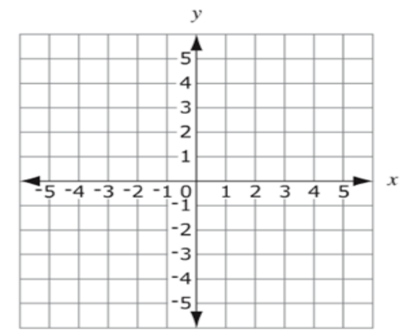
6^{th} Grade MCA3 Standards, Benchmarks, Examples, Test Specifications & Sampler Questions

Strand	Standard	No.	Benchmark (6th Grade)	Sampler Item
Number & Operation **MCA 14-18 Items** **Modified MCA 9-12 Items**	Read, write, represent and compare positive rational numbers expressed as fractions, decimals, percents and ratios; write positive integers as products of factors; use these representations in real-world and mathematical situations. **MCA 5-7 Items** **Modified MCA 4-7 Items**	6.1.1.1	Locate positive rational numbers on a number line and plot pairs of positive rational numbers on a coordinate grid. ***(1)*** *Item Specifications* • Both axes must have the same scale • Items may require locating points on either axis • Vocabulary allowed in items: integer, *x*-axis, *y*-axis, horizontal axis, vertical axis, rational number, coordinate grid ***"and vocabulary given at previous grades" (&vgapg.)***	Plot the point (4, 5) on the coordinate grid. Click on the coordinate grid to plot the point. 
		6.1.1.2	Compare positive rational numbers represented in various forms. Use the symbols $<$, $=$ and $>$. ***(1)*** *For example*: $\frac{1}{2} > 0.36$. *Item Specifications* • Vocabulary allowed in items: is greater than, is less than &vgapg.	Which statement is true? **A.** $\frac{1}{6} = 0.16$ **B.** $0.08 = \frac{4}{5}$ **C.** $0.25 < \frac{1}{4}$ **D.** $\frac{1}{3} > 0.3$ **Modified Example** An inequality is shown. $x > 0.2$ Which value for x makes the inequality true? **A.** $\frac{1}{2}$ **B.** $\frac{1}{5}$ **C.** $\frac{1}{10}$

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		6.1.1.3	Understand that percent represents parts out of 100 and ratios to 100. ***(1)*** *For example*: 75% corresponds to the ratio 75 to 100, which is equivalent to the ratio 3 to 4. *Item Specifications* • Allowable notation: 25%, ¼, 1:4 • Percents must be between 1 and 100, inclusive • Vocabulary allowed in items: percent, ratio &vgapg.	Riley has 200 stamps. • 35% are from Europe. • 10% are from Asia. • 20% are from Australia. The rest of the stamps are from North America. How many of Riley's stamps are from North America? **A.** 35 **B.** 65 **C.** 70 **D.** 130
		6.1.1.4	Determine equivalences among fractions, decimals and percents; select among these representations to solve problems. ***(1)*** *For example*: If a woman making \$25 an hour gets a 10% raise, she will make an additional \$2.50 an hour, because \$2.50 is $\frac{1}{10}$ or 10% of \$25. *Item Specifications* • Allowable notation: 50%, ¼ , 0.95, $0.\overline{25}$ • Percents must be between 1 and 100 inclusive • Vocabulary allowed in items: vocabulary given at previous grades.	Which is equivalent to 0.04%? **A.** $\frac{1}{4}$ **B.** $\frac{1}{25}$ **C.** $\frac{1}{400}$ **D.** $\frac{1}{2{,}500}$
		6.1.1.5	Factor whole numbers; express a whole number as a product of prime factors with exponents. ***(1)*** *For example*: $24 = 2^3 \times 3$. *Item Specifications* • Prime factors are not greater than 13 • Numbers being factored are less than 1,000 • Vocabulary allowed in items: prime factor, prime factorization, exponent, power, base &vgapg.	What is the prime factorization of 630? **A.** $2\times3\times5\times7$ **B.** $2\times3^2\times5\times7$ **C.** $2\times3^2\times35$ **D.** $2\times5\times7\times9$

