

## Pennsylvania Content Standards Grade Level Benchmarks

### 2.1. Numbers, Number Systems and Number Relationships

3	4	5	6
<p><b>A. Count using whole numbers (to 10,000) and by 2s, 3s, 5s, 10s, 25s, and 100s.</b></p> <p><b>B. Use whole numbers and fractions to represent quantities.</b></p> <p><b>C. Represent equivalent forms of the same number through the use of concrete objects, drawings, word names and symbols.</b></p> <p><b>D. Use drawings diagrams, or models to show the concept of fraction as part of a whole.</b></p> <p><b>E. Count, compare and make change using a collection of coins and one-dollar bills.</b></p> <p><b>F. Apply number patterns (even and odd) and compare values of numbers on the hundred board.</b></p> <p><b>G. Use concrete objects to count, order, and group.</b></p> <p><b>H. Demonstrate understanding of one-to-one</b></p>	<p>A. Write numbers to 10,000 using expanded notation</p> <p>B. Read and write numbers to one million using whole numbers.</p> <ul style="list-style-type: none"> <li>• Interpret place value to one million</li> </ul>	<p><b>A. Use expanded notation to represent whole numbers or decimals.</b></p> <p><b>B. Apply number theory concepts to rename a number quantity.</b></p> <p><b>C. Demonstrate that mathematical operations can represent a variety of problem situations.</b></p> <p><b>D. Use models to represent fractions and decimals.</b></p> <p><b>E. Explain the concepts of prime and composite numbers.</b></p> <p><b>F. Use simple concepts of negative umbers such as on a number line, in counting, and temperature.</b></p> <p><b>G. Develop and apply number theory concepts (e.g. primes, factors, multiples, and composites) to represent numbers in various ways</b></p>	<p>A. Represent and explain relationships among integers, decimals, fractions and percents and distinguish appropriate form to use to solve problems.</p> <ul style="list-style-type: none"> <li>• Express numbers in factor form.</li> <li>• Find GCF and LCM.</li> <li>• Classify numbers as prime or composite.</li> </ul> <p>B. Simplify equivalent numeric expressions involving four basic operations and grouping symbols.</p> <p>C. Use a number line to represent and compare fractions, decimals and integers and to model real life situations.</p> <p>D. Write a ratio or proportion to represent a real world problem.</p> <p>E. Model simple algebraic expressions using tiles or block manipulative.</p> <p>F. Use the number line model to represent with integers (operations) and their applications.</p> <p>G. Model and solve real life situations using one and two-step equations.</p>

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<p>correspondence.</p> <p><b>I. Apply place-value concepts and numeration to counting, ordering and grouping</b></p> <p><b>J. Estimate, approximate, round or use exact numbers as appropriate.</b></p> <p><b>K. Describe the inverse relationship between addition and subtraction.</b></p> <p><b>L. Demonstrate knowledge of basic facts in four basic operations.</b></p>	<p>J. Demonstrate that mathematical operations can represent a variety of problem situations.</p> <ul style="list-style-type: none"> <li>• Calculate change up to \$99.99.</li> <li>• Make change up to \$9.99 using the smallest number of coins and bills.</li> </ul> <p>K. Explain and write examples of equivalent fractions.</p>		

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### 2.2. Computation and Estimation

3	4	5	6
<p><b>A. Apply addition and subtraction situations using concrete objects.</b></p> <p><b>B. Solve single and double-digit addition and subtraction problems with regrouping in vertical form.</b></p>	<p>A. Calculate the sum, difference, product and quotient of numerical and/or word problems with double digits.</p> <p>B. Add and subtract fractions with like denominators in numerical and/or word problems.</p>	<p><b>A. Create and solve word problems involving addition, subtraction, multiplication and division of whole numbers.</b></p> <p><b>B. Develop and apply algorithms to solve word problems that involve addition, subtraction, and/or multiplication with decimals with and without regrouping, fractions and mixed numbers, that include like and unlike denominators.</b></p>	<p>A. Calculate the value of expressions involving grouping symbols.</p> <p><b>B. Add, subtract, multiply and divide different kinds and forms of rational numbers including integers, decimal fractions, percents and proper and improper fractions.</b></p> <ul style="list-style-type: none"> <li>• Include real world applications.</li> <li>• Demonstrate the use of a calculator for the above calculations.</li> </ul>

3	4	5	6
<p><b>C. Demonstrate concept of multiplication as repeated addition and arrays.</b></p> <p><b>D. Demonstrate concept of division as repeated subtraction and as sharing.</b></p> <p><b>E. Use estimation skills to arrive at conclusions.</b></p> <p><b>F. Determine the reasonableness of calculated answers.</b></p> <p><b>G. Explain addition and subtraction algorithms with regrouping.</b></p>	<p>F. Prior to calculation, estimate to find a reasonable solution.</p> <p>G. Describe estimation strategies used in a variety of numerical and/or word problems.</p> <p>H. Demonstrate the ability to round numbers up to the hundreds place.</p> <p>I. Demonstrate proficiency in the use of a calculator.</p> <p>J. Demonstrate proficiency with addition,</p>	<p><b>C. Demonstrate the ability to round numbers.</b></p> <p><b>D. Determine through estimations the reasonableness of answers to problems involving addition, subtraction, multiplication and division of whole numbers.</b></p> <p><b>E. Demonstrate skills for using fraction calculators to verify conjectures, confirm computations, and explore complex problem solving situations.</b></p> <p><b>F. Apply estimation strategies to a variety of problems including time and money.</b></p> <p><b>G. Explain multiplication and division algorithms.</b></p> <p><b>H. Select a method for computation and explain why it is appropriate.</b></p>	<p>E. Define percent and estimate solutions to percent problems.</p> <p>G. Explain when rounding or exact numbers appropriate in real life problems.</p> <ul style="list-style-type: none"> <li>• Demonstrate ability to round to any place value including decimals.</li> </ul> <p>H. Check the reasonableness of answers involving fractions.</p>

<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
	subtraction, multiplication, and division of money.		

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**2.3. Measurement and Estimation**

<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<p><b>A. Compare measurable characteristics of different objects on the same dimensions (time, temperature, area, length, weight, capacity, perimeter).</b></p> <p><b>B. Determine the measurement of objects with non-standard and standard (e.g., US customary and metric) units.</b></p> <p><b>C. Determine and compare elapsed times.</b></p> <p><b>D. Tell time (analog and digital) to the minute.</b></p>	<p>A. Describe and compare the attributes of length, capacity, and weight (e.g. US customary and metric units).</p> <p>B. Describe the attributes of temperature using Fahrenheit and Celsius.</p> <p>C. Estimate and measure objects to the nearest <math>\frac{1}{4}</math> inch.</p> <p>D. Calculate the perimeter and area of a square/rectangle.</p>	<p><b>A. Select and use appropriate instruments and units for measuring quantities such as perimeter, volume, area, weight, time, and temperature.</b></p> <p><b>B. Select and use standard tools to measure the size of figures with specified accuracy, including length, width, perimeter, and area</b></p> <p><b>C. Estimate, refine, and verify specified measurements of objects.</b></p> <p><b>D. Convert linear measurements within the same system.</b></p>	<p>A. Model and explain using manipulatives (e.g., string, square and cubes), linear measure, area, and volume.</p> <ul style="list-style-type: none"> <li>• Measure and apply formulas for perimeter and area for these polygons: rectangle, triangle, parallelogram, and circle model.</li> <li>• Apply formulas for volume for rectangular prisms and cylinders</li> </ul> <p>C. Draw, label and measure acute, right, obtuse and straight angles using protractors.</p> <p>D. Choose and justify an appropriate unit of measurement (standard and metric) and demonstrate proficiency with measuring tools.</p> <ul style="list-style-type: none"> <li>• Identify and compare units of distance, time and rate.</li> <li>• Apply appropriate conversions to</li> </ul>

