crosses neither the *x* nor the *y*-axis. [Extended]

#### [Not explicit in the Common Core State Standards]

- Make sense of problems, and persevere in solving them.
- 2. Reason abstractly and quantitatively.
- Construct viable arguments, and critique the reasoning of others.
- 4. Model with mathematics.
- 5. Use appropriate tools strategically.
- 6. Attend to precision.
- 7. Look for, and make use of, structure.
- Look for, and express regularity in, repeated reasoning.

#### **Focal Point**

Analyzing and representing linear functions and solving linear equations and systems of linear equations

#### Compute with rational numbers

**N.FL.07.07** Solve problems involving operations with integers. [Core]

**N.FL.07.08** Add, subtract, multiply, and divide positive and negative rational numbers fluently. [Core]

**N.FL.07.09** Estimate results of computations with rational numbers. [Core]

#### **Common Core State Standards**

#### **Critical Area**

Developing understanding of operations with rational numbers and working with expressions and linear equations

# **COMMON CONTENT**

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers

**7.NS.I** Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

a. Describe situations in which opposite quantities combine to make 0. For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.

b. Understand p + q as the number located a distance |q| from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.

c. Understand subtraction of rational numbers as adding the additive inverse, p - q = p + (-q). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.

d. Apply properties of operations as strategies to add and subtract rational numbers.

**7. NS.2** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (-1)(-1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.

- Make sense of problems, and persevere in solving them.
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#### **Common Core State Standards**

b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers then -(p/q)= (-p)/q = p/(-q). Interpret quotients of rational numbers by describing real-world contexts.

c. Apply properties of operations as strategies to multiply and divide rational numbers.

**7. NS.3** Solve real-world and mathematical problems involving the four operations with rational numbers.<sup>1</sup>

# Apply basic properties of real numbers in algebraic contexts

**A.PA.07.11** Understand and use basic properties of real numbers: additive and multiplicative identities, additive and multiplicative inverses, commutativity, associativity, and the distributive property of multiplication over addition. [Core]

#### Combine algebraic expressions and solve equations

**A.FO.07.12** Add, subtract, and multiply simple algebraic expressions of the first degree, e.g., (92x + 8y) - 5x + y, or x(x+2) and justify using properties of real numbers. [Core]

**A.FO.07.13** From applied situations, generate and solve linear equations of the form ax + b = c and ax + b = cx + d, and interpret solutions. [Extended]

# Use properties of operations to generate equivalent expressions

**7. EE.I** Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

# Solve real-life and mathematical problems using numerical and algebraic expressions and equations

**7. EE.3** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations as strategies to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making \$25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour; or \$2.50, for a new salary of \$27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.

**7. EE.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

a. Solve word problems leading to equations of the form px + q = r and p(x + q) = r, where p, q, and rare specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?

- Make sense of problems, and persevere in solving them.
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<sup>&</sup>lt;sup>1</sup> Computations with rational numbers extend the rules for manipulating fractions to complex fractions

#### **Common Core State Standards**

### CONTENT THAT IS DIFFERENT

#### Content moving out of 7th grade

#### Recognize irrational numbers

**N.MR.07.06** Understand the concept of square root and cube root, and estimate using calculators. [Extended]

#### 8th Grade

#### Work with radicals and integer exponents

**8. EE.2** Use square root and cube root symbols to represent solutions to equations of the form  $x^2 = p$  and  $x^3 = p$ , where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that  $\sqrt{2}$  is irrational.

### Mathematical Practices

- Make sense of problems, and persevere in solving them.
- 2. Reason abstractly and quantitatively.
- Construct viable arguments, and critique the reasoning of others.
- 4. Model with mathematics.
- 5. Use appropriate tools strategically.
- 6. Attend to precision.
- 7. Look for, and make use of, structure.
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#### Understand and represent linear functions

**A.PA.07.06** Calculate the slope from the graph of a linear function as the ratio of "rise/run" for a pair of points on the graph, and express the answer as a fraction and a decimal; understand that linear functions have slope that is a constant rate of change. [Core]

**A.PA.07.07** Represent linear functions in the form y = x + b, y = mx, and y = mx + b, and graph, interpreting slope and y-intercept. [Extended]

**A.FO.07.08** Find and interpret the x and/or y intercepts of a linear equation or function. Know that the solution to a linear equation of the form ax+b=0 corresponds to the point at which the graph of y=ax+b crosses the x axis. [Extended]

#### 8th Grade

#### Define, evaluate, and compare functions

**8. F.3** Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function  $A = s^2$  giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.

