Indiana Department of Education

Indiana Academic Standards for Mathematics – Sixth Grade
Adopted April 2014 – Standards Resource Guide Document

This Teacher Resource Guide has been developed to provide supporting materials to help educators successfully implement the Indiana Academic Standards for Sixth Grade Mathematics – Adopted April 2014. These resources are provided to help you in your work to ensure all students meet the rigorous learning expectations set by the Academic Standards. Use of these resources is optional – teachers should decide which resource will work best in their school for their students.

This resource document is a living document and will be frequently updated. The Indiana Department of Education would like to thank Alyssa Chew, Donna McGinness, Jim Mirabelli, Cara Miller, Jennifer Oberst, and Lindsey Stine for their contributions to this document.

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The examples in this document are for illustrative purposes only, to promote a base of clarity and common understanding. Each example illustrates a standard but please note that examples are not intended to limit interpretation or classroom applications of the standards.

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GOOD WEBSITES FOR MATHEMATICS:
http://nlvm.usu.edu/en/nav/vlibrary.html
http://www.math.hope.edu/swanson/methods/applets.html
http://learnzillion.com
http://illuminations.nctm.org
https://teacher.desmos.com
http://illustrativemathematics.org
http://www.insidemathematics.org
https://www.khanacademy.org/
https://www.teachingchannel.org/
http://map.mathshell.org/materials/index.php
https://www.istemnetwork.org/index.cfm
http://www.azed.gov/azccrs/mathstandards/

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	Indiana Academic Standard for Mathematics Sixth Grade – Adopted April 2014	Highlighted Vocabulary Words from the Standard Defined	Specific Sixth Grade Example for the Standard	Specific Sixth Grade Electronic Resource for the Standard
Number Sense				
MA.6.NS.1:	Understand that positive and negative numbers are used to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge). Use positive and negative numbers to represent and compare quantities in real-world contexts, explaining the meaning of 0 in each situation.		A submarine was situated 400 feet below sea level. If it ascends 250 feet, what is its new position? Represent this situation on a number line. What does 0 represent in this situation?	https://www.illustrativemathematics.org/illustrations/277

https://www.illustrativemathematics.org/illustrations/278 |
| MA.6.NS.2: | Understand the integer number system. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself (e.g., –(–3) = 3), and that 0 is its own opposite. | **Integer Number System** - consists of all numbers expressible in the form a or $-a$ for some whole number a. | a) Plot 0, 5 and -5 on a number line.

b) What is the opposite of 7? What is the opposite of -7? What is the opposite of 0? Plot these three numbers on a number line. | |

MA.6.NS.3:	Compare and order rational numbers and plot them on a number line. Write, interpret, and explain statements of order for rational numbers in real-world contexts.	**Rational number** - a real number that can be written as a ratio of two integers with a non-zero denominator.	a) Plot the following numbers on a number line. $$-3.6,\ 1.5,\ -1\tfrac{1}{4},\ \tfrac{5}{3}$$ b) In town A, the temperature is $-4℃$. In town B, the temperature is $-5℃$. Write an inequality statement that compares the temperatures in the two towns and describe the meaning of the statement in terms of the context.	https://www.illustrativemathematics.org/illustrations/285
MA.6.NS.4:	Understand that the absolute value of a number is the distance from zero on a number line. Find the absolute value of real numbers and know that the distance between two numbers on the number line is the absolute value of their difference. Interpret absolute value as magnitude for a positive or negative quantity in a real-world situation.	**Absolute Value** - the absolute value of a number is the distance from zero on a number line. **Magnitude** - referring to the size of the quantity.	a) What is the value of $\|-6.5\|$? Explain your answer. b) Plot 3 and -5.9 on a number line. What is the distance between these numbers? c) Amy recorded a value of -25 in her account spreadsheet to represent the amount she spent at a store. What number should replace the box in the sentence below to describe this situation? $\|-25\| = \square$ *to represent the amount Amy spent at the store.*	

