Indiana Academic Standards for Mathematics – Seventh 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 Seventh 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. Please send any suggested links and report broken links to:

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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/

	Indiana Academic Standard for Mathematics Seventh Grade – Adopted April 2014	Highlighted Vocabulary Words from the Standard Defined	Specific Seventh Grade Example for the Standard	Specific Seventh Grade Electronic Resource for the Standard
Number Sense				
MA.7.NS.1:	Find the prime factorization of whole numbers and write the results using exponents.	**Prime Factorization** - writing a composite number as a product of its prime numbers.	Write the prime factorization of each number using exponents. a) 48 b) 75 c) 200	
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.	**Square Root** - the square root of a number is a nonnegative number which when multiplied by itself equals the given number.	a) Find the value of each expression. • $\sqrt{49}$ • $\sqrt{144}$ b) Describe the relationship between the expressions in each example. • 6^2 and $\sqrt{36}$ • 8^2 and $\sqrt{64}$ • 11^2 and $\sqrt{121}$	
MA.7.NS.3:	Know there are rational and irrational numbers. Identify, compare, and order rational and common irrational numbers (√2, √3, √5, ∏) and plot them on a number line.	**Rational number** - a real number that can be written as a ratio of two integers with a non-zero denominator. **Irrational number** - a real number that cannot be expressed as a ratio of two integers.	List the numbers from least to greatest and plot them on a number line. $3\frac{3}{5}, -2.2, -\frac{5}{2}, \sqrt{5}, \pi$	

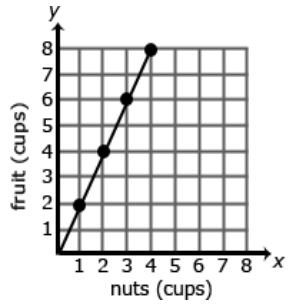
Computation				
MA.7.C.1:	Understand p + q as the number located a distance |q| from p, in the positive or negative direction, depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.		Represent each sum on a number line. a) $-4+7$ b) $3+(-2)$ c) $-2.5+(-2.5)$ d) $4\frac{1}{2}+\left(-4\frac{1}{2}\right)$	http://commoncoretools.me/wp-content/uploads/2013/07/ccssm_progression_NS+Number_2013-07-09.pdf https://www.illustrativemathematics.org/illustrations/310
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.		a) Which expression is equivalent to 4/5 - 2/3? • 4/5 + (-2/3) • 4/5 – (-2/3) • 2/3 – 4/5 • 2/3 + 4/5 b) Trey owes his dad $1.75. He owes his sister $2.50. Represent the total amount Trey owes on a number line. c) The temperature in town A is -4°C. The temperature in town B is 1°C. Represent the difference between the temperatures in town A and town B on a number line. Fill in the blank to complete the sentence. The temperature in town A is ___°C colder than in town B.	http://commoncoretools.me/wp-content/uploads/2013/07/ccssm_progression_NS+Number_2013-07-09.pdf https://www.illustrativemathematics.org/illustrations/314 https://www.illustrativemathematics.org/illustrations/46

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.		Which expressions are equivalent to -4(3 + -6)? a) 4(3) + 4(-6) b) -4(3) + -4(-6) c) 4(-3) + 4(6) d) -4(-3) + -4(6)	http://commoncoretools.me/wp-content/uploads/2013/07/ccssm_progression_NS+Number_2013-07-09.pdf
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).	**Quotient** - when one number (dividend) is divided by another number (divisor), the result obtained is known as the quotient.	Which expressions are equivalent to -(20/4)? a) 20/-4 b) -20/-4 c) -20/4 d) 20/4	http://commoncoretools.me/wp-content/uploads/2013/07/ccssm_progression_NS+Number_2013-07-09.pdf
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.	**Unit Rate** - when rates are expressed as a quantity of 1, such as 2 feet per second or 5 miles per hour.	Michele walks $^2/_3$ mile every $^1/_6$ hour. What is the unit rate in which Michele walks in miles per hour?	https://www.illustrativemathematics.org/illustrations/82 https://www.illustrativemathematics.org/illustrations/470
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.	**Proportional Relationship** - when two ratios are equal, they are said to have a proportional relationship.	Last year, Kim earned $8 per hour at her job. This year, Kim earns $10 per hour at her job. What is the percent of increase, in dollars earned per hour, from last year to this year?	https://www.illustrativemathematics.org/illustrations/106