### Use functions to model relationships between quantities

**8. F.4** Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

### Represent and interpret data

**D.RE.07.01** Represent and interpret data using circle graphs, stem and leaf plots, histograms, and box-and-whisker plots, and select appropriate representation to address specific questions. [Core]

# 6th Grade

#### Summarize and describe distributions

**6. SP.4** Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

#### Represent and interpret data

**D.AN.07.02** Create and interpret scatter plots and find line of best fit; use an estimated line of best fit to answer questions about the data. [Core]

### Common Core State Standards

#### 8th Grade

#### Investigate patterns of association in bivariate data

**8. SP.1** Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

**8. SP.2** Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

#### Content moving into 7th grade

#### Understand real number concepts

**N.ME.08.03** Understand that in decimal form, rational numbers either terminate or eventually repeat, and that calculators truncate or round repeating decimals; locate rational numbers on the number line; know fraction forms of common repeating decimals, e.g., 0.1 (repeating)= 1/9; 0.3(repeating)= 1/3.

### 8th Grade Solve problems

**N.MR.08.07** Understand percent increase and percent decrease in both sum and product form, e.g., 3% increase of a quantity x is x + .03x = 1.03x.

**N.MR.08.08** Solve problems involving percent increases and decreases.

**N.FL.08.09** Solve problems involving compounded interest or multiple discounts.

# Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers

**7. NS.2** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

# Use properties of operations to generate equivalent expressions

**7. EE.2** Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."

- Make sense of problems, and persevere in solving them.
- 2. Reason abstractly and quantitatively.
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#### 8th Grade

Understand solutions and solve equations, simultaneous equations, and linear inequalities

**A.FO.08.12** Solve linear inequalities in one and two variables, and graph the solution sets.

#### **Common Core State Standards**

# Solve real-life and mathematical problems using numerical and algebraic expressions and equations

**7. EE.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

b. Solve word problems leading to inequalities of the form px + q > r or px + q < r, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. For example, as a salesperson, you are paid \$50 per week plus \$3 per sale. This week you want your pay to be at least \$100. Write an inequality for the number of sales you need to make, and describe the solutions.

#### **Focal Point**

 Construct viable arguments, and critique the reasoning of others.

**Mathematical** 

**Practices** 

I. Make sense of

problems, and

persevere in

solving them.

2. Reason abstractly and quantitatively.

- 4. Model with mathematics.
- 5. Use appropriate tools strategically.
- 6. Attend to precision.
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### **COMMON CONTENT**

**Critical Area** 

#### Draw and construct geometric objects

**G.SR.07.01** Use a ruler and other tools to draw squares, rectangles, triangles, and parallelograms with specified dimensions. [Extended]

# Understand the concept of similar polygons, and solve related problems

**G.TR.07.03** Understand that in similar polygons, corresponding angles are congruent and the ratios of corresponding sides are equal; understand the concepts of similar figures and scale factor; [Core]

**G.TR.07.04** Solve problems about similar figures and scale drawings. [Core]

# Understand the concept of similar polygons, and solve related problems

**G.TR.07.05** Show that two triangles are similar using the criteria: corresponding angles are congruent (AAA similarity); the ratios of two pairs of corresponding sides are equal and the included angles are congruent (SAS similarity); ratios of all pairs of corresponding sides are equal (SSS similarity); use these criteria to solve problems and to justify arguments. [Core]

# Draw, construct, and describe geometrical figures and describe the relationships between them

Solving problems involving scale drawings and

two- and three-dimensional shapes to solve

informal geometric constructions, and working with

problems involving area, surface area, and volume

**7. G.I** Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

**7. G.2** Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

**G.TR.07.06** Understand and use the fact that when two triangles are similar with scale factor of r, their areas are related by a factor of  $r^2$ . [Core]

#### CONTENT THAT IS DIFFERENT

#### Content moving into 7th grade

#### High School

Relationships Between Two-dimensional and Threedimensional Representations

**G2.2.2** Identify or sketch cross sections of threedimensional figures. Identify or sketch solids formed by revolving two-dimensional figures around lines. Draw, construct, and describe geometrical figures and describe the relationships between them

**Common Core State Standards** 

**7. G.3** Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

#### 8th Grade

#### Solve problems about geometric figures

**G.SR.08.03** Understand the definition of a circle; know and use the formulas for circumference and area of a circle to solve problems.