3	4	5	6
<p><b>E. Determine appropriate unit of measure.</b></p> <p><b>F. Use concrete objects to determine area and perimeter.</b></p> <p><b>G. Estimate and verify measurements.</b></p> <p><b>H. Demonstrate that a single object has different attributes that can be measured in different ways (e.g. length, mass/weight, time, area, temperature, capacity and perimeter).</b></p>		<p><b>E. Add and subtract measurements.</b></p>	<p>measurement in real life situations.</p> <p><b>G. Interpret the scale on maps and drawings.</b></p>

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**2.4. Mathematical Reasoning and Connections**

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<p><b>A. Make, check and verify predictions about the quantity, size and shape of objects and groups of objects.</b></p> <p><b>B. Use measurements to determine the geography of the school building.</b></p>	<p>A. Justify and give examples of other ways to solve problems.</p>	<p><b>A. Compare quantities and magnitudes of numbers.</b></p> <p><b>B. Use models, number facts, properties and relationships to check and verify predictions and explain reasoning.</b></p> <p><b>C. Draw inductive and deductive</b></p>	<p>A. Generalize from a pattern of observations, make conjectures and provide supporting arguments.</p> <p>B. Examine numeric relationship expressions to arrive at a conclusion. (e.g. commutative property, association property, transitive property)</p> <p>C. Examine if...then statements to determine if the statements are valid.</p>

3	4	5	6
	<p>C. Explain basic valid and invalid arguments within mathematical contexts.</p> <p>D. Compare strengths and weaknesses of various strategies used to solve a problem-solving situation.</p>	<p><b>conclusions within mathematical contexts.</b></p> <p><b>D. Distinguish between relevant and irrelevant information in a mathematical problem.</b></p> <p><b>E. Interpret statements made with precise language of logic (i.e. all, every, none, some or many).</b></p> <p><b>F. Use statistics to quantify issues in social studies.</b></p>	<p>D. Use and explain algorithmic procedures for computing and estimating with whole numbers, fractions, decimals and integers.</p>

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**2.5. Mathematical Problem Solving and Communication**

3	4	5	6
<p><b>A. Use appropriate problem solving strategies such as guess and check and working backwards.</b></p> <p><b>B. Determine when sufficient information is present to solve a problem and explain how to solve a problem.</b></p>	<p>A. Describe what information is needed to solve a problem</p> <p>B. Use trial and error and the process of elimination to solve problems.</p>	<p><b>A. Develop a plan to analyze a problem, identify the information needed to solve the problem, carry out the plan, check whether an answer makes sense and explain how the problem was solved.</b></p> <p><b>B. Use appropriate mathematical terms, vocabulary, language symbols and graphs to clearly and logically explain solutions to problems.</b></p>	<p><b>A. Invent, select, use, and justify the appropriate methods, materials and strategies used to solve problems.</b></p> <ul style="list-style-type: none"> <li>• Problem solving strategies include but are not limited to : guess and check, working backwards, solving a simpler problem, making a graph, making a model, making a list, using simulation, drawing a diagram, using logical reasoning, using algebra.</li> </ul> <p><b>B. Verify and interpret results using precise mathematical language, notation, and representations, including numerical tables and equations, simple algebraic equations and formulas, charts, graphs and diagrams.</b></p> <p>C. Justify strategies and defend approaches</p>

3	4	5	6
<p><b>C. Select and use an appropriate method, materials and strategy to solve problems, including mental mathematics, paper and pencil, and concrete objects.</b></p>	<p>C. Create and write story problems using the following strategies:</p> <ul style="list-style-type: none"> <li>• Given a number sentence, state a problem in own words.</li> <li>• Model problem with diagrams or physical objects.</li> </ul> <p>D. Explain the method and reasoning behind the problem's solution to determine reasonableness of and to verify results with respect to the original problem.</p>	<p><b>C. Show ideas in a variety of ways, including words, numbers, symbols, pictures, charts, graphs, tables, diagrams and models.</b></p> <p><b>D. Connect, extend, and generalize problem solutions to other concepts, problems and circumstances in mathematics.</b></p> <p><b>E. Select, use, and justify the methods, materials and strategies used to solve problems.</b></p> <p><b>F. Use appropriate problem solving strategies such as solving a simpler problem or drawing a picture or diagram.</b></p>	<p>used and conclusions reached.</p> <ul style="list-style-type: none"> <li>• <b>Justify generalization drawn from conclusions.</b></li> </ul> <p><b>D. Determine pertinent information in problem situations, and whether any further information is needed for solution.</b></p>

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**2.6. Statistics and Data Analysis**

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<p><b>A. Gather, organize and display data using pictures, tallies, charts, bar graphs, and pictographs.</b></p> <p><b>B. Formulate and answer questions based on data shown on graphs.</b></p> <p><b>C. Predict the likely number of times a condition will occur based on the analyzed data.</b></p> <p><b>D. Form and justify an opinion on whether a given statement is reasonable based on a comparison to data.</b></p>	<p>A. Systematically collect, organize and display data for given situations using line plots, line graphs and bar graphs, including horizontal and vertical double bar graphs.</p> <p>B. Interpret data from tables, line plots, line graphs and bar graphs, and explain convincing arguments that are based on data analysis and previous experiences.</p>	<p><b>A. Organize and display data using pictures, tallies, tables, charts, bar graphs, and circle graphs.</b></p> <p><b>B. Describe data sets using mean, median, mode and range.</b></p> <p><b>C. Sort data using Venn diagrams.</b></p> <p><b>D. Predict the likely number of times a condition will occur based on the analyzed data</b></p> <p><b>E. Construct and defend simple conclusions based on data.</b></p>	<p>A. Describe data using mean, median, mode, range, and quartiles.</p> <p>C. Collect and analyze data to make predictions.</p> <p>E. Interpret data using pictures, tallies, tables, charts, bar graphs, circles graphs, plots, and Venn diagrams.</p>

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#### 2.7. Probability and Predictions

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<p><b>A. Predict and measure the likelihood of events and recognize that the results of an experiment may not match predicted outcomes.</b></p> <p><b>B. Design a fair and an unfair spinner.</b></p>		<p><b>A. Perform simulations with concrete devices (dice, spinner, etc.) to predict the chance of an event occurring.</b></p> <p><b>B. Determine the fairness of the design of a spinner.</b></p>	<p>A. Determine and identify the probability of an event given all possible outcomes.</p> <p>B. Determine the probability of an event.</p>

3	4	5	6
<p><b>C. List or graph the possible results of an experiment.</b></p> <p><b>D. Analyze data using the concepts of largest, smallest, most often, least often and middle.</b></p>	<p>C. Utilize and explain the results of an experiment to analyze the probability of an event.</p> <p>E. Generate a list of all possible outcomes of given events by constructing a table or developing an organized list.</p>	<p><b>C. Express probabilities as fractions and decimals.</b></p> <p><b>D. Compare predictions based on theoretical probability and experimental results.</b></p> <p><b>E. Calculate the probability of a simple event.</b></p> <p><b>F. Determine patterns generated as a result of an experiment.</b></p> <p><b>G. Determine the probability of an event involving “and,” “or” or “not”.</b></p> <p><b>H. Predict and determine why some outcomes are certain, more likely, less likely, equally likely or impossible.</b></p> <p><b>I. Find all possible combinations and arrangements involving a limited number of variables.</b></p>	<ul style="list-style-type: none"> <li>• Express the probability of an event as a fraction, decimal, and percent.</li> <li>• Predict outcomes using sampling.</li> <li>• Calculate the likelihood of an event occurring given the number of trials and probability.</li> </ul> <p>C. Create and solve a real-life situation that requires probability.</p> <p>D. Make and justify predictions that are based on experimental probability.</p>

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		<p><b>J. Make a tree diagram and list the elements in the sample space.</b></p>	

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#### 2.8. Algebra and Functions

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<p><b>A. Recognize, describe, extend, create and replicate a variety of patterns including attribute, activity, number and geometric patterns.</b></p> <p><b>B. Use concrete objects and trial and error to solve number sentences and check if solutions are sensible and accurate.</b></p> <p><b>C. Substitute a missing addend in a number sentence.</b></p> <p><b>D. Create a story to match a given combination of symbols and numbers.</b></p> <p><b>E. Use concrete objects and symbols to model the concepts of variables, ...</b></p>	<p>A. Create, extend, and describe a pattern.</p>	<p><b>A. Recognize, reproduce, extend, create and describe patterns, sequences and relationships verbally, numerically, symbolically and graphically, using a variety of materials.</b></p> <p><b>B. Connect patterns to geometric relations and basic number skills.</b></p> <p><b>C. Form rules based on patterns (e.g., an equation that relates pairs in a sequence).</b></p> <p><b>D. Use concrete objects and combinations of symbols and numbers to create expressions that model mathematical situations.</b></p> <p><b>E. Explain the use of combinations of symbols and numbers in expressions, equations, and inequalities.</b></p>	<p>A. Create, describe, and extend patterns.</p> <p>C. Create and interpret expressions that model problem situations and create and solve equations that model problem situations.</p> <p>D. Use concrete models or symbols to model simple algebraic expressions.</p> <ul style="list-style-type: none"> <li>• Algebraic Balances</li> <li>• Algebra Tiles/Blocks</li> <li>• Chips or Counters</li> <li>• Number Tiles</li> </ul> <p>E. Solve one and two-step equations.</p>

3	4	5	6
<p><b>expressions, equations, and inequalities.</b></p> <p><b>F. Explain the meaning of solutions and symbols.</b></p> <p><b>G. Gather information and display it in the form of a table or a chart.</b></p> <p><b>H. Describe and interpret the data shown in tables and charts.</b></p> <p><b>I. Demonstrate simple function rules.</b></p> <p><b>J. Analyze simple functions and relationships and locate points on a simple grid.</b></p>	<p><b>F. Gather information, analyze the collected data, and display it in a table.</b></p> <p><b>H. Create a picture on a grid, and identify the coordinate points.</b></p> <p><b>I. Interpret and draw conclusions about data.</b></p>	<p><b>F. Describe a realistic situation using information given in equations, inequalities, tables or graphs.</b></p> <p><b>G. Select and use appropriate strategies, including concrete materials, to solve number sentences and explain the method of solution.</b></p> <p><b>H. Locate and identify points on a coordinate system.</b></p> <p><b>J. Generate functions from tables of data and relate data to corresponding graphs and functions.</b></p>	<p><b>J. Show that an equality relationship between two quantities remains the same as long as the same change is made to both quantities.</b></p>

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**2.9. Geometry**

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<p><b>A. Name and label geometric shapes in two and three dimensions (circle/sphere, square/cube, triangle/pyramid, rectangle/prism).</b></p>	<p><b>A. Create a labeled drawing of a real life person, place, or thing using geometric shapes.</b></p>	<p><b>A. Give formal definitions of geometric figures.</b></p>	<p><b>A. Draw (sketch), label and name points, lines and planes and relationships (e.g., ray AB, AB, Describe the infinite set of points starting at A and extends in the direction of B).</b></p>

