

MA202

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 π 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 recombine 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)