

Math 302A/B: Understanding Elementary Mathematics Course Information

COURSE CONTENT

The mathematical topics addressed in Math 302A include: problem solving, numeration, whole number arithmetic, meanings of operations, divisors and multiples, meaning of fractions, fraction arithmetic, decimals, percents, ratio, and proportional reasoning.

The mathematical topics addressed in Math 302B include: Indirect measurement, circles and angles, transformational geometry, perimeter, area, surface area, volume, organization and display of data, and probability.

COURSE OBJECTIVES

In both Math 302A/B students will:

- Develop an understanding of why familiar mathematics procedures and rules are valid and how they relate to important mathematical concepts.
- Communicate mathematical ideas and develop an ability to explain and justify their own reasoning.
- Examine how mathematical ideas are represented in multiple ways, in particular through the use of technology or hands-on manipulatives.
- Foster productive mathematical habits of mind by developing both an awareness that mathematics is a useful and sensible subject, and an image of themselves as active mathematical learners.
- Strengthen abilities to problem-solve and self-monitor mathematical thinking.
- Develop a familiarity with materials and methods that are consistent with mathematics reform at the K-8 level.

In Math 302A students will:

- Be able to describe the primary characteristics of the base 10 numeration system, explain why it is such a powerful invention, and extend the characteristics of a place value and base numeration system to bases other than 10
- Be able to describe the major contexts for each of the four basic operations: +, -, x, and ÷ and describe the connectedness of the four operations
- Be able to explain why the major algorithms for the four basic operations work
- Be able to unpack the mathematical nature of strategies that children typically use to solve arithmetic problems
- Be able to explain the basic contexts in which fractions occur
- Be able to explain the mathematical meanings behind fraction computation, including simplifying, finding equivalent fractions, changing between improper fractions and mixed numbers, and adding, subtracting, multiplying, and dividing
- Be able to explain the relationships among whole numbers, integers, fractions, decimals, and ratios
- Be able to identify proportional relationships and apply proportional reasoning to understand these relationships
- Be able appropriately use ratios and understand the contexts in which they occur

In Math 302B students will:

- Develop their own spatial thinking abilities and appreciate the impact these abilities have on the learning of geometry;
- Be able to explain the structure of geometry and apply the properties of shapes to solve problems;
- Be able to classify and identify characteristics of two- and three-dimensional shapes;
- Be able to apply congruence transformations to geometric shapes to understand properties of shapes and create new shapes;
- Be able to identify the symmetries of two- and three-dimensional shapes and create shapes/designs with given symmetries;
- Be able to identify a tessellation, produce a tessellation, and state why a shape will or will not tessellate;
- Be able to identify and create similar figures;
- Be able to determine the perimeter and area of two-dimensional shapes (triangles, quadrilaterals, and circles), and the surface area and volume of three-dimensional solids (prisms, pyramids, cones, cylinders, and spheres)
- Be able to explain that different attributes of an object – perimeter and area, and surface area and volume – are not related in simple ways;
- Be able to represent data in an appropriate graph and interpret graphs;
- Be able to determine the measures of central tendency for a set of data and explain which measure might best represent the data;
- Be able to determine if an event is certain or impossible and to be able to explain that the probability of an event will be between 0 and 1;
- Be able to explain the relationship between experimental and theoretical probabilities;
- Be able to use probability to determine if a game is fair or unfair.
- Be able to use simulations, sampling, and tree diagrams in determining the probability of an event.

PEDAGOGICAL TOOLS AND PHILOSOPHY

Math 302A/B stresses a student-centered approach to instruction. Teacher driven lectures are de-emphasized in favor of a more participatory learning environment. Class time will frequently be devoted to group work, with students engaging in mathematical exploration and problem solving. When possible, students will use hands-on manipulatives and technology to form the foundations for conceptual mathematical ideas. The two courses model many of the recent recommendations for reform in mathematics education presented by the National Council of Teachers of Mathematics and other professional organizations. Thus, these courses emphasize problem-solving, use of technology (calculators and computers) and manipulative materials, cooperative learning, oral and written communication of mathematical ideas and solutions, and the connections between mathematics and its uses in everyday life.

Supporting the development of understanding of concepts, and interrelationships among concepts, requires a student-centered classroom in which the students are actively engaged in collaboration, exploration, and discourse. Collaboration and exploration are necessary for developing deep knowledge of course topics. The discourse that occurs during class, in large and small group discussions, is an essential component of the course. This approach serves not only the learning of Math 302A/B students, but also models the approach the students should use in the future in their own classrooms.