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		6.1.1.6	Determine greatest common factors and least common multiples. Use common factors and common multiples to calculate with fractions and find equivalent fractions. ***(1)*** *For example*: Factor the numerator and denominator of a fraction to determine an equivalent fraction. *Item Specifications* • Vocabulary allowed in items: greatest common factor, least common multiple &vgapg.	What is the greatest common factor of 48 and 64? **A.** 2 **B.** 8 **C.** 16 **D.** 24 **Modified Example** Emma wants to add the 3 fractions shown. $\frac{1}{3}+\frac{1}{4}+\frac{1}{6}$ First, she needs to find the Least Common Multiple. What is the **Least Common Multiple** for these 3 fractions? A. 6 B. 12 C. 24
		6.1.1.7	Convert between equivalent representations of positive rational numbers. *For example*: Express $\frac{10}{7}$ as $\frac{7+3}{7}=\frac{7}{7}+\frac{3}{7}=1\frac{3}{7}$. ***(1)*** *Item Specifications* • Conversions are limited to within a representation (e.g., 7/4=1¾ and 3^2=3·3, not 0.5=1/2) • Vocabulary allowed in items: exponent, integer &vgapg.	Which is equivalent to 4^3? **A.** 12 **B.** 48 **C.** 64 **D.** 81
	Understand the concept of ratio and its relationship to fractions and to the multiplication and division of whole numbers.	6.1.2.1	Identify and use ratios to compare quantities; understand that comparing quantities using ratios is not the same as comparing quantities using subtraction. ***(1)*** *For example*: In a classroom with 15 boys and 10 girls, compare the numbers by subtracting (there are 5 more boys than girls) or by dividing (there are 1.5 times as many boys as girls). The comparison using division may be expressed as a ratio of boys to girls (3 to 2 or 3:2 or 1.5 to 1). *Item Specifications* • Allowable ratio notation: ¼, 1 to 4, 1:4, 1 out of 4 • Vocabulary allowed in items: ratio &vgapg.	Kelly makes 12 candles in 3 hours. Lee makes 6 candles in 1 hour. What is the difference in the numbers of candles they each make in 8 hours? **A.** 2 **B.** 8 **C.** 16 **D.** 48

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	Use ratios to solve real-world and mathematical problems. **MCA** **2-4 Items** **Modified MCA** **1-3 Items**	6.1.2.2	Apply the relationship between ratios, equivalent fractions and percents to solve problems in various contexts, including those involving mixtures and concentrations. ***(1)*** *For example*: If 5 cups of trail mix contains 2 cups of raisins, the ratio of raisins to trail mix is 2 to 5. This ratio corresponds to the fact that the raisins are $\frac{2}{5}$ of the total, or 40% of the total. And if one trail mix consists of 2 parts peanuts to 3 parts raisins, and another consists of 4 parts peanuts to 8 parts raisins, then the first mixture has a higher concentration of peanuts. *Item Specifications* • Allowable ratio notation: ¼, 1 to 4, 1:4, 1 out of 4, 25% • Rates may be expressed using the word "per" • Vocabulary allowed in items: ratio, percent &vgapg.	A paint color is made using 4 drops of red and 5 drops of blue for each 5 gallons of paint. How many gallons of paint are being colored when 45 drops of color are used? **A.** 9 **B.** 25 **C.** 45 **D.** 81
		6.1.2.3	Determine the rate for ratios of quantities with different units. ***(1)*** *For example*: 60 miles for every 3 hours is equivalent to 20 miles for every one hour (20 mph). *Item Specifications* • Allowable ratio notation: ¼, 1 to 4, 1:4, 1 out of 4 • Rates may be expressed using the word "per" • Vocabulary allowed in items: rate, ratio, unit rate &vgapg.	A bottle of soap costs $3.45 for 64 ounces. What is the cost per ounce? **A.** $0.05 **B.** $0.19 **C.** $0.22 **D.** $0.64 **Modified Example** Sam's restaurant uses 30 pounds of flour every day. The restaurant is open 7 days per week. How much flour does the restaurant use in **2 weeks**? **A.** 210 pounds **B.** 270 pounds **C.** 420 pounds
		6.1.2.4	Use reasoning about multiplication and division to solve ratio and rate problems. ***(1)*** *For example*: If 5 items cost $3.75, and all items are the same price, then 1 item costs 75 cents, so 12 items cost $9.00. *Item Specifications* • Allowable ratio notation: ¼, 1 to 4, 1:4, 1 out of 4 • Rates may be expressed using the word "per" • Vocabulary allowed in items: rate, ratio &vgapg.	Conor reads 3 pages every 4 minutes. At this rate, how many pages can he read in 30 minutes? Type your answer in the box.

