MATH-1380: MATHEMATICS FOR ELEMENTARY AND MIDDLE SCHOOL TEACHERS II

Cuyahoga Community College

Viewing: MATH-1380 : Mathematics for Elementary and Middle School Teachers II

Board of Trustees:
March 2023

Academic Term:
Fall 2023

Subject Code
MATH - Mathematics

Course Number:
1380

Title:
Mathematics for Elementary and Middle School Teachers II

Catalog Description:
Second of two-semester sequence designed for elementary and middle school education majors. Emphasis on understanding ideas and concepts. Includes statistics, probability, measurement, geometric shapes, Euclidean geometry, coordinate geometry, transformational geometry, problem-solving strategies, and historical topics. Highlights applications to classroom, projects, and use of current technology, including scientific/graphing calculators and computers.

Credit Hour(s):
4

Lecture Hour(s):
4

Requisites

Prerequisite and Corequisite
MATH-1370 Mathematics for Elementary and Middle School Teachers I, or departmental approval: equivalent coursework.

Outcomes
Course Outcome(s):
Collect, organize, display, analyze, and interpret data.

Essential Learning Outcome Mapping:
Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):
 a. Describe the population and sample in a survey.
 b. Use proportional reasoning to extrapolate information from a sample.
 c. Describe the attributes of categorical data as compared to numerical data.
 d. Describe bias in a survey.
 e. Construct a line plot and a stem and leaf plot.
 f. Construct a line graph and a circle graph.
 g. Plot information in a scatterplot and draw a regression line.
 h. Calculate measures of center and dispersion and interpret distributions of various shapes.
 i. Find the mean, mode and median for a collection of numbers.
 j. Construct a box and whisker plot.
 k. Describe the properties of the normal distribution.
 l. Calculate the variance.

m. Find the standard deviation for data.
n. Calculate the z-scores.

Course Outcome(s):
Compute probabilities for simple and complex experiments.

Essential Learning Outcome Mapping:
Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):
 a. Describe the sample space for an experiment.
 b. Calculate experimental probability.
 c. Find the theoretical probabilities of the outcomes.
 d. Use Pascal's Triangle to find probabilities.
 e. Evaluate expressions involving factorials.
 f. Calculate permutations and combinations.
 g. Find the expected value of an experiment.
 h. Find the odds in favor and against an event.
 i. Find the probability given the odds.
 j. Find compound and conditional probabilities.

Course Outcome(s):
Describe and analyze two-dimensional and three-dimensional shapes.

Essential Learning Outcome Mapping:
Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):
 a. Find, sort, and construct two-dimensional and three-dimensional shapes, including, but not limited to, rectangle, triangle, parallelograms, prisms.
 b. Identify the characteristics of two-dimensional and three-dimensional shapes.
 c. Complete basic geometric proofