Grade 7 Math Content Connectors

Grade 7

PROCESS STANDARDS FOR MATHEMATICS

The Process Standards demonstrate the ways in which students should develop conceptual understanding of mathematical content, and the ways in which students should synthesize and apply mathematical skills.

PROCESS STANDARDS FOR MATHEMATICS	
PS.1: Make sense of problems and persevere in solving them.	Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway, rather than simply jumping into a solution attempt. They consider analogous problems and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” and "Is my answer reasonable?" They understand the approaches of others to solving complex problems and identify correspondences between different approaches. Mathematically proficient students understand how mathematical ideas interconnect and build on one another to produce a coherent whole.
PS.2: Reason abstractly and quantitatively.	Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to 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 the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

PS.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. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They analyze situations by breaking them into cases and recognize and use counterexamples. They organize their mathematical thinking, justify their conclusions and communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. They justify whether a given statement is true always, sometimes, or never. Mathematically proficient students participate and collaborate in a mathematics community. They listen to or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

PROCESS STANDARDS FOR MATHEMATICS	
PS.4: Model with mathematics.	Mathematically proficient students apply the mathematics they know to solve problems arising in everyday life, society, and the workplace using a variety of appropriate strategies. They create and use a variety of representations to solve problems and to organize and communicate mathematical ideas. Mathematically proficient students apply what they know and are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.
PS.5: Use appropriate tools strategically.	Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Mathematically proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. Mathematically proficient students identify relevant external mathematical resources, such as digital content, and use them to pose or solve problems. They use technological tools to explore and deepen their understanding of concepts and to support the development of learning mathematics. They use technology to contribute to concept development, simulation, representation, reasoning, communication and problem solving.

PS.6: Attend to precision.	Mathematically proficient students communicate precisely to others. They use clear definitions, including correct mathematical language, in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They express solutions clearly and logically by using the appropriate mathematical terms and notation. They specify units of measure and label axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently and check the validity of their results in the context of the problem. They express numerical answers with a degree of precision appropriate for the problem context.
PS.7: Look for and make use of structure.	Mathematically proficient students look closely to discern a pattern or structure. They step back for an overview and shift perspective. They recognize and use properties of operations and equality. They organize and classify geometric shapes based on their attributes. They see expressions, equations, and geometric figures as single objects or as being composed of several objects.
PS.8: Look for and express regularity in repeated reasoning.	Mathematically proficient students notice if calculations are repeated and look for general methods and shortcuts. They notice regularity in mathematical problems and their work to create a rule or formula. Mathematically proficient students maintain oversight of the process, while attending to the details as they solve a problem. They continually evaluate the reasonableness of their intermediate results.

MATHEMATICS: GRADE 7

The Mathematics standards for grade 7 are supplemented by the Process Standards for Mathematics.

The Mathematics standards for grade 7 are made up of five strands: Number Sense; Computation; Algebra and Functions; Geometry and Measurement; and Data Analysis, Statistics, and Probability. The skills listed in each strand indicate what students in grade 7 should know and be able to do in Mathematics.

NUMBER SENSE

Indiana Academic Standards	Content Connectors
MA.7.NS.1: Find the prime factorization of whole numbers and write the results using exponents.	**MA.7.NS.1.a.1**: Determine the prime factorization of whole numbers.
MA.7.NS.2: Understand the inverse relationship between squaring and finding the square root of a perfect square integer. Find square roots of perfect square integers.	**MA.7.NS.2.a.1**: Identify perfect squares.
MA.7.NS.3: Know there are rational and irrational numbers. Identify, compare, and order rational and common irrational numbers ($\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$, $\prod$) and plot them on a number line.	**MA.7.NS.3.a.1**: Understand the definition of rational and irrational numbers.
	MA.7.NS.3.a.2: Order and compare rational and irrational numbers using a number line.

