

Table 1: Applying Webb’s Depth of Knowledge Levels for Mathematics


**(Adapted from Karin Hess, Center for Assessment/NCIEA
by the Kentucky Department of Education, 2005)**

Webb’s DOK Levels			
Recall and Reproduction (DOK 1)	Skills and Concepts/ Basic Reasoning (DOK 2)	Strategic Thinking/ Complex Reasoning (DOK 3)	Extended Thinking/ Reasoning (DOK 4)
<ul style="list-style-type: none"> • Recall of a fact, information or procedure • Recall or recognize fact • Recall or recognize definition • Recall or recognize term • Recall and use a simple procedure • Perform a simple algorithm. • Follow a set procedure • Apply a formula • A one-step, well-defined, and straight algorithm procedure. • Perform a clearly defined series of steps • Identify • Recognize • Use appropriate tools • Measure 	<ul style="list-style-type: none"> • Students make some decisions as to how to approach the problem • Skill/Concept • Basic Application of a skill or concept • Classify • Organize • Estimate • Make observations • Collect and display data • Compare data • Imply more than one step • Visualization Skills • Probability Skills • Explain purpose and use of experimental procedures. • Carry out experimental procedures 	<ul style="list-style-type: none"> • Requires reasoning, planning using evidence and a higher level of thinking • Strategic Thinking • Freedom to make choices • Explain your thinking • Make conjectures • Cognitive demands are complex and abstract • Conjecture, plan, abstract, explain • Justify • Draw conclusions from observations • Cite evidence and develop logical arguments for concepts • Explain phenomena in terms of concepts 	<ul style="list-style-type: none"> • Performance tasks • Authentic writing • Project-based assessment • Complex, reasoning, planning, developing and thinking • Cognitive demands of the tasks are high • Work is very complex • Students make connections within the content area or among content areas • Select one approach among alternatives • Design and conduct experiments • Relate findings to concepts and phenomena

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<ul style="list-style-type: none"> • Habitual response: Can be described; Can be explained • Answer item automatically • Use a routine method • Recognize patterns • Retrieve information from a graph • Includes one step word problems • Do basic computations 	<ul style="list-style-type: none"> • Make observations and collect data • Beyond habitual response • Classify, organize and compare data. • Explain, describe or interpret • Organize and display data in tables, charts and graphs. • Use of information • Two or more steps, procedures • Demonstrate conceptual knowledge through models and explanations. • Extend a pattern. • Explain concepts, relationships, and nonexamples. 	<ul style="list-style-type: none"> • Use concepts to solve problems • Make and test conjectures • Some complexity • Provide math justification when more than one possible answer • Non-routine problems • Interpret information from a complex graph • Analyze, synthesize • Weigh multiple things. 	<ul style="list-style-type: none"> • Combine and synthesize ideas into new concepts • Critique experimental designs
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Table 2: Depth of Knowledge Sample Chart -

Using the Same Content Statement Across DOK levels/Grade spans (Kentucky Department of Education, 2005)			
MA-05-5.1.1 Students will extend patterns, find the missing term(s) in a pattern or describe rules for patterns (numbers, pictures, tables, words) from real-world and mathematical problems. DOK - 3			
Webb's DOK Levels			
Recall and Reproduction (DOK 1)	Skills and Concepts/ Basic Reasoning (DOK 2)	Strategic Thinking/ Complex Reasoning (DOK 3)	Extended Thinking/ Reasoning (DOK 4)
Find the next three terms in the following pattern: 2/7, 4/7, 6/7, 8/7. ...	Draw the next figure in the following pattern: 	Find the next three terms in the pattern and determine the rule for the following pattern of numbers: 1, 4, 8, 11, 15, 18, 22, 25, 29, ...	Find the next three terms in the pattern, determine the rule for finding the next number in the pattern, and make or find a model for the pattern: 1, 1, 2, 3, 5, 8, 13, 21, 34, ...
MA-08-1.4.1 Students will apply ratios and proportional reasoning to solve real-world problems (e.g., percents, constant rate of change, unit pricing, percent of increase or decrease). DOK - 3			
The price of gasoline was \$2.159 per gallon last week. This week the new price is \$2.319 per gallon. Determine the percent of increase.	On a trip across the country, Justin determined that he would have to drive about 2,763 miles. What speed would he have to average to complete the trip in no more	A sweater that you really been want has just been placed on sale. The original cost was \$63.99. The sale price is \$47.99. What is the percent of decrease from	Students will visit three local grocery stores and find the prices of three different sizes of the same product at the three stores. Students will then determine the unit