MA.7.C.7:	Compute with rational 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) $7(-8)$ b) $-61-20$ c) $-98\div 6$ d) $5\frac{2}{3}-9\frac{3}{4}$ e) $-5.2\cdot 8\cdot(-\frac{3}{4})$	
MA.7.C.8:	Solve real-world problems with rational numbers by using one or two operations.		a) The temperature in town A is -3.5 degrees Celsius. The temperature in town B is 2.5 times colder. What is the temperature in town B? b) Larry bought 3 pounds of apples and one bag of oranges at the store. The apples cost $1.75 per pound and the bag of oranges cost $2.99. What was the total cost of Larry's purchase? Do not include tax.	

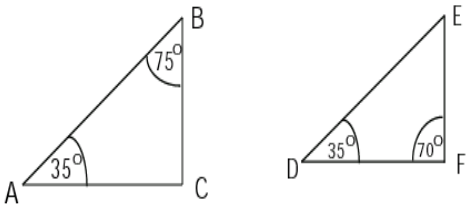
Algebra and Functions				
MA.7.AF.1:	Apply the properties of operations (e.g., identity, inverse, commutative, associative, distributive properties) to create equivalent linear expressions, including situations that involve factoring (e.g., given 2x - 10, create an equivalent expression 2(x - 5)). Justify each step in the process.		a) Which expressions are equivalent to $6m + 18$? • $6(m + 18)$ • $6(m + 3)$ • $6 + m + 18$ • $18 + m + 5m$ • $5m + 18 + m$ b) Which expressions are equivalent to $4(y - 3) + 9y$? • $13y - 3$ • $4y - 12 + 9y$ • $13y - 12$ • $10y$ • $4y - 3 + 9y$	
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 real-world problems using equations of these forms and solve such problems.	**Fluently** – efficient and accurate	Solve each equation. a) $4(x - 3) = 32$ b) $\frac{2}{3}c + 5 = 10\frac{1}{2}$ c) $-3x - 4 = 44$ Jane's cell phone plan is $40 each month plus $0.15 per minute for each minute over 200 minutes of call time. Jane's cell phone bill last month was $58.00. Write an equation that can be used to determine the number of minutes over 200 that Jane was billed. How many minutes over 200 was Jane billed last month?	http://www.math-play.com/equation-games.html

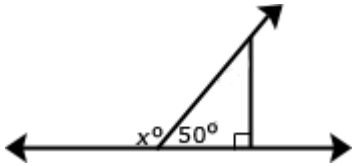
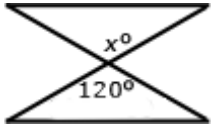
MA.7.AF.3:	Solve inequalities of the form px +q (> or ≥) r or px + q (< or ≤) r, where p, q, and r are specific rational numbers. Represent real-world problems using inequalities of these forms and solve such problems. Graph the solution set of the inequality and interpret it in the context of the problem.		Amanda has $45 to spend on flowers. She buys some roses for a total of $19 and will spend the rest on lily flowers. Each lily flower costs $3. Write an inequality that can be used to determine the number of lily flowers Amanda can buy. How many lily flowers can Amanda buy?	
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.		The table shows the distance Betty traveled in a plane over time. Does this data represent a situation with a constant or varying rate of change? Justify your answer. Time (min.) | 30 | 60 | 90 | 120 Distance (miles) | 290 | 580 | 870 | 1160	
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.	**Slope** - The steepness of a line expressed as a ratio of the vertical change to the horizontal change.	Graph the line that contains the point (-3, 5) and has a slope of $-\frac{3}{4}$.	https://www.khanacademy.org/math/algebra/linear-equations-and-inequalitie/slope-and-intercepts/v/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).	**Origin** - the point on a coordinate plane in which the x and y axes intersect; the ordered pair for the origin is (0, 0).	The cost of gasoline is given in the table. Gallons | 2 | 4 | 6 | 8 Cost ($) | $7 | $14 | $21 | $28 Does this data represent a proportional relationship? Justify your answer.	

