

Math					
2.11 Concepts of Calculus					
K	1	2	3	4	5
A. Place numbers in order from least to greatest and greatest to least. • Numbers to 20.	A. Place numbers in order from least to greatest and greatest to least. • Numbers to 100.	A. Place numbers in order from least to greatest and greatest to least. • Numbers to 1,000.	<b>A. Identify whole number quantities and measurements from least to most and greatest value.</b> • Numbers to 10,000.	A. Make comparisons of numbers (e.g., more, less, same, least, most, greater than, less than).	<b>A. Make comparisons of numbers (e.g., more, less, same, least, most, greater than, less than).</b>
B. Identify least and greatest values represented in a concrete object graph.	B. Identify least and greatest values represented in a concrete object graph.	B. Identify least and greatest values represented in bar graphs.	<b>B. Identify least and greatest values represented in bar graphs and pictographs.</b>	B. Identify least and greatest values represented in bar graphs, line graphs, and pictographs.	<b>B. Identify least and greatest values represented in bar and circle graphs.</b>
C. Recognize “change” in real-life.	C. State the rate of change as fast or slow using a real-life event.	C. State the rate of change as faster or slower using real-life events.	<b>C. Categorize rates of change as faster and slower.</b>	C. Identify maximum and minimum.	<b>C. Identify maximum and minimum.</b>
D. Continue a pattern of simple shapes that could be extended infinitely.	D. Continue a pattern of shapes that could be extended infinitely.	D. Continue a pattern of numbers or objects that could be extended infinitely.	<b>D. Continue a pattern of numbers or objects that could be extended infinitely.</b>	D. Create and describe a pattern of numbers or objects that could be extended infinitely.	<b>D. Describe the relationship between rates of change and time.</b>
				E. Recognize that area is measured by square tiles and volume is measured by cubes.	<b>E. Estimate areas and volumes as the sums of areas of tiles and volumes of cubes.</b>
				F. Recognize the relationship between the size of the unit of measurement and the estimate of the	<b>F. Describe the relationship between the size of the unit of measurement and the estimate of the areas and volumes.</b>

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3, 5, 8, 11 (bold) = PA Academic Standards

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				areas and volumes.(e.g., the smaller the unit used, the greater number of units required).	

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**Math**

**2.11 Concepts of Calculus**

6	7	8
A. Identify least and greatest values represented in a variety of graphs. Compare numbers and real-life quantities using ordering symbols ( $>$ , $<$ , $,$ ).	A. Interpret minimum and maximum values represented in a variety of graphs.	<b>A. Analyze graphs of related quantities for minimum and maximum values and justify the findings.</b>
B. Examine linear (constant) rates of change in real life situations using tables to organize and graphs to display the data. <ul style="list-style-type: none"> <li>• Miles per hour.</li> <li>• Pay per hour.</li> </ul>	B. Compute and compare unit rates and ratios and examine slopes in real world situations.	<b>B. Describe the concept of unit rate, ratio and slope in the context of rate of change.</b>
C. Continue patterns of numbers and objects . <ul style="list-style-type: none"> <li>• Long division with repeating decimals.</li> <li>• Input/output tables.</li> <li>• Designs with pattern blocks.</li> </ul>	C. Compare and contrast finite and infinite patterns. <ul style="list-style-type: none"> <li>• Terminating and repeating decimals.</li> <li>• Changing fractions to decimals.</li> <li>• Sequences.</li> </ul>	<b>C. Continue a pattern of numbers or objects that could be extended infinitely.</b>

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**2.11 Concepts of Calculus**

9	10	11	12
A. Determine maximum and minimum values for parabolas. Discuss extremum or closed intervals of various functions.	A. Discuss the most efficient rectangular or 2-D or 3-D figures- largest area with smallest perimeter or largest volume with smallest surface area. (Graph data where possible!)	<b>A. Determine maximum and minimum values of a function over a specified interval.</b>	
B. Interpret maximum and minimum for parabolas in content of projectile, and other optimization problems.	B. Solve optimization problems in a geometric content.	<b>B. Interpret maximum and minimum values in problem situations.</b>	
C. In graphing unit, develop tables and graphs for the “doubling” and “halving” functions.	C. Examine effects of doubling sides of a figure on perimeter, area, surface, or volume. Examine effects of taking half of each dimension on these characteristics. <u>Graph relations where possible!</u>	<b>C. Graph and interpret rates of growth/decay.</b>	
D. Use arithmetic and geometric sequences to determine sums of a finite number of terms. Demonstrate applications of the sums. In the context of graphing rational functions, $y=1/x$ , discuss asymptotes as “convergence” of values.	D. Relate fractiles to sequences and finite series.	<b>D. Determine sums of finite sequences of numbers and infinite geometric series.</b>	
E. In graphing unit on coordinate plane, introduce area under a curve as approximately the sum of rectangles of given width.	E. Estimate areas under a curve by adding rectangles or trapezoids.	<b>E. Estimate areas under curves using sequences of areas.</b>	

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