Geometry and Measurement

- Develop visualization skills:
  - Be familiar with projections, cross-sections, and decomposition of common two- and three-dimensional figures.
  - Represent three-dimensional shapes in two dimensions and constructing three-dimensional objects from two-dimensional representations.
  - Manipulate mentally physical representations of two- and three-dimensional shapes.
  - Determine the rotational and line symmetries for two-dimensional shapes.

- Develop familiarity with basic shapes and their properties:
  - Know fundamental objects of geometry, including point, ray, line, and line segment.
  - Develop an understanding of angles and how they are measured.
  - Be familiar with plane isometries - reflections (flips), rotations (turns), and translations (slides).
  - Understand congruence, similarity, and proportional reasoning via similarity.
  - Learn technical vocabulary and understanding the importance of definition.
  - Be familiar with currently available manipulatives and software that allow exploration of shapes.

- Understanding the process of measurement and measurement techniques:
  - Recognize different aspects of size.
  - Understand the idea of unit and the need to select a unit appropriate to the attribute being measured.
  - Know the standard (English and metric) system of units.
  - Use measurement tools such as rulers and meter sticks to make measurements.
  - Estimate using common units of measurement.
  - Compare units and relate measurements within each of the two common systems of measure, English and metric.
  - Understand that measurements are approximate and that different units affect precision.
  - Understand role of $\pi$ in measurement.
  - Understand and use Pythagorean Theorem.

- Understand length, area, and volume:
  - Know what is meant by one-, two-, and three-dimensions.
  - See rectangles as arrays of squares and rectangular solids as arrays of cubes.
  - Recognize the behavior of measure (length, area, and volume) under uniform dilations.
  - Devise area formulas for triangles, parallelograms, and trapezoids; knowing the formula for the area of a circle; be familiar with volume and surface area formulas for prisms, cylinders, and other three-dimensional objects.
  - Decompose and recompose non-regular shapes to find area or volume.
• Understand the independence of perimeter and area; surface area and volume.

Data Analysis, Statistics, and Probability

➢ Design data investigations (optional):
  • Understanding the kinds of questions that can be addressed by data.
  • Make decisions on what and how to measure.
  • Be familiar with how surveys and statistical experiments are designed and what can be learned from them.
  • Understand what constitutes a random sample and how bias is reduced.

➢ Describe data:
  • Describe shape: symmetric versus skewed data distribution and what this indicates about the question being addressed by the data. (optional)
  • Describe spread: range, outliers, clusters (optional), gaps (optional), and what these indicate about the question being addressed by the data.
  • Describe center: mean, median, and mode and what these indicate about the question being addressed by the data.
  • Be familiar with different forms of graphical data representation, e.g. line plots, histograms, line graphs, bar graphs, box plots, pie charts, stem-and-leaf plots, among others; recognize that different forms of representation communicate different features of the data and that some representations are more appropriate than others for a given data set.
  • Comparing two sets of data (not always of the same size).

➢ Draw conclusions:
  • Choose among representations and summary statistics to communicate conclusions.
  • Understand variability and the role it plays in decision making. (optional)
  • Understand some of the difficulties that arise in sampling and inference.
  • Recognize some of the ways that statistics and graphical displays of data can be misleading.

➢ Develop notions of probability:
  • Making judgements under uncertainty.
  • Assign numbers as a measure of likelihood to single-stage and multi-stage events.
  • Understand conditional probability and some of its applications.
  • Be familiar with the idea of randomness.
  • Develop empirical probabilities through simulations; relate to theoretical probability.
  • Understand the notions of expected value and fairness and use probability to determine fairness. (optional)