|				
MA.6.NS.5:	Know commonly used fractions (halves, thirds, fourths, fifths, eighths, tenths) and their decimal and percent equivalents. Convert between any two representations (fractions, decimals, percents) of positive rational numbers without the use of a calculator.		Write the other two representations (fraction, decimal, percent) for each number. a) $\frac{3}{4}$ b) 44% c) $\frac{1}{3}$ d) 2.5	
MA.6.NS.6:	Identify and explain prime and composite numbers.	**Prime Numbers** - a number that has exactly two factors, 1 and the number itself; 1 is not considered to be prime. **Composite Numbers** - a whole number that has factors other than 1 and the number itself.	Determine whether the numbers are prime or composite and explain how you know. 42, 7, 13, 1, 12, 99	
MA.6.NS.7:	Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers from 1 to 100, with a common factor as a multiple of a sum of two whole numbers with no common factor.	**Greatest Common Factor** - the greatest number that is a factor of two or more given numbers. **Least Common Multiple -** the smallest number that is a common multiple of two or more given numbers.	a) What is the greatest common factor of 32 and 60? b) What is the least common multiple of 6 and 9? c) Fill in the boxes below to make a true statement. Complete the statement, such that, the boxes inside the parentheses do not have any common factor between them. $$36 + 8 = \square \left(\square + \square \right)$$	https://www.illustrativemathematics.org/illustrations/255 https://www.illustrativemathematics.org/illustrations/256 https://www.illustrativemathematics.org/illustrations/257

MA.6.NS.8:	Interpret, model, and use ratios to show the relative sizes of two quantities. Describe how a ratio shows the relationship between two quantities. Use the following notations: a/b, a to b, a:b.	**Ratio** - a numerical representation which shows the relative size of two quantities; a comparison of numbers by division.	Claire has 12 dimes and 4 quarters. What is the ratio of dimes to quarters? [Ask students to model this ratio in different ways and to write a sentence that describes the ratio relationship.]	https://www.illustrativemathematics.org/illustrations/76
MA.6.NS.9:	Understand the concept of a unit rate and use terms related to rate in the context of a ratio relationship.	**Unit Rate** - when rates are expressed as a quantity of 1, such as 2 feet per second or 5 miles per hour. **Rate** - ratio that compares two quantities of different units.	Dena runs 20 miles in 4 hours. What are the unit rates in this situation (the distance Dena runs in 1 hour and the amount of time required to run 1 mile)?	https://www.illustrativemathematics.org/illustrations/1181
MA.6.NS.10	Use reasoning involving rates and ratios to model real-world and other mathematical problems (e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations).	Click on the link in this row in the final column to see examples of **tables of equivalent ratios, tape diagrams, and double number line diagrams**.	a) It took Sam 10 minutes to complete 12 math problems. If he works for 1.5 hours at this rate, how many problems will he complete? What is Sam's average rate in problems completed per hour? b) Ed has 8 pieces of candy which represents 40% of all the candy in his home. How many pieces of candy are in Ed's home?	http://commoncoretools.files.wordpress.com/2012/02/ccss_progression_rp_67_2011_11_12_corrected.pdf

Computation				
MA.6.C.1:	Divide multi-digit whole numbers fluently using a standard algorithmic approach.	**Algorithmic approach** - using a list of well-defined instructions or a step-by-step procedure to solve a problem. **Fluently** - efficient and accurate	Find the value of each expression. a) $10,767 \div 37$ b) $12,201 \div 98$	
MA.6.C.2:	Compute with positive fractions and positive decimals fluently using a standard algorithmic approach.	**Algorithmic approach** - using a list of well-defined instructions or a step-by-step procedure to solve a problem. **Fluently** - efficient and accurate	Find the value of each expression. a) $\frac{3}{7} \cdot \frac{4}{5}$ b) $4\frac{2}{3} - 1\frac{2}{5}$ c) $20.604 + 121.7$ d) $156 \div 4.8$	
MA.6.C.3:	Solve real-world problems with positive fractions and decimals by using one or two operations.		a) Janelle earned \$1,230.93 over the past three months. On average, how much did Janelle earn in each of the last three months? b) Fred exercised $\frac{3}{4}$ hour on Monday, $1\frac{2}{3}$ hours on Wednesday, and $\frac{1}{2}$ hour on Friday. For how long, in hours, did Fred exercise over the span of those three days?	