3	4	5	6
<p><b>B. Building geometric shapes using concrete objects (e.g., manipulatives).</b></p> <p><b>C. Draw two and three dimensional geometric shapes and construct rectangles, squares and triangles on the geoboard and on graph paper satisfying specific criteria.</b></p> <p><b>D. Find and describe geometric figures in real life.</b></p> <p><b>E. Identify and draw lines of symmetry in geometric figures.</b></p> <p><b>F. Identify symmetry in nature.</b></p> <p><b>G. Fold paper to demonstrate the reflection about a line.</b></p> <p><b>H. Show relationship between and among figures using reflection.</b></p>	<p>B. Identify properties of geometric figures (e.g., parallel, perpendicular, similar, congruent, symmetrical).</p> <ul style="list-style-type: none"> <li>• Draw congruent polygons and identify lines of symmetry.</li> <li>• Define parallel and perpendicular lines</li> </ul> <p>E. Identify, draw and label quadrilaterals and angles (e.g., right, acute, obtuse).</p> <p>F. Identify and compare points, segments, and lines.</p> <p>G. Identify the rotation of a drawing or object.</p>	<p><b>B. Classify and compare triangles and quadrilaterals according to sides or angles.</b></p> <p><b>C. Identify and measure circles, their diameters and radii.</b></p> <p><b>D. Describe in words how geometric shapes are constructed.</b></p> <p><b>E. Construct two and three dimensional shapes and figures using manipulatives, geoboards and computer software.</b></p> <p><b>F. Find familiar solids in the environment and describe them.</b></p> <p><b>G. Create an original tessellation.</b></p> <p><b>H. Describe the relationship between the perimeter and area of triangles, quadrilaterals and circles .</b></p> <p><b>I. Represent and use the concepts of line, point, and plane.</b></p>	<p>B. Identify and draw angles using a protractor.</p> <p>C. Identify, draw, label and classify regular polygons up to decagon.</p> <ul style="list-style-type: none"> <li>• Identify, draw and label circles, chords and arcs.</li> </ul> <p>D. Demonstrate the relationship between 2 and 3-D representations of a figure (e.g., scale, drawings, blueprints).</p> <p>E. Draw and apply properties of geometric figures (e.g. parallel, perpendicular, similar, congruent, symmetry).</p> <p>G. Recognize the value <math>\pi</math> and use it to determine the circumference and area of circle.</p> <p>H. Identify and classify prisms, pyramids, cylinders, cones, and spheres.</p> <p>I. Identify and complete drawings to illustrate slides, flips, and turns.</p>

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<p><b>I. Predict how shapes can be changed by combining or dividing them.</b></p>	<p>L. Describe in words the difference between two and three- dimensional shapes.</p>	<p><b>J. Define the basic properties of squares, pyramids, parallelo-grams, quadrilaterals, trapezoids, polygons, rectangles, rhombi, circles, triangles, cubes, prism, spheres, and cylinders.</b></p> <p><b>K. Analyze simple transformations of geometric figures and rotations of line segments.</b></p> <p><b>L. Identify properties of geometric figures (i.e., parallel, perpendicular, similar, congruent, symmetrical)</b></p>	<p><b>J. Analyze geometric patterns, such as tessellations and sequences of shapes, and develop descriptions of the patterns.</b></p> <p><b>K. Analyze objects to determine if they illustrate tessellations, symmetry, congruence, similarity, and scale.</b></p>



<p><b>A. Identify whole number quantities and measurements from least to most and greatest value.</b></p> <p><b>B. Identify least and greatest values represented in bar graphs and pictographs.</b></p> <p><b>C. Categorize rates of change as faster and slower.</b></p> <p><b>D. Continue a pattern of numbers or objects that could be extended infinitely.</b></p>	<p>A. Compare numbers up to the hundred thousands place using greater than less than.</p> <p>B. Create a bar graph and circle graph and identify the least and greatest values.</p> <p>C. Give illustrations of real life events involving changing rates (e.g., speed, time, and heat).</p> <p>D. Observe patterns of numbers and make predictions to determine and continue the sequence.</p> <p>E. Calculate area of rectangles and squares.</p>	<p><b>A. Make comparisons of numbers such as more, less, same, least, most, greater than and less than.</b></p> <p><b>B. Identify least and greatest values represented in bar and circle graphs.</b></p> <p><b>C. Identify maximum and minimum.</b></p> <p><b>D. Describe the relationship between rates of change and time.</b></p> <p><b>E. Estimate areas and volumes as the sums of areas of tiles and volumes of cubes.</b></p> <p><b>F. Describe the relationship between the size of the unit of measurement and the estimate of the areas and volumes.</b></p>	<p>A. Compare rates of change in real life situations.</p> <p>B. Compare numbers and real-life quantities using ordering symbols (<math>&gt;</math>, <math>&lt;</math>, <math>\leq</math>, <math>\geq</math>).</p> <ul style="list-style-type: none"> <li>Identify least and greatest values represented in a variety of graphs.</li> </ul>
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