COMPUTATION

Indiana Academic Standards	Content Connectors
MA.7.C.1: 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.	**MA.7.C.1.a.1**: Add a positive and negative integer.
MA.7.C.2: 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.	**MA.7.C.2.a.1**: Subtract positive and negative integers.
	MA.7.C.2.a.2: Find the distance between two rational numbers on a number line using absolute value.
MA.7.C.3: 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.	**MA.7.C.3.a.1**: Solve multiplication problems with positive and negative integers.
Indiana Academic Standards	**Content Connectors**
MA.7.C.4: Understand that integers can be divided, provided that the divisor is not zero, and that every quotient of integers (with non-zero divisor) is a rational number. Understand that if p and q are integers, then –(p/q) = (–p)/q = p/(–q).	**MA.7.C.4.a.1**: Solve division problems with positive and negative integers.
MA.7.C.5: Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.	**MA.7.C.5.a.1**: Determine unit rates given a ratio of lengths, areas, and other quantities measured in like units.
MA.7.C.6: Use proportional relationships to solve ratio and percent problems with multiple operations, such as the following: simple interest, tax, markups, markdowns, gratuities, commissions, fees, conversions within and across measurement systems, percent increase and decrease, and percent error.	**MA.7.C.6.a.1**: Use proportions to solve ratio problems.
	MA.7.C.6.a.2: Solve word problems involving ratios.
	MA.7.C.6.a.3: Use proportional relationships to solve multi-step percent problems.
MA.7.C.7: Compute with rational numbers fluently using a standard algorithmic approach.	**MA.7.C.7.a.1**: Compute with rational numbers.

MA.7.C.8: Solve real-world problems with rational numbers by using one or two operations.	**MA.7.C.8.a.1**: Using one operation, solve real-world problems involving rational numbers.

ALGEBRA AND FUNCTIONS

Indiana Academic Standards	Content Connectors
MA.7.AF.1: Apply the properties of operations (e.g., identity, inverse, commutative, associative, distributive properties) to create equivalent linear expressions, including situations that involve factoring (e.g., given 2x - 10, create an equivalent expression 2(x - 5)). Justify each step in the process.	**MA.7.AF.1.a.1**: Use properties of operations to produce equivalent linear expressions.
MA.7.AF.2: Solve equations of the form px + q= r and p(x + q) = r fluently, where p, q, and r are specific rational numbers. Represent realworld problems using equations of these forms and solve such problems.	**MA.7.AF.2.a.1**: Solve equations with up to two variables based on real-world problems.
	MA.7.AF.2.a.2: Use variables to represent quantities in a real‗world or mathematical problem to solve linear equations.
MA.7.AF.3: Solve inequalities of the form px +q (> or ≥) r or px + q (< or ≤) r, where p, q, and r are specific rational numbers. Represent real-world problems using inequalities of these forms and solve such	**MA.7.AF.3.a.1**: Solve inequalities with up to two variables based on real-world problems.

Indiana Academic Standards	Content Connectors
problems. Graph the solution set of the inequality and interpret it in the context of the problem.	**MA.7.AF.3.a.2**: Use variables to represent quantities in a real‗world or mathematical problem to solve linear inequalities.
	MA.7.AF.3.a.3: Determine the graph of an inequality.
MA.7.AF.4: Define slope as vertical change for each unit of horizontal change and recognize that a constant rate of change or constant slope describes a linear function. Identify and describe situations with constant or varying rates of change.	**MA.7.AF.4.a.1**: Relate slope to rate of change between two variables.
	MA.7.AF.4.a.2: Using real-world examples, recognize the graph that shows the correct slope between two variables.
MA.7.AF.5: Graph a line given its slope and a point on the line. Find the slope of a line given its graph.	**MA.7.AF.5.a.1**: Graph a line using slope and a point on the line.

	MA.7.AF.5.a.2: Understand how to calculate the slope of a line.
MA.7.AF.6: 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).	**MA.7.AF.6.a.1**: Identify if the relationship is proportional between two quantities in a table.
	MA.7.AF.6.a.2: Determine if two quantities are in a proportional relationship using points graphed on a coordinate plane.
MA.7.AF.7: Identify the unit rate or constant of proportionality in tables, graphs, equations, and verbal descriptions of proportional relationships.	**MA.7.AF.7.a.1**: Given a table or a graph of a line, identify the unit rate.
MA.7.AF.8: Explain what the coordinates of a point on the graph of a proportional relationship mean in terms of the situation, with special attention to the points (0, 0) and (1,r), where r is the unit rate.	**MA.7.AF.8.a.1**: Given a proportional relationship, explain the meaning of the coordinates on the graph.
MA.7.AF.9: Identify real-world and other mathematical situations that involve proportional relationships. Write equations and draw graphs to represent proportional relationships and recognize that these situations are described by a linear function in the form y = mx, where the unit rate, m, is the slope of the line.	**MA.7.AF.9.a.1**: Represent proportional relationships as an equation and as a graph.