| MA.6.C.4: | Compute quotients of positive fractions and solve real-world problems involving division of fractions by fractions. Use a visual fraction model and/or equation to represent these calculations. | **Quotient** - when one number (dividend) is divided by another number (divisor), the result obtained is known as the quotient. | a) What is $\frac{7}{3} \div \frac{4}{5}$?

b) How many $^2/_5$-cup servings are in $2\,^3/_4$ cups of yogurt?

c) Manny has $\frac{1}{2}$ yard of fabric to make book covers. Each book cover is made from $\frac{1}{8}$ yard of fabric. How many book covers can Manny make? [See model below. Solution is 4.]
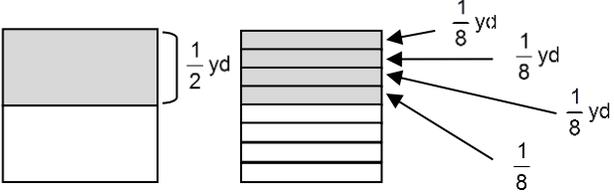
 | https://www.illustrativemathematics.org/illustrations/50 |
| MA.6.C.5: | Evaluate positive rational numbers with whole number exponents. | | a) Evaluate: 2^5

b) Evaluate: $\left(\frac{2}{3}\right)^4$

c) Which is equivalent to 1.2^3?

• $1.2 x 3$
• $1.2 + 3$
• $1.2 x 1.2 x 1.2$
• $1.2 + 1.2 + 1.2$
• $3 x 3 x 3$ | |

MA.6.C.6:	Apply the order of operations and properties of operations (identity, inverse, commutative properties of addition and multiplication, associative properties of addition and multiplication, and distributive property) to evaluate numerical expressions with nonnegative rational numbers, including those using grouping symbols, such as parentheses, and involving whole number exponents. Justify each step in the process.		Evaluate: $3 + 8x2 + 7(3^2 - 1)$	http://www.math-play.com/Order-of-Operations-Millionaire/order-of-operations-millionaire.html

Algebra and Functions				
MA.6.AF.1:	Evaluate expressions for specific values of their variables, including expressions with whole-number exponents and those that arise from formulas used in real-world problems.		a) What is the value of the expression if $m = 3$ and $n = 2$? $$2m^3 + 3(6 - n)^n$$ b) The volume of a cube, V, can be found using the formula $V = s^3$, where s is the side length of the cube. Last week, Tony made a container in the shape of cube with side lengths of 5 inches. This week, he creates a container that has three times the volume of the container he made last week. What is the volume of the new container?	
MA.6.AF.2:	Apply the properties of operations (e.g., identity, inverse, commutative, associative, distributive properties) to create equivalent linear expressions and to justify whether two linear expressions are equivalent when the two expressions name the same number regardless of which value is substituted into them.		Are the expressions below equivalent? Justify your answer. $$5(3 + 2m) + 4m$$ $$8 + 6m + 7 + 8m$$	
MA.6.AF.3:	Define and use multiple variables when writing expressions to represent real-world and other mathematical problems, and evaluate them for given values.		a) A babysitter charges an hourly rate of $5 to watch each child that is 8 years of age or older and $7 to watch each child under 8 years of age. Write an expression to represent the amount the babysitter charges for one hour given any number of children. Be sure to define your variables. How much money would the babysitter charge to watch 3 children under 8 years of age and 2 children above 8 years of age for 4 hours? b) Write an expression to represent the area of a square with side length $3c$. What is the area of the square if $c = 4$? c) Write an expression to represent 3 times the sum of a number and 5, plus a different number cubed.	https://www.illustrativemathematics.org/illustrations/532

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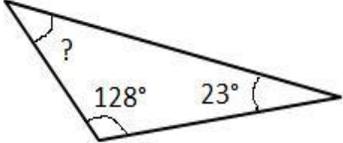| MA.6.AF.4:	Understand that solving an equation or inequality is the process of answering the following question: Which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.		a) Identify 3 numbers that are solutions of the inequality and 3 numbers that are not solutions of the inequality. Justify your answers. $$5 + s > 10.$$ b) Stamps cost $0.49 each. The cost for a sheet of stamps is $9.80. The equation $0.49s = 9.80$ represents this relation where s represents the number of stamps in the sheet. How many stamps are in the sheet? Explain the strategies you used to determine your answer. Show that your solution is correct using substitution.	https://www.illustrativemathematics.org/illustrations/673
MA.6.AF.5:	Solve equations of the form x + p = q, x – p = q, px = q, and x/p = q fluently for cases in which p, q and x are all nonnegative rational numbers. Represent real world problems using equations of these forms and solve such problems.	**Fluently** - efficient and accurate	a) Solve each equation. • $d + 35.5 = 52$ • $4k = 84$ • $r - 1\frac{1}{6} = 5\frac{2}{3}$ • $\frac{x}{1.2} = 6$ b) Stephen used 32.5 gallons of water to wash his car which is 6 gallons more than the amount he used to take a shower. Write an equation that can be used to determine the amount of water Stephen used to take a shower. How much water did Stephen use to take a shower?	http://www.math-play.com/equation-games.html https://www.illustrativemathematics.org/illustrations/425 https://www.illustrativemathematics.org/illustrations/1107 http://www.mathgoodies.com/lessons/vol7/equations.html

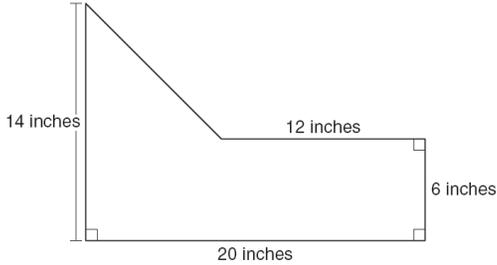| MA.6.AF.6:	Write an inequality of the form x > c, x ≥ c, x < c, or x ≤ c, where c is a rational number, to represent a constraint or condition in a real-world or other mathematical problem. Recognize inequalities have infinitely many solutions and represent solutions on a number line diagram.	**Constraint** - limitation or restriction; a restriction on what answers are allowed.	Jonas spent more than $50 at an amusement park. Write an inequality to represent the amount of money Jonas spent at the amusement park and represent this on a number line. What are some possible amounts of money Jonas may have spent at the amusement park?	
MA.6.AF.7:	Understand that signs of numbers in ordered pairs indicate the quadrant containing the point; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. Graph points with rational number coordinates on a coordinate plane.		a) Graph the ordered pairs on a coordinate plane. (-2, 2.5), (3, 0), (-4, -1/2) b) Graph (-5, 2) and (5, 2) on a coordinate plane and describe how the points are related with respect to one or both axes. c) Consider points located in the fourth quadrant of the coordinate plane. Describe the coordinates of the ordered pairs representing such points.	http://www.mathsisfun.com/data/cartesian-coordinates-interactive.html
MA.6.AF.8:	Solve real-world and other mathematical problems by graphing points with rational number coordinates on a coordinate plane. Include the use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.		Vicky created a map of her neighborhood on a coordinate plane. Her house is located at (-3.5, 6) and her school is located at (-3.5, -1). How far, in units, is Vicky's house from her school?	https://www.illustrativemathematics.org/illustrations/290
MA.6.AF.9:	Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane.		The table represents the relationship between feet and yards. Complete the table and plot the data on a coordinate plane. What do you notice about the arrangement of the points? <table><tr><td>Feet</td><td>3</td><td>6</td><td>9</td><td></td><td>27</td></tr><tr><td>Yards</td><td>1</td><td>2</td><td>3</td><td>5</td><td></td></tr></table>	https://www.illustrativemathematics.org/illustrations/711

| MA.6.AF.10 | Use variables to represent two quantities in a proportional relationship in a real-world problem; write an equation to express one quantity, the dependent variable, in terms of the other quantity, the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. | **Proportional Relationship** - when two ratios are equal, they are said to have a proportional relationship.
Independent Variable - a variable that provides the input values.
Dependent Variable - a variable whose values depend on the values of the independent variable. | Bo pays $30 every month for cable television. Represent this monthly cost using an equation and graph. Be sure to define your variables and label your axes. How many months would Bo be able to pay for cable television with $250? | https://www.illustrativemathematics.org/illustrations/806 |

| Geometry and Measurement				
MA.6.GM.1:	Convert between measurement systems (English to metric and metric to English) given conversion factors, and use these conversions in solving real-world problems.		a) Terry walked 3.5 kilometers over the weekend. How many miles did he walk? (1 kilometer = 0.62 mile) b) Sara's suitcase weighs 27 kilograms. How many pounds does her suitcase weigh? (1 pound = 0.454 kilograms)	http://www.learner.org/interactives/metric/mass.html
MA.6.GM.2:	Know that the sum of the interior angles of any triangle is 180º and that the sum of the interior angles of any quadrilateral is 360º. Use this information to solve real-world and mathematical problems.		What is the measure, in degrees, of the missing angle? 	
MA.6.GM.3:	Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate; apply these techniques to solve real-world and other mathematical problems.		The coordinates of three vertices of a rectangle are (-4, 2), (-4, -3), and (2, 2). Represent these vertices as points in the coordinate plane. What are the coordinates of the point representing the fourth vertex of the rectangle? What is the area and perimeter of the rectangle?	

MA.6.GM.4:	Find the area of complex shapes composed of polygons by composing or decomposing into simple shapes; apply this technique to solve real-world and other mathematical problems.	**Complex shape** - a shape made by two or more basic shapes **Composing -** creating; building **Decomposing -** deconstructing; taking apart	The diagram below shows the base of a sculpture that Amy made. What is the area of the base of the sculpture?	https://www.illustrativemathematics.org/illustrations/647
MA.6.GM.5:	Find the volume of a right rectangular prism with fractional edge lengths using unit cubes of the appropriate unit fraction edge lengths (e.g., using technology or concrete materials), and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = lwh and V = Bh to find volumes of right rectangular prisms with fractional edge lengths to solve real-world and other mathematical problems.	**Volume** - the amount of 3-dimensional space an object occupies; capacity.	Hope has a box in the shape of a right rectangular prism that measures 3 feet by $2\frac{1}{2}$ feet by $\frac{3}{4}$ foot. She fills 50% of the box with packing material. How much space inside the box is filled with packing material?	https://www.illustrativemathematics.org/illustrations/657 http://www.onlinemathlearning.com/volume-rectangular-prism-6g2.html http://www.opusmath.com/common-core-standards/6.g.2-find-the-volume-of-a-right-rectangular-prism-with-fractional-edge-lengths