	<p>than 50 hours of driving time?</p>	<p>the original price? You still do not have enough money saved up to purchase the sweater, so you wait just a little longer and the store now has an ad that states that all items currently on sale have been reduced by $\frac{1}{3}$ of the sale price. What is the new sale price? What is the overall percent of decrease from the original price?</p>	<p>price for each size item at each store and make a decision as to which is the best buy. Students will then write a report chronicling their work and reporting which is the best buy, justifying their decision with their mathematical work.</p>
<p>MA-HS-3.2.1 Students will identify and describe properties of and apply geometric transformations within a plane to solve real-world and mathematical problems. DOK - 3</p>			
<p>Students will identify a transformation within a plane.</p>	<p>Students will perform a compound transformation of a geometric figure within a coordinate plane.</p>	<p>Students will perform a geometric transformation to meet specified criteria and then explain what does or does not change about the figure.</p>	<p>Students will abstract the transformations occurring in an Escher woodprint and then create a simplified tessellation of their own.</p>

Table 3: Depth of Knowledge Sample Chart

Using Same Verb Across DOK Levels and Grade Spans (Kentucky Department of Education, 2005)					
Mathematics Core Content Statement	Ceiling	Recall and Reproduction (DOK 1)	Skills and Concepts/ Basic Reasoning (DOK 2)	Strategic Thinking/ Complex Reasoning (DOK 3)	Extended Thinking/ Reasoning (DOK 4)
MA-05-3.3.1 Students will identify and graph ordered pairs on a positive coordinate system scaled by ones, twos, threes, fives, or tens; locate points on a grid; and apply graphing in the coordinate system to solve real-world problems.	2	Students will graph the point (1,6) in the first quadrant of the coordinate plane.	Students will graph the vertices of the reflected image of a triangle.	Given the coordinates for three vertices of a rectangle, students will graph the coordinates of the fourth vertex.	Students will graph the vertices of a triangle onto positive coordinate planes using different scales and analyze what changes in the figure are affected by the changes in scales and explain why.

Table 3: Depth of Knowledge Sample Chart

<p>MA-08-3.3.1 Students will identify and graph ordered pairs on a coordinate system, correctly identifying the origin, axes and ordered pairs; and will apply graphing in the coordinate system to solve real-world and mathematical problems.</p>	<p>2</p>	<p>Students will graph the point $(\frac{2}{3}, -4\frac{3}{8})$.</p>	<p>Students will graph the vertices of a rectangle and compare the diagonals.</p>	<p>Students will graph the vertices of a quadrilateral and determine its classification.</p>	<p>Students will graph a variety of two-dimensional figures and analyze them to determine classifications.</p>
<p>MA-HS-3.3.1 Students will apply algebraic concepts and graphing in the coordinate plane to analyze and solve problems (e.g., finding the final coordinates for a specified polygon, midpoints, betweenness of points, parallel and perpendicular lines, the distance between two points, the slope of a segment).</p>	<p>2</p>	<p>Given the coordinates of the endpoints of a segment, graph the midpoint of the segment.</p>	<p>Given three vertices of a parallelogram, graph the coordinates of the fourth vertex.</p>	<p>Graph the four vertices of a quadrilateral, and then use slope and distance formulas to determine the best classification for the quadrilateral.</p>	<p>In an equilateral triangle, graph the perpendicular bisectors of each side using slope and midpoint, and then compare those results with constructions using a compass and straightedge. Compare and contrast the results.</p>