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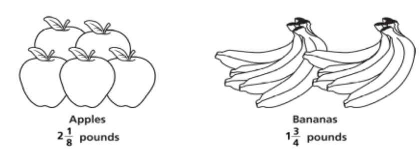
	Multiply and divide decimals, fractions and mixed numbers; solve real-world and mathematical problems using arithmetic with positive rational numbers. **MCA 5-7 Items** **Modified MCA 3-5 Items**	6.1.3.1	Multiply and divide decimals and fractions, using efficient and generalizable procedures, including standard algorithms. ***(<u>1.4</u>)*** *<u>Item Specifications</u>* • Items must not have context • Vocabulary allowed in items: reciprocal &vgapg.	Divide. $1\frac{1}{10} \div 1\frac{1}{5}$ **A.** $\frac{11}{12}$ **B.** $\frac{25}{33}$ **C.** $1\frac{8}{25}$ **D.** $1\frac{1}{2}$ **<u>Modified Example</u>** Multiply. 2.174×100 **A.** 217.4 **B.** 21.74 **C.** 0.02174
		6.1.3.2	Use the meanings of fractions, multiplication, division and the inverse relationship between multiplication and division to make sense of procedures for multiplying and dividing fractions. ***(<u>1.4</u>)*** *<u>For example</u>*: Just as $\frac{12}{4}=3$ means $12=3\times4$, $\frac{2}{3}\div\frac{4}{5}=\frac{5}{6}$ means $\frac{5}{6}\times\frac{4}{5}=\frac{2}{3}$. *<u>Item Specifications</u>* • Assessed within 6.1.3.1 No Example Question on the State Sampler	(none)
		6.1.3.3	Calculate the percent of a number and determine what percent one number is of another number to solve problems in various contexts. ***(<u>1.4</u>)*** *<u>For example</u>*: If John has $45 and spends $15, what percent of his money did he keep? *<u>Item Specifications</u>* • Percents are not less than 1 • Percents over 100 are 110, 125, 150 and 200 • Vocabulary allowed in items: percent &vgapg.	A company is printing 250 calendars. In 1 hour, 75 calendars are printed. What percent of the calendars are printed in 1 hour? **A.** 3% **B.** 3.3% **C.** 30% **D.** 33%
		6.1.3.4	Solve real-world and mathematical problems requiring arithmetic with decimals, fractions and mixed numbers. ***(<u>1.4</u>)*** *<u>Item Specifications</u>* • Items are limited to no more than two operations • Vocabulary allowed in items: reciprocal &vgapg. No Example Question on the MCA3 State Sampler	**<u>Modified Example</u>** 5. Mr. Stevens bought $2\frac{1}{8}$ pounds of apples and $1\frac{3}{4}$ pounds of bananas.  How many pounds of fruit did Mr. Stevens buy **altogether**? A. $3\frac{1}{3}$ B. $3\frac{7}{16}$ C. $3\frac{7}{8}$

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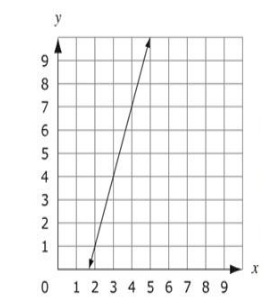
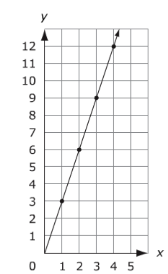
		6.1.3.5	Estimate solutions to problems with whole numbers, fractions and decimals and use the estimates to assess the reasonableness of results in the context of the problem. ***(1.4)*** *For example*: The sum $\frac{1}{3}+0.25$ can be estimated to be between $\frac{1}{2}$ and 1, and this estimate can be used to check the result of a more detailed calculation. *Item Specifications* • Assessed within 6.1.3. No Example Question on the State Sampler	(none)
Algebra **MCA 12-16 Items** **Modified MCA 8-11 Items**	Recognize and represent relationships between varying quantities; translate from one representation to another; use patterns, tables, graphs and rules to solve real-world and mathematical problems. **MCA 4-5 Items** **Modified MCA 2-3 Items**	6.2.1.1	Understand that a variable can be used to represent a quantity that can change, often in relationship to another changing quantity. Use variables in various contexts. ***(2.5)*** *For example*: If a student earns $7 an hour in a job, the amount of money earned can be represented by a variable and is related to the number of hours worked, which also can be represented by a variable. *Item Specifications* • Allowable multiplication notation: 3*x*, *xy*, 3•4, 3(4) • Equations will not contain exponents • Vocabulary allowed in items: evaluate &vgapg.	An equation is shown. $j = 7k + 5$ When the value of k increases by 2, by what amount does the value of j increase? **A.** 2 **B.** 9 **C.** 12 **D.** 14
		6.2.1.2	Represent the relationship between two varying quantities with function rules, graphs and tables; translate between any two of these representations. ***(2.5)*** *For example*: Describe the terms in the sequence of perfect squares t = 1, 4, 9, 16, ... by using the rule $t = n^2$ for n = 1, 2, 3, 4, ... *Item Specifications* • Allowable multiplication notation: 3*x*, *xy*, 3•4, 3(4) • Equations will not contain exponents • Vocabulary allowed in items: translate, function, coordinate grid &vgapg.	A graph is shown.  What is the equation of the line on the graph? **A.** $y = x - 1$ **B.** $y = x + 3$ **C.** $y = 3x + 1$ **D.** $y = 3x - 5$ **Modified Example** A function is shown in a table and on a graph. x: 1, 2, 3, 4; y: 3, 6, 9, 12  What is the value of y when $x = 5$? **A.** 7 **B.** 13 **C.** 15

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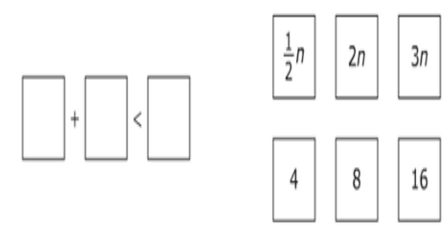
	Use properties of arithmetic to generate equivalent numerical expressions and evaluate expressions involving positive rational numbers. **MCA** **2-3 Items** **Modified MCA** **1-2 Items**	6.2.2.1	Apply the associative, commutative and distributive properties and order of operations to generate equivalent expressions and to solve problems involving positive rational numbers. ***(3)*** *For example*: $\frac{32}{15}\times\frac{5}{6}=\frac{32\times5}{15\times6}=\frac{2\times16\times5}{3\times5\times3\times2}=\frac{16}{9}\times\frac{2}{2}\times\frac{5}{5}=\frac{16}{9}$. *Another example*: Use the distributive law to write: $\frac{1}{2}+\frac{1}{3}\left(\frac{9}{2}-\frac{15}{8}\right)=\frac{1}{2}+\frac{1}{3}\times\frac{9}{2}-\frac{1}{3}\times\frac{15}{8}=\frac{1}{2}+\frac{3}{2}-\frac{5}{8}=2-\frac{5}{8}=1\frac{3}{8}$. *Item Specifications* • Allowable multiplication notation: 3*x*, *xy*, 3•4, 3(4) • Items must not have context • Vocabulary allowed in items: order of operations, simplify &vgapg.	Simplify. $4\left(\frac{1}{2}+\frac{3}{8}\right)-\frac{5}{8}\cdot2$ **A.** $1\frac{1}{8}$ **B.** 2 **C.** $2\frac{1}{4}$ **D.** $5\frac{3}{4}$ **Modified Example** An expression is shown. $\frac{220}{(4+6\times2)-9}$ What is the **first step** in simplifying the expression? **A.** 6×2 **B.** $4+6$ **C.** $\frac{220}{4}$
	Understand and interpret equations and inequalities involving variables and positive rational numbers. Use equations and inequalities to represent real-world and mathematical problems; use the idea of maintaining equality to solve equations. Interpret solutions in the original context. **MCA** **6-8 Items**	6.2.3.1	Represent real-world or mathematical situations using equations and inequalities involving variables and positive rational numbers. ***(4)*** *For example*: The number of miles *m* in a *k* kilometer race is represented by the equation *m* = 0.62 *k*. *Item Specifications* • Allowable multiplication notation: 3*x*, *xy*, 3•4, 3(4), x^2 • <, > and = symbols are allowed • Vocabulary allowed in items: vocabulary given at previous grades.	Write an inequality that is true when $n=8$. Click and drag the number or symbol into the inequality.  **Modified Example** A store sold $800.00 in clothing last week. The store also spent *n* dollars for advertising last week. Which number sentence represents *t*, the total amount of money the store made last week? **A.** $800-n=t$ **B.** $800+n=t$ **C.** $n+t=800$

