

## §111.24. Mathematics, Grade 8.

### (a) Introduction.

(1) Within a well-balanced mathematics curriculum, the primary focal points at Grade 8 are using basic principles of algebra to analyze and represent both proportional and non-proportional linear relationships and using probability to describe data and make predictions.

(2) Throughout mathematics in Grades 6-8, students build a foundation of basic understandings in number, operation, and quantitative reasoning; patterns, relationships, and algebraic thinking; geometry and spatial reasoning; measurement; and probability and statistics. Students use concepts, algorithms, and properties of rational numbers to explore mathematical relationships and to describe increasingly complex situations. Students use algebraic thinking to describe how a change in one quantity in a relationship results in a

change in the other; and they connect verbal, numeric, graphic, and symbolic representations of relationships. Students use geometric properties and relationships, as well as spatial reasoning, to model and analyze situations and solve problems. Students communicate information about geometric figures or situations by quantifying attributes, generalize procedures from measurement experiences, and use the procedures to solve problems. Students use appropriate statistics, representations of data, reasoning, and concepts of probability to draw conclusions, evaluate arguments, and make recommendations.

(3) Problem solving in meaningful contexts, language and communication, connections within and outside mathematics, and formal and informal reasoning underlie all content areas in mathematics. Throughout mathematics in Grades 6-8, students use these processes together with graphing technology and other mathematical tools such as manipulative materials to develop conceptual understanding and solve problems as they do mathematics.

(b) Knowledge and skills.

**(8.1) Number, operation, and quantitative reasoning.** The student understands that different forms of numbers are appropriate for different situations.

The student is expected to:

- (A) compare and order rational numbers in various forms including integers, percents, and positive and negative fractions and decimals;
- (B) select and use appropriate forms of rational numbers to solve real-life problems including those involving proportional relationships;
- (C) approximate (mentally and with calculators) the value of irrational numbers as they arise from problem situations (such as  $\pi$ ,  $\sqrt{2}$ ); and
- (D) express numbers in scientific notation, including negative exponents, in appropriate problem situations.

**(8.2) Number, operation, and quantitative reasoning.** The student selects and uses appropriate operations to solve problems and justify solutions.

The student is expected to:

(A) select appropriate operations to solve problems involving rational numbers and justify the selections;

(B) use appropriate operations to solve problems involving rational numbers in problem situations;

(C) evaluate a solution for reasonableness; and

(D) use multiplication by a constant factor (unit rate) to represent proportional relationships.

**(8.3) Patterns, relationships, and algebraic thinking.** The student identifies proportional or non-proportional linear relationships in problem situations and solves problems.

The student is expected to:

(A) compare and contrast proportional and non-proportional linear relationships; and

(B) estimate and find solutions to application problems involving percents and other proportional relationships such as similarity and rates.

**(8.4) Patterns, relationships, and algebraic thinking.** The student makes connections among various representations of a numerical relationship.

The student is expected to generate a different representation of data given another representation of data (such as a table, graph, equation, or verbal description).

**(8.5) Patterns, relationships, and algebraic thinking.** The student uses graphs, tables, and algebraic representations to make predictions and solve problems.

The student is expected to:

(A) predict, find, and justify solutions to application problems using appropriate tables, graphs, and algebraic equations; and

(B) find and evaluate an algebraic expression to determine any term in an arithmetic sequence (with a constant rate of change).

**(8.6) Geometry and spatial reasoning.** The student uses transformational geometry to

develop spatial sense.

The student is expected to:

- (A) generate similar figures using dilations including enlargements and reductions; and
- (B) graph dilations, reflections, and translations on a coordinate plane.

**(8.7) Geometry and spatial reasoning.** The student uses geometry to model and describe the physical world.

The student is expected to:

- (A) draw three-dimensional figures from different perspectives;
- (B) use geometric concepts and properties to solve problems in fields such as art and architecture;
- (C) use pictures or models to demonstrate the Pythagorean Theorem; and
- (D) locate and name points on a coordinate plane using ordered pairs of rational numbers.

**(8.8) Measurement.** The student uses procedures to determine measures of three-dimensional figures.

The student is expected to:

- (A) find lateral and total surface area of prisms, pyramids, and cylinders using concrete models and nets (two-dimensional models);
- (B) connect models of prisms, cylinders, pyramids, spheres, and cones to formulas for volume of these objects; and
- (C) estimate measurements and use formulas to solve application problems involving lateral and total surface area and volume.

**(8.9) Measurement.** The student uses indirect measurement to solve problems.

The student is expected to:

(A) use the Pythagorean Theorem to solve real-life problems; and

(B) use proportional relationships in similar two-dimensional figures or similar three-dimensional figures to find missing measurements.

**(8.10) Measurement.** The student describes how changes in dimensions affect linear, area, and volume measures.

The student is expected to:

(A) describe the resulting effects on perimeter and area when dimensions of a shape are changed proportionally; and

(B) describe the resulting effect on volume when dimensions of a solid are changed proportionally.

**(8.11) Probability and statistics.** The student applies concepts of theoretical and experimental probability to make predictions.

The student is expected to:

(A) find the probabilities of dependent and independent events;

(B) use theoretical probabilities and experimental results to make predictions and decisions; and

(C) select and use different models to simulate an event.

**(8.12) Probability and statistics.** The student uses statistical procedures to describe data.

The student is expected to:

(A) select the appropriate measure of central tendency or range to describe a set of data and justify the choice for a particular situation;

(B) draw conclusions and make predictions by analyzing trends in scatterplots; and

(C) select and use an appropriate representation for presenting and displaying relationships among collected data, including line plots, line graphs, stem and leaf plots, circle graphs, bar graphs, box and whisker plots, histograms, and Venn diagrams, with and without the use of technology.

**(8.13) Probability and statistics.** The student evaluates predictions and conclusions based on statistical data.

The student is expected to:

(A) evaluate methods of sampling to determine validity of an inference made from a set of data; and

(B) recognize misuses of graphical or numerical information and evaluate predictions and conclusions based on data analysis.

**(8.14) Underlying processes and mathematical tools.** The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school.

The student is expected to:

(A) identify and apply mathematics to everyday experiences, to activities in and outside of school, with other disciplines, and with other mathematical topics;

(B) use a problem-solving model that incorporates understanding the problem, making a plan, carrying out the plan, and evaluating the solution for reasonableness;

(C) select or develop an appropriate problem-solving strategy from a variety of different types, including drawing a picture, looking for a pattern, systematic guessing and checking, acting it out, making a table, working a simpler problem, or working backwards to solve a problem; and

(D) select tools such as real objects, manipulatives, paper/pencil, and technology or techniques such as mental math, estimation, and number sense to solve problems.

**(8.15) Underlying processes and mathematical tools.** The student communicates about Grade 8 mathematics through informal and mathematical language, representations, and models.

The student is expected to:

- (A) communicate mathematical ideas using language, efficient tools, appropriate units, and graphical, numerical, physical, or algebraic mathematical models; and
- (B) evaluate the effectiveness of different representations to communicate ideas.

**(8.16) Underlying processes and mathematical tools.** The student uses logical reasoning to make conjectures and verify conclusions.

The student is expected to:

- (A) make conjectures from patterns or sets of examples and nonexamples; and
- (B) validate his/her conclusions using mathematical properties and relationships.

*Source: The provisions of this §111.24 adopted to be effective September 1, 1998, 22 TexReg 7623; amended to be effective August 1, 2006, 30 TexReg 1930.*

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