

**Upon successful completion of this course, the student will be able to:**

### **Ratio and Proportion**

1a. Reason about how quantities vary together in a proportional relationship, using tables, double number lines, and tape diagrams as supports.

1b. Use unit rates to solve problems and to formulate equations for proportional relationships.

1c. Recognize that unit rates make connections with prior learning by connecting ratios to fractions.

1d. View the concept of proportional relationship as an intellectual precursor and key example of a linear relationship.

1e. Examine and reason about functional relationships represented using tables, graphs, equations, and descriptions of functions in words. In particular, students can examine the way two quantities change together using a table, graph, and equation.

1f. Examine the patterns of change in proportional and linear relationships and the types of real-world situations these functions can model and contrast with nonlinear relationships.

### **Measurement**

2a. Explain the general principles of measurement, the process of iterations, and the central role of units (including nonstandard, U.S. customary, and metric units).

2b. Explain how the number line connects measurement with number through length.

2c. Understand and distinguish area and volume, giving rationales for area and volume formulas that can be obtained by finitely many compositions and decompositions of unit squares or unit cubes, including but not limited to formulas for the areas of rectangles, triangles, and parallelograms, and volumes of arbitrary right prisms.

2d. Describe how length, area, and volume of figures change under scaling, focusing on areas of parallelograms and triangles, with counting-number scale factors.

2e. Informally develop the formulas for area and circumference of a circle and use them in solving real-world problems.

**2f.** Attend to precision in measurement with rounding guided by the context.

**2g.** Convert between different units both by reasoning about the meaning of multiplication and division and through dimensional analysis.

### **Geometry**

**3a.** Understand geometric concepts of angle, parallel, and perpendicular, and use them in describing and defining shapes.

**3b.** Describe and reason about spatial locations (including the coordinate plane).

**3c.** Informally prove and explain theorems about angles and solve problems about angle relationships.

**3d.** Classify shapes into categories and reason to explain relationships among the categories.

**3e.** Explain when and why the Pythagorean Theorem is valid and use the Pythagorean Theorem in a variety of contexts.

**3f.** Examine, predict, and identify translations, rotations, reflections, and dilations, and combinations of these.

**3g.** Understand congruence in terms of translations, rotations, and reflections; and similarity in terms of translations, rotations, reflections, and dilations and solve problems involving congruence and similarity.

**3h.** Understand symmetry as transformations that map a figure onto itself.

### **Statistics and Probability**

**4a.** Recognize and formulate a statistical question as one that anticipates variability and can be answered with data.

**4b.** Understand various ways to summarize, describe, and compare distributions of numerical data in terms of shape, center (e.g., mean, median), and spread (e.g., range, interquartile range).

**4c.** Use measures and data displays to ask and answer questions about data and to compare data sets. (This includes connections to grades 6–8 statistics.)

**4d.** Distinguish categorical from numerical data and select appropriate data displays.

**4e.** Use reasoning about proportional relationships to argue informally from a sample to a population.

**4f.** Calculate theoretical and experimental probabilities of simple and compound events, and understand why their values may differ for a given event in a particular experimental situation.

**4g.** Explore relationships between two variables by studying patterns in bivariate data.