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	Modified MCA 5 -7 Items	6.2.3.2	Solve equations involving positive rational numbers using number sense, properties of arithmetic and the idea of maintaining equality on both sides of the equation. Interpret a solution in the original context and assess the reasonableness of results. ***(4)*** *For example*: A cellular phone company charges \$0.12 per minute. If the bill was \$11.40 in April, how many minutes were used? *Item Specifications* • Allowable multiplication notation: 3*x*, *xy*, 3•4, 3(4) • Vocabulary allowed in items: vocabulary given at previous grades.	A phone company uses the equation $y = 0.15x + 10$ to find y, the monthly charge for a customer sending x text messages. How many text messages are sent if the monthly charge is \$77.50? **A.** 10 **B.** 21 **C.** 450 **D.** 506 **Modified Example** An equation is shown. $\frac{2}{3} = \frac{x}{18}$ What value for x makes the equation true? **A.** $6\frac{2}{3}$ **B.** 12 **C.** 17
Geometry & Measurement **MCA 10-12 Items**	Calculate perimeter, area, surface area and volume of two- and three-dimensional figures to solve real-world and	6.3.1.1	Calculate the surface area and volume of prisms and use appropriate units, such as cm^2 and cm^3. Justify the formulas used. Justification may involve decomposition, nets or other models. ***(1.7)*** *For example*: The surface area of a triangular prism can be found by decomposing the surface into two triangles and three rectangles. *Item Specifications* • Vocabulary allowed in items: vocabulary given at previous grades	The surface area of a cube is 384 square inches. What is the volume of the cube? **A.** 8 cubic inches **B.** 16 cubic inches **C.** 256 cubic inches **D.** 512 cubic inches