### 6th Grade

#### Understand and apply basic properties

**G.GS.06.01** Understand and apply basic properties of lines, angles, and triangles, including:

-- triangle inequality,

-- relationships of vertical angles, complementary angles, supplementary angles,

-- congruence of corresponding and alternate interior angles when parallel lines are cut by a transversal, and that such congruencies imply parallel lines,

-- locate interior and exterior angles of any triangle, and use the property that an exterior angle of a triangle is equal to the sum of the remote (opposite) interior angles,

-- know that the sum of the exterior angles of a convex polygon is 360°. [Extended]

#### Find volume and surface area

**M.TE.06.03** Compute the volume and surface area of cubes and rectangular prisms given the lengths of their sides, using formulas. [Core]

# Solve real-life and mathematical problems involving angle measure, area, surface area, and volume

**7. G.4** Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

# Solve real-life and mathematical problems involving angle measure, area, surface area, and volume

**7. G.5** Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

**7. G.6** Solve real-world and mathematical problems involving area, volume, and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms

- Make sense of problems, and persevere in solving them.
- 2. Reason abstractly and quantitatively.
- Construct viable arguments, and critique the reasoning of others.
- 4. Model with mathematics.
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#### **Focal Point**

#### **Common Core State Standards**

#### **Critical Area**

Drawing inferences about populations based on samples

#### **COMMON CONTENT**

#### None

[Not explicit in the GLCE]

# CONTENT THAT IS DIFFERENT

#### Content moving into 7th grade

Use random sampling to draw inferences about a population

**7. SP.I** Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

**7. SP.2** Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.

# Draw informal comparative inferences about two populations

**7. SP.3** Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.

- Make sense of problems, and persevere in solving them.
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#### **Common Core State Standards**

**7. SP.4** Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.

# 6th Grade Understand the concept of probability and solve problems

**D.PR.06.01** Express probabilities as fractions, decimals, or percentages between 0 and 1; know that 0 probability means an event will not occur and that probability 1 means an event will occur.

**D.PR.06.02** Compute probabilities of events from simple experiments with equally likely outcomes, e.g., tossing dice, flipping coins, spinning spinners, by listing all possibilities and finding the fraction that meets given conditions.

#### 7th Grade

# Investigate chance processes and develop, use, and evaluate probability models

**7. SP.5** Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

**7. SP.7** Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.

a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.

#### 8th Grade

Understand probability concepts for simple compound events

**D.PR.08.03** Compute relative frequencies from a table of experimental results for a repeated event. Interpret the results using relationship of probability to relative frequency.

**D.PR.08.04** Apply the Basic Counting Principle to find total number of outcomes possible for independent and dependent events, and calculate the probabilities using organized lists or tree diagrams.

**D.PR.08.05** Find and/or compare the theoretical probability, the experimental probability, and/or the relative frequency of a given event.

#### 7th Grade

### Investigate chance processes and develop, use, and evaluate probability models

**7. SP.6** Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.

**7. SP.7** Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.

- Make sense of problems, and persevere in solving them.
- 2. Reason abstractly and quantitatively.
- Construct viable arguments, and critique the reasoning of others.
- 4. Model with mathematics.
- 5. Use appropriate tools strategically.
- 6. Attend to precision.
- 7. Look for, and make use of, structure.
- Look for, and express regularity in, repeated reasoning.

**D.PR.08.06** Understand the difference between independent and dependent events, and recognize common misconceptions involving probability, e.g., Alice rolls a 6 on a die three times in a row; she is just as likely to roll a 6 on the fourth roll as she was on any previous roll.

#### Common Core State Standards

b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?

7. SP.8 Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

a.Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.

b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event.

c. Design and use a simulation to generate frequencies for compound events. For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood what is the probability that it will take at least 4 donors to find one with type A blood?

# Connections

# **COMMON CONTENT**

#### None

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

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

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## **CONTENT THAT IS DIFFERENT**

#### Content moving out of 7th grade

#### Draw and construct geometric objects

**G.SR.07.02** Use compass and straightedge to perform basic geometric constructions: the perpendicular bisector of a segment, an equilateral triangle, and the bisector of an angle; understand informal justifications. [NASL]

#### High School Make geometric constructions

**G.CO.12** Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.

**G.CO.13** Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

- I. Make sense of problems, and persevere in solving them.
- 2. Reason abstractly and quantitatively.
- 3. Construct viable arguments, and critique the reasoning of others.
- 4. Model with mathematics.
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- 6. Attend to precision.

#### Compute statistics about data sets

**D.AN.07.03** Calculate and interpret relative frequencies and cumulative frequencies for given data sets. [Extended]

**D.AN.07.04** Find and interpret the median, quartiles, and interquartile range of a given set of data. [Extended]

### **Common Core State Standards**

#### 6th Grade

#### Summarize and describe distributions

**6. SP.5** Summarize numerical data sets in relation to their context, such as by:

a. Reporting the number of observations.

b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data was gathered.

d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data was gathered.

#### 8th Grade

#### Investigate patterns of association in bivariate data

8. SP.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?

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