

Appendix C
Pennsylvania Academic Standards for Math
Grade 8

2.1.8

- A. Represent and use numbers in equivalent forms (e.g., integers, fractions, decimals, percents, exponents, scientific notation, square roots).
- B. Simplify numerical expressions involving exponents, scientific notation and using order of operations.
- C. Distinguish between and order, rational, and irrational numbers.
- D. Apply ratio and proportion to mathematical problem situations involving distance, rate, time and similar triangles.
- E. Simplify and expand algebraic expressions using exponential forms.
- F. Use the number line model to demonstrate integers and their applications.
- G. Use the inverse relationships between addition, subtraction, multiplication, division, exponentiation, and root extraction to determine unknown quantities in equations.

2.2.8

- A. Complete calculations by applying the order of operations.
- B. Add, subtract, multiply, and divide different kinds and forms of rational numbers including integers, decimal fractions, percents, and proper and improper fractions.
- C. Estimate the value of irrational numbers.
- D. Estimate amount of tips and discounts using ratios, proportions, and percents.
- E. Determine the appropriateness of overestimating or underestimating in computation.
- F. Identify the difference between exact value and approximation and determine which is appropriate for a given situation.

2.3.8

- A. Develop formulas and procedures for determining measurements (e.g., area, volume, distance).
- B. Solve rate problems (e.g., $\text{rate} \times \text{time} = \text{distance}$, $\text{principal} \times \text{interest rate} = \text{interest}$).
- C. Measure angles in degrees and determine the relationships of angles.
- D. Estimate, use, and describe measures of distance, rate, perimeter, area, volume, weight, mass, and angles.
- E. Describe how a change in linear dimension of an object affects its perimeter, area, and volume.
- F. Use scale measurements to interpret maps or drawings.
- G. Create and use scale models.

2.4.8

- A. Make conjectures based on logical reasoning and test conjectures by using counter-examples.
- B. Combine numeric relationships to arrive at a conclusion.
- C. Use if...then statements to construct simple, valid arguments.
- D. Construct, use, and explain algorithmic procedures for computing and estimating with whole numbers, fractions, decimals, and integers.
- E. Distinguish between inductive and deductive reasoning.
- F. Use measurements and statistics to quantify issues (e.g., in family, consumer science situations).

2.5.8

- A. Invent, select, use, and justify the appropriate methods, materials, and strategies to solve problems.
- 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.
- C. Justify strategies and defend approaches used and conclusions reached.
- D. Determine pertinent information in problem situations and whether any further information is needed for a solution.

2.6.8

- A. Compare and contrast different plots of data using values of mean, median, mode, quartiles, and range.
- B. Explain effects of sampling procedures and missing or incorrect information on reliability.
- C. Fit a line to the scatter plot of two quantities and describe any correlation of the variables.
- D. Design and carry out a random sampling procedure.
- E. Analyze and display data in stem-and-leaf and box-and-whisker plots.
- F. Use scientific and graphing calculators and computer spreadsheets to organize and analyze data.
- G. Determine the validity of the sampling method described in studies published in local or national newspapers.

2.7.8

- A. Determine the number of combinations and permutations for an event.
- B. Present the results of an experiment using visual representations (e.g., tables, charts, graphs).
- C. Analyze predictions (e.g., election polls).
- D. Compare and contrast results from observations and mathematical models.
- E. Make valid inferences, predictions, and arguments based on probability.

2.8.8

- A. Apply simple algebraic patterns to basic number theory and to spatial relations.
- B. Discover, describe, and generalize patterns, including linear, exponential, and simple quadratic relationships.
- C. Create and interpret expressions, equations or inequalities that model problem situations.
- D. Use concrete objects to model algebraic concepts.
- E. Select and use a strategy to solve an equation or inequality, explain the solution, and check the solution for accuracy.
- F. Solve and graph equations and inequalities using scientific and graphing calculators and computer spreadsheets.
- G. Represent relationships with tables or graphs in the coordinate plane and verbal or symbolic rules.
- H. Graph a linear function from a rule or table.
- I. Generate a table or graph from a function and use graphing calculators and computer spreadsheets to graph and analyze functions.
- J. Show that an equality relationship between two quantities remains the same as long as the same change is made to both quantities; explain how a change in one quantity determines another quantity in a functional relationship.

2.9.8

- A. Construct figures incorporating perpendicular and parallel lines, the perpendicular bisector of a line segment and an angle bisector using computer software.
- B. Draw, label, measure, and list the properties of complementary, supplementary, and vertical angles.
- C. Classify familiar polygons as regular or irregular up to a decagon.
- D. Identify, name, draw, and list all properties of squares, cubes, pyramids, parallelograms, quadrilaterals, trapezoids, polygons, rectangles, rhombi, circles, spheres, triangles, prisms, and cylinders.
- E. Construct parallel lines, draw a transversal, and measure and compare angles formed (e.g., alternate interior and exterior angles).
- F. Distinguish between similar and congruent polygons.
- G. Approximate the value of π (pi) through experimentation.
- H. Use simple geometric figures (e.g., triangles, squares) to create, through rotation, transformational figures in three dimensions.
- I. Generate transformations using computer software.
- J. Analyze geometric patterns (e.g., tessellations, sequences of shapes) and develop descriptions of the patterns.
- K. Analyze objects to determine whether they illustrate tessellations, symmetry, congruence, similarity, and scale.

2.10.8

- A. Compute measures of sides and angles using proportions, the Pythagorean Theorem, and right triangle relationships.
- B. Solve problems requiring indirect measurement for the lengths of sides of triangles.

2.11.8

- A. Analyze graphs of related quantities for minimum and maximum values and justify the findings.
- B. Describe the concept of unit rate, ratio, and slope in the context of rate of change.
- C. Continue a pattern of numbers or objects that could be extended infinitely.