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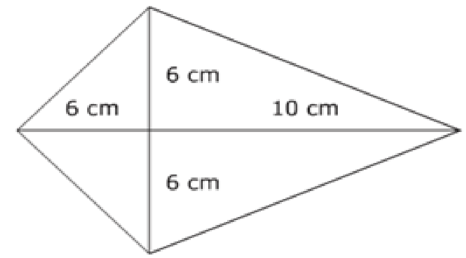
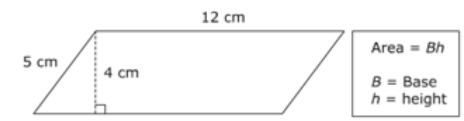
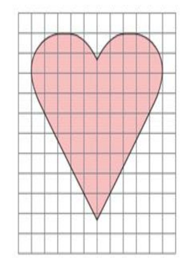
Modified MCA 7-9 Items	mathematical problems. **MCA 3-5 Items** **Modified MCA 3-4 Items**	6.3.1.2	Calculate the area of quadrilaterals. Quadrilaterals include squares, rectangles, rhombuses, parallelograms, trapezoids and kites. When formulas are used, be able to explain why they are valid. ***(1.7)*** *For example*: The area of a kite is one-half the product of the lengths of the diagonals, and this can be justified by decomposing the kite into two triangles. *Item Specifications* • Congruent side marks (hash marks) may be used • Allowable notation: 3 square centimeters, 3 cm sq, 3 cm^2 • Vocabulary allowed in items: vocabulary given at previous grades.	A scale drawing of a kite is shown.  What is the area of the kite? **A.** 28 cm^2 **B.** 60 cm^2 **C.** 96 cm^2 **D.** 192 cm^2 **Modified Example** A parallelogram is shown.  What is the **area** of the parallelogram? **A.** 34 sq cm **B.** 48 sq cm **C.** 60 sq cm
		6.3.1.3	Estimate the perimeter and area of irregular figures on a grid when they cannot be decomposed into common figures and use correct units, such as cm and cm^2. ***(1.7)*** *Item Specifications* • Allowable notation: 3 square centimeters, 3 cm sq, 3 cm^2 • Vocabulary allowed in items: vocabulary given at previous grades	A heart shape is cut from a gridded piece of paper.  What is the approximate area of the heart? **A.** 50 square units **B.** 70 square units **C.** 90 square units **D.** 144 square units

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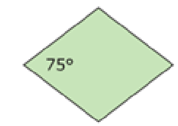
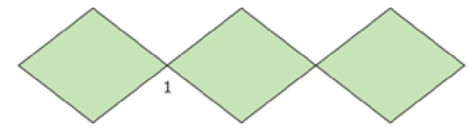
<tr><th>Strand</th><th>Standard</th><th>No.</th><th>Benchmark (6th Grade)</th><th>Sampler Item</th></tr>
<tr>
<td rowspan="2"></td>
<td rowspan="2">Understand and use relationships between angles in geometric figures.

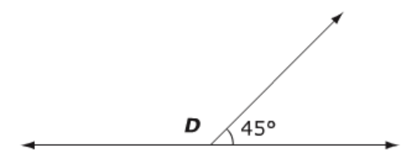
MCA
3-5 Items

Modified MCA
3-4 Items</td>
<td>6.3.2.1</td>
<td>Solve problems using the relationships between the angles formed by intersecting lines.

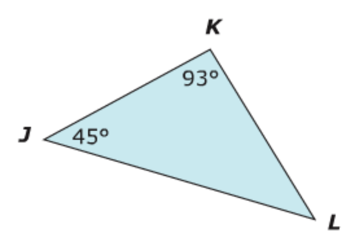
<u>For example</u>: If two streets cross, forming four corners such that one of the corners forms an angle of 120˚, determine the measures of the remaining three angles. <u>(1.7)</u>

<u>Another example</u>: Recognize that pairs of interior and exterior angles in polygons have measures that sum to 180˚.

<u>Item Specifications</u>
• Allowable notation: ∠A, m∠A , ΔABC
• Vocabulary allowed in items: intersecting, vertical, adjacent, complementary, supplementary, straight, hypotenuse, leg &vgapg.</td>
<td>A rhombus is shown.

The rhombus is used to make a design.

What is m∠1?
A. 15°
B. 75°
C. 105°
D. 150°

<u>Modified Example</u>
The figure shows supplementary angles.

What is the measure of angle D?
A. 45°
B. 135°
C. 180°</td>
</tr>
<tr>
<td>6.3.2.2</td>
<td>Determine missing angle measures in a triangle using the fact that the sum of the interior angles of a triangle is 180˚. Use models of triangles to illustrate this fact. <u>(1.7)</u>

<u>For example</u>: Cut a triangle out of paper, tear off the corners and rearrange these corners to form a straight line. Another example: Recognize that the measures of the two acute angles in a right triangle sum to 90˚.