| MA.6.GM.6: | Construct right rectangular prisms from nets and use the nets to compute the surface area of prisms; apply this technique to solve real-world and other mathematical problems. | **Net** - a 2-dimensional pattern of a 3-dimensional figure that can be folded to form the 3-dimensional figure.
 Surface area - the total area of the surface of a 3-dimensional object. | Bob is decorating the outside faces of a gift box. The box is a right rectangular prism as shown in the diagram below with the dimensions given in feet. How much space is available for Bob to decorate?
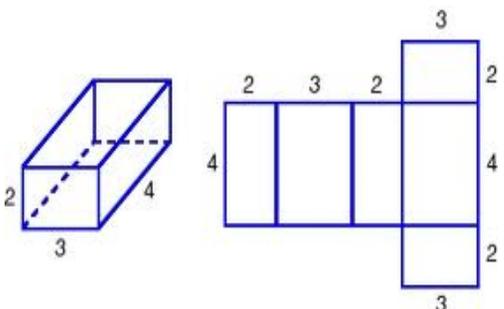
  | http://illuminations.nctm.org/ActivityDetail.aspx?ID=205

 http://www.everythingmaths.co.za/grade-10/12-measurement/12-measurement-02.cnxmlplus |

Data Analysis and Statistics			
MA.6.DS.1:	Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for the variability in the answers. Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.	**Variability -** in this sense, variability refers to anticipating different responses. **Distribution** - the way data is spread **Center** - mean or median value **Spread -** variability (range and interquartile range)	Mike asked his class the following questions. Which of them are statistical questions? a) What is your favorite food? b) What was the low temperature yesterday? c) How old are you in years? d) What is the date today? e) In what month were you born?	https://www.illustrativemathematics.org/illustrations/703 https://www.illustrativemathematics.org/illustrations/1040
MA.6.DS.2:	Select, create, and interpret graphical representations of numerical data, including line plots, histograms, and box plots.	**Line Plots -** a graphical display of a set of data where each data point is shown as a dot or mark above a number line. **Histograms -** a graphical display of data that is grouped into intervals and plotted as bars. Histograms are similar to bar graphs, but each bar represents a range or interval of data. **Box Plots -** a graphical display that shows the distribution of a set of data along a number line, dividing the data into four parts using the median, quartiles, and extreme values.	Nineteen students completed a writing sample. Their samples were scored using a six point rubric. The scores were 0, 1, 2, 2, 3, 3, 3, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5, 6, 6. Create a data display to represent the scores. What are some observations that can be made from your data display?	https://www.illustrativemathematics.org/illustrations/1026 http://illuminations.nctm.org/ActivityDetail.aspx?ID=77 http://illuminations.nctm.org/ActivityDetail.aspx?ID=78
MA.6.DS.3:	Formulate statistical questions; collect and organize the data (e.g., using technology); display and interpret the data with graphical representations (e.g., using technology).		Activity: Students can formulate a statistical question of interest. They can collect, organize, and display their data, and make observations based on their data display.	

| MA.6.DS.4: | Summarize numerical data sets in relation to their context in multiple ways, such as: report the number of observations; describe the nature of the attribute under investigation, including how it was measured and its units of measurement; determine quantitative measures of center (mean and/or median) and spread (range and interquartile range), as well as describe any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered; and relate the choice of measures of center and spread to the shape of the data distribution and the context in which the data were gathered. | **Mean** - a measure of center in a set of numerical data, computed by adding the values in a list and then dividing by the number of values in the list. **Median** - a measure of center in a set of numerical data; the value appearing at the center of a sorted list – or the mean of the two central values if the list contains an even number of values. **Range** - the difference between the largest number and the smallest number in a data set. **Interquartile Range** - a measure of variation in a set of numerical data; the distance between the first and third quartiles of the data set. | The data below shows David's test scores in his history class.

65, 85, 85, 85, 90, 90, 95, 95, 100, 100

David's teacher allows him to use the mean or median of his test scores to represent his final grade. Which gives David a higher final grade? Justify your answer. | https://www.illustrativemathematics.org/illustrations/1026

https://www.illustrativemathematics.org/illustrations/877

https://www.illustrativemathematics.org/illustrations/1199 |