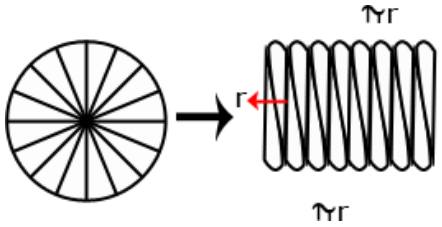
MA.7.AF.7:	Identify the unit rate or constant of proportionality in tables, graphs, equations, and verbal descriptions of proportional relationships.	**Constant of Proportionality** - the constant value of the ratio of two proportional quantities x and y; usually written y = kx, where k is the factor (constant) of proportionality.	Ray paid $26.25 for 7.5 gallons of gasoline. What is the unit rate of gasoline in dollars per gallon?	https://www.illustrativemathematics.org/illustrations/181 https://www.illustrativemathematics.org/illustrations/1178
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.		The graph represents the ratio of nuts to fruit in a trail mix. What does the point (1,2) represent? Using the ratio represented in the graph, how many cups of nuts are needed in the trail mix if there are 20 cups of fruit? 	https://www.illustrativemathematics.org/illustrations/181 https://www.illustrativemathematics.org/illustrations/1178

<table>
<tr>
<td>MA.7.AF.9:</td>
<td>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.</td>
<td></td>
<td>The table below shows the cost of gum packs. Represent this relationship using a graph and equation. Be sure to define your variables and label your axes.

<table>
<tr><th>Number of Packs</th><th>Cost in Dollars</th></tr>
<tr><td>1</td><td>1.50</td></tr>
<tr><td>2</td><td>3.00</td></tr>
<tr><td>3</td><td>4.50</td></tr>
<tr><td>4</td><td>6.00</td></tr>
</table>
</td>
<td>https://www.illustrativemathematics.org/illustrations/101</td>
</tr>
</table>

Geometry and Measurement				
MA.7.GM.1:	Draw triangles (freehand, with ruler and protractor, and using technology) with given conditions from three measures of angles or sides, and notice when the conditions determine a unique triangle, more than one triangle, or no triangle.		a) Construct a triangle with angles measuring 30°, 45°, and 105°. b) Can you draw a triangle with sides that are 13 cm, 5 cm and 6 cm? Justify your answer. c) Draw a triangle with all three angles measuring 60 degrees. Is this a unique triangle? Why or why not?	http://vimeo.com/91418249
MA.7.GM.2:	Identify and describe similarity relationships of polygons including the angle-angle criterion for similar triangles, and solve problems involving similarity.	**Similarity** - in similar figures, the corresponding angles are congruent, and the corresponding sides are proportional.	Are the triangles similar? Justify your answer. 	
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.	**Scale drawings** - a drawing that shows a real object with accurate sizes except they have all been reduced or enlarged by a certain amount (called the scale).	Anita has a map with a scale of ¼ inch = 15 miles. Anita measures the distance from her home to her grandmother's home on her map to be 3 inches. What is the distance, in miles, from Anita's home to her grandmother's home?	

MA.7.GM.4:	Solve real-world and other mathematical problems that involve vertical, adjacent, complementary, and supplementary angles.	**Vertical angles** - angles opposite each other when two lines intersect. **Adjacent angles** - angles that share a common side. **Complementary angles** - two angles whose sum is 90 degrees. **Supplementary angles** - two angles whose sum is 180 degrees.	In each diagram, what is the measure, in degrees, of angle x?  	

MA.7.GM.5:	Understand the formulas for area and circumference of a circle and use them to solve real-world and other mathematical problems; give an informal derivation of the relationship between circumference and area of a circle.	**Circumference** - the distance around the outside of a circle calculated by $2\pi r$ or πd.	a) Ed has swimming pool in the shape of a cylinder. The bottom of the pool is circular with a radius of 15 feet. What is the length, in feet, of the distance around the bottom of the swimming pool? What is the area of the bottom of the swimming pool? b) Activity: Student should use a circle as a model to make several equal parts as in a pie model (see below). The greater the number of cuts, the better. The pie pieces are laid out to form a shape similar to a parallelogram. Students will then write an expression for the area of the parallelogram related to the radius (note: the length of the base of the parallelogram is half the circumference, or πr, and the height is r, resulting in an area of πr^2. Extension: Given the circumference of a circle, determine the area or given the area of a circle, determine the circumference. 	

MA.7.GM.6:	Solve real-world and other mathematical problems involving volume of cylinders and three-dimensional objects composed of right rectangular prisms.	**Volume** - the amount of 3-dimensional space an object occupies; capacity.	Becky needs to transfer liquid to a vase using a cylindrical container with a radius of 5 centimeters and a height of 10 centimeters. • The vase has a volume of 2,800 cubic centimeters, and she will fill the vase to 75% capacity. • Becky will completely fill the container each time it is used to fill the vase. How many times will Becky need to fill the container to fill the vase to 75% capacity?	
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.	**Surface area** - the total area of the surface of a 3-dimensional object.	a) Joe is wrapping a gift in a box in the shape of a right rectangular prism. The dimensions of the box are 5 inches by 6 inches by 2 inches. Construct a net of this prism and determine the minimum amount of wrapping paper needed to completely wrap the gift. b) A can of soup in the shape of a cylinder is 10 centimeters tall and has a diameter of 6 centimeters. A label covers the entire can except for the top and bottom. Construct a net of this cylinder and determine the area covered by the label. What is the total surface area of the can including the top and bottom?	http://www.onlinemathlearning.com/geometry-nets.html http://virtualnerd.com/geometry/surface-area-volume-solid/prisms-cylinders-area/calculate-surface-area-rectangular-prism-net

<table>
<tr><th colspan="5">Data Analysis, Statistics and Probability</th></tr>
<tr>
<td>MA.7.DSP.1:</td>
<td>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.</td>
<td>Statistics - facts or data of a numerical kind, assembled, classified, and tabulated so as to present significant information about a given subject.</td>
<td>The student council has been asked to conduct a survey of the student body to determine the students' lunch preferences. They have determined two ways to do the survey. The two methods are listed below. Which survey option should the student council use and why?

• Assign a unique number to each student in the school and use a random generator to select 30 numbers from this list. Have students associated with the selected numbers complete the survey.
• Have the first 30 students that enter the cafeteria complete the survey.</td>
<td>https://www.illustrativemathematics.org/illustrations/974</td>
</tr>
<tr>
<td>MA.7.DSP.2:</td>
<td>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 predictions.</td>
<td>Random Sample - a sample in which every individual or element in the population has an equal chance of being selected.</td>
<td>The data from four random samples of 100 students regarding their lunch preferences are given below.

<table>
<tr><th></th><th>Salad</th><th>Pizza</th><th>Taco</th><th>Total</th></tr>
<tr><td>Sample A</td><td>8</td><td>42</td><td>50</td><td>100</td></tr>
<tr><td>Sample B</td><td>12</td><td>77</td><td>11</td><td>100</td></tr>
<tr><td>Sample C</td><td>25</td><td>50</td><td>25</td><td>100</td></tr>
<tr><td>Sample D</td><td>20</td><td>62</td><td>18</td><td>100</td></tr>
</table>

How might the cafeteria use this information to plan their meals?</td>
<td>https://www.illustrativemathematics.org/illustrations/1339</td>
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<tr>
<td>MA.7.DSP.3:</td>
<td>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.</td>
<td>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.
Mean Absolute Deviation - a measure of variation in a set of numerical data; computed by adding the distances between each data value and the mean, then dividing by the number of data values.</td>
<td>The two data sets below depict random samples of housing prices sold in two towns. Based on this data, which measure of center will provide the most accurate estimation of housing prices in these towns? Explain your reasoning.
<table>
<tr><th>Town A</th><th>Town B</th></tr>
<tr><td>1,200,000</td><td>5,000,000</td></tr>
<tr><td>281,000</td><td>250,000</td></tr>
<tr><td>265,500</td><td>250,000</td></tr>
<tr><td>265,000</td><td>200,000</td></tr>
<tr><td>242,000</td><td>190,000</td></tr>
<tr><td>211,000</td><td>160,000</td></tr>
<tr><td>140,000</td><td>154,000</td></tr>
</table>
</td>
<td>https://www.illustrativemathematics.org/illustrations/1340

https://www.illustrativemathematics.org/illustrations/1341</td>
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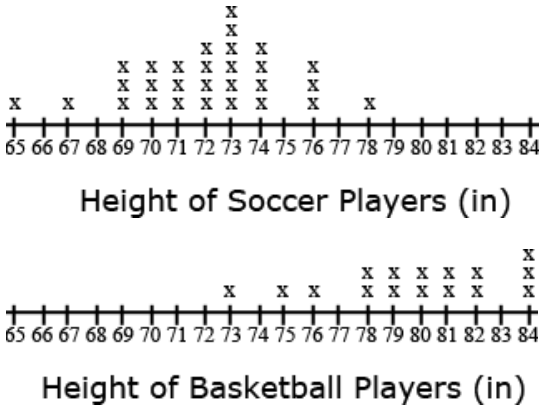
MA.7.DSP.4:	Make observations about the degree of visual overlap of two numerical data distributions represented in line plots or box plots. Describe how data, particularly outliers, added to a data set may affect the mean and/or median.	**Outlier** - a value that lies "outside" (is much smaller or larger than) most of the other values in a set of data.	The line plots represent the heights, in inches, of players on a soccer team and basketball team. What observations can you make from this data?  	https://www.illustrativemathematics.org/illustrations/1340 https://www.illustrativemathematics.org/illustrations/1341
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.		a) If the weatherman predicts that there is a 20% chance of rain, would this be a good day to plan a picnic? What is the probability that it will not rain? b) A container contains 2 gray marbles, 1 white marble, and 4 black marbles. Without looking, if you choose a marble from the container, will the probability be closer to 0 or to 1 that you will select a white marble? A gray marble? A black marble? Justify each of your predictions.	http://illuminations.nctm.org/activitydetail.aspx?id=67

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.	**Relative frequency** - the ratio of the number of times an event occurs to the number of occasions on which it might occur in the same period.	Activity: Students can collect data using physical objects, a graphing calculator, or a web-based simulation. Students can perform experiments multiple times, combine data with other groups, or increase the number of trials in a simulation to look at the long-run relative frequencies. Example: Each group receives a bag that contains 4 green marbles, 6 red marbles, and 10 blue marbles. Each group performs 50 pulls, recording the color of marble drawn and replacing the marble into the bag before the next draw. Students compile their data as a group and then as a class. They summarize their data as experimental probabilities and make conjectures based on their data. (How many green draws would you expect if you were to conduct 1000 pulls? 10,000 pulls?). Students create another scenario with a different ratio of marbles in the bag and make a conjecture about the outcome of 50 marble pulls with replacement. (An example would be 3 green marbles, 6 blue marbles, 3 blue marbles.) Students try the experiment and compare their predictions to the experimental outcomes to continue to explore and refine conjectures about theoretical probability.	http://www.sciencenetlinks.com/interactives/marble/marblemania.html https://www.illustrativemathematics.org/illustrations/1047 https://www.illustrativemathematics.org/illustrations/1521

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.	**Sample Space** - all of the possible outcomes.	Activity: Roll a standard six-sided die 10 times. After each roll, record whether a five was rolled or not. a) What proportion of the 10 rolls resulted in a five? b) Combine your results with those of your classmates. What proportion of all the rolls in the class resulted in a five? c) Make a list of all the outcomes when rolling the die. d) What proportion of the 6 outcomes result in a five? Is this close to the proportion in part A and part B? e) Suppose you rolled the die thousands of times. What proportion of the time would you expect to roll a five?	http://www.actuarialfoundation.org/probabilitychallenge/