<u>Item Specifications</u>
• Allowable notation: ∠A, m∠A , ΔABC
• Vocabulary allowed in items: adjacent, complementary, supplementary, interior, exterior, hypotenuse, leg &vgapg.</td>
<td>A triangle is shown.

What is m∠L?
A. 42°
B. 45°
C. 48°
D. 138°</td>
</tr>
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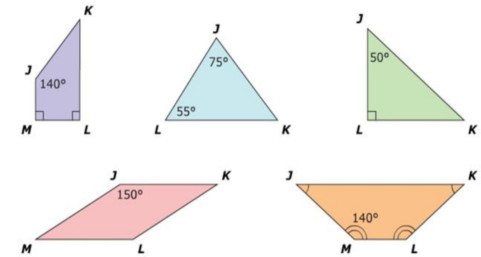
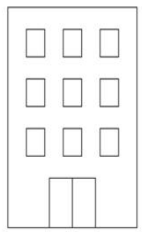
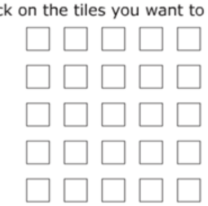
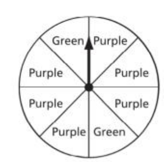
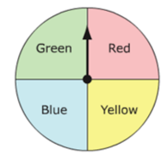
		6.3.2.3	Develop and use formulas for the sums of the interior angles of polygons by decomposing them into triangles. ***(1.7)*** *Item Specifications* • Allowable notation: ∠*A*, m∠*A* , Δ*ABC* • Vocabulary allowed in items: interior, diagonal &vgapg.	In which shapes does the measure of ∠K = 40°? Click on the shapes you want to select. 
	Choose appropriate units of measurement and use ratios to convert within measurement systems to solve real-world and mathematical problems. **MCA** **2-3 Items** **Modified MCA** **1-2 Items**	6.3.3.1	Solve problems in various contexts involving conversion of weights, capacities, geometric measurements and times within measurement systems using appropriate units. ***(1.5)*** *Item Specifications* • Vocabulary allowed in items: customary, metric, capacity &vgapg.	Joleen bought 12 apples. Each apple weighed 1.8 ounces. How many pounds of apples did Joleen buy? **A.** 1.35 pounds **B.** 2.4 pounds **C.** 21.6 pounds **D.** 28.8 pounds
		6.3.3.2	Estimate weights, capacities and geometric measurements using benchmarks in measurement systems with appropriate units. ***(1.5)*** *For example*: Estimate the height of a house by comparing to a 6-foot man standing nearby. *Item Specifications* • Vocabulary allowed in items: customary, metric, capacity &vgapg.	A building has 9 windows. Each window is 5 feet tall.  About how tall is the building? **A.** 15 feet **B.** 25 feet **C.** 40 feet **D.** 45 feet **Modified Example** Which is a reasonable weight for a textbook?  **A.** 0.03 pound **B.** 0.3 pound **C.** 3 pounds