GEOMETRY AND MEASUREMENT

Indiana Academic Standards	Content Connectors
MA.7.GM.2: Identify and describe similarity relationships of polygons including the angle-angle criterion for similar triangles, and solve problems involving similarity.	**MA.7.GM.2.a.1**: Identify similar polygons.
MA.7.GM.3: Solve real-world and other mathematical problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing. Create a scale drawing by using proportional reasoning.	**MA.7.GM.3.a.1**: When given a real-world situation, determine the appropriate scale.
MA.7.GM.4: Solve real-world and other mathematical problems that involve vertical, adjacent, complementary, and supplementary angles.	**MA.7.GM.4.a.1**: Identify various angles in a realworld situation.

MA.7.GM.5: Understand the formulas for area and circumference of a circle and use them to solve realworld and other mathematical problems; give an informal derivation of the relationship between circumference and area of a circle.	**MA.7.GM.5.a.1**: Understand the formulas to calculate the area and circumference of a circle.
MA.7.GM.6: Solve real-world and other mathematical problems involving volume of cylinders and threedimensional objects composed of right rectangular prisms.	**MA.7.GM.6.a.1**: Given a model and an equation with all variables given, find the volume of a cylinder.
MA.7.GM.7: Construct nets for right rectangular prisms and cylinders and use the nets to compute the surface area; apply this technique to solve real-world and other mathematical problems.	**MA.7.GM.7.a.1**: Understand surface area and identify it in a real-world situation.

DATA ANALYSIS, STATISTICS, AND PROBABILITY

Indiana Academic Standards	Content Connectors
MA.7.DSP.1: Understand that statistics can be used to gain information about a population by examining a sample of the population and 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.	**MA.7.DSP.1.a.1**: Determine sample size to answer a given question.
MA.7.DSP.2: Use data from a random sample to draw inferences about a population. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or	**MA.7.DSP.2.a.1**: Interpret data to draw conclusions.
Indiana Academic Standards	**Content Connectors**
predictions.	
MA.7.DSP.3: Find, use, and interpret measures of center (mean and median) and measures of spread (range, interquartile range, and mean absolute deviation) for numerical data from random samples to draw comparative inferences about two populations.	**MA.7.DSP.3.a.1**: Identify the range, median, mean, or mode of a given data set.
	MA.7.DSP.3.a.2: Compare two similar populations/models to draw a conclusion.
	MA.7.DSP.3.a.3: Make or select an appropriate statement based on two unequal data sets using measure of central tendency and shape.

MA.7.DSP.4: Make observations about the degree of visual overlap of two numerical data distributions represented in line plots or box plots. Describe how data, particularly outliers, added to a data set may affect the mean and/or median.	**MA.7.DSP.4.a.1**: Make or select a statement to compare the distribution of two data sets.
MA.7.DSP.5: Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Understand that 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. Understand that a probability of 1 indicates an event certain to occur and a probability of 0 indicates an event impossible to occur.	**MA.7.DSP.5.a.1**: Describe the probability of events as being certain or impossible.
MA.7.DSP.6: Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its relative frequency from a large sample.	**MA.7.DSP.6.a.1**: Make a prediction regarding the probability of an event occurring; conduct simple probability experiments.
MA.7.DSP.7: Develop probability models that include the sample space and probabilities of outcomes to represent simple events with equally likely outcomes. Predict the approximate relative frequency of the event based on the model. Compare probabilities from the model to observed frequencies; evaluate the level of agreement and explain possible sources of discrepancy.	**MA.7.DSP.7.a.1**: Compare actual results of simple experiments with theoretical probabilities.