Strand	Standard	No.	Benchmark (6th Grade)	Sampler Item
Data Analysis & Probability **MCA 6-8 Items** **Modified MCA 6-8 Items**	Use probabilities to solve real-world and mathematical problems; represent probabilities using fractions, decimals and percents. **MCA 6-8 Items** **Modified MCA 6-8 Items**	6.4.1.1	Determine the sample space (set of possible outcomes) for a given experiment and determine which members of the sample space are related to certain events. Sample space may be determined by the use of tree diagrams, tables or pictorial representations. ***(2)*** *For example*: A 6×6 table with entries such as (1,1), (1,2), (1,3), …, (6,6) can be used to represent the sample space for the experiment of simultaneously rolling two number cubes. *Item Specifications* • Size of the sample space will not exceed 36 • Vocabulary allowed in items: probability, outcome, tree diagram, event, random, sample space, combinations &vgapg.	Eli has a cube with sides numbered 1–6 and a spinner with 3 equal sections labeled A, B, and C. He rolls the cube and spins the spinner. How many outcomes are possible? Type your answer in the box. **Modified Example** The diagram shows the different menu options at a restaurant. **Menu Choices** **Main Course**: Hamburger, Baked Chicken, Tacos, Pasta **Vegetable**: Carrots, Green Beans **Starch**: Rice, Potato, Bread How many different combinations of 1 main course, 1 vegetable, and 1 starch are possible? **A.** 2 **B.** 9 **C.** 24
		6.4.1.2	Determine the probability of an event using the ratio between the size of the event and the size of the sample space; represent probabilities as percents, fractions and decimals between 0 and 1 inclusive. Understand that probabilities measure likelihood. ***(2)*** *For example*: Each outcome for a balanced number cube has probability $\frac{1}{6}$, and the probability of rolling an even number is $\frac{1}{2}$. *Item Specifications* • Size of the sample space is no more than 100 • Vocabulary allowed in items: probability, outcome, event, likely, unlikely, certain, impossible, ratio, random, sample space &vgapg.	Ryan has 25 tiles. The probability that he randomly chooses a green tile is 12%. Show how many of Ryan's tiles are green. Click on the tiles you want to select.  **Modified Example** A spinner has equal-sized sections.  What is the probability that the spinner will land on a green section? A. $\frac{2}{8}$ B. $\frac{2}{6}$ C. $\frac{1}{3}$

<table>
<tr><th>Strand</th><th>Standard</th><th>No.</th><th>Benchmark (6th Grade)</th><th>Sampler Item</th></tr>
<tr><td rowspan="2"></td><td rowspan="2"></td><td>6.4.1.3</td><td>Perform experiments for situations in which the probabilities are known, compare the resulting relative frequencies with the known probabilities; know that there may be differences. <u>(2)</u>

<u>For example</u>: Heads and tails are equally likely when flipping a fair coin, but if several different students flipped fair coins 10 times, it is likely that they will find a variety of relative frequencies of heads and tails.

<u>Item Specifications</u>
• Vocabulary allowed in items: probability, outcome, event, theoretical, frequency, relative frequency, random &vgapg.</td><td>Four students each flipped a coin 50 times and recorded the results in the table.<table><tr><th>Student</th><th>Heads</th><th>Tails</th></tr><tr><td>Mai Ka</td><td>31</td><td>19</td></tr><tr><td>Heather</td><td>15</td><td>35</td></tr><tr><td>Jose</td><td>21</td><td>29</td></tr><tr><td>Tyrone</td><td>20</td><td>30</td></tr></table>Who had a relative frequency of $\frac{3}{5}$ of flipping tails?
A. Mai Ka
B. Heather
C. Jose
D. Tyrone

<u>Modified Example</u>
Kwan spins the arrow on the spinner shown and records the results in a table.

Kwan's Results<table><tr><th>Color</th><th>Number</th></tr><tr><td>Red</td><td>21</td></tr><tr><td>Yellow</td><td>26</td></tr><tr><td>Blue</td><td>24</td></tr><tr><td>Green</td><td>29</td></tr></table>What is the difference between the experimental and theoretical probabilities of landing on the red section?
A. $\frac{1}{25}$ B. $\frac{5}{24}$ C. $\frac{17}{84}$</td></tr>
<tr><td>6.4.1.4</td><td>Calculate experimental probabilities from experiments; represent them as percents, fractions and decimals between 0 and 1 inclusive. Use experimental probabilities to make predictions when actual probabilities are unknown. <u>(2)</u>

<u>For example</u>: Repeatedly draw colored chips with replacement from a bag with an unknown mixture of chips, record relative frequencies, and use the results to make predictions about the contents of the bag.

<u>Item Specifications</u> • Size of the sample space is no more than 100
• Vocabulary allowed in items: probability, outcome, event, experimental, frequency, predict, random &vgapg.</td><td>Tyler has a stack of cards. He picks a card, records the color, and returns the card to the stack. He repeats this 60 times and chooses a red card 24 times. What is the experimental probability of choosing a red card from the stack?
A. 0.14
B. 0.23
C. 0.40
D. 2.50</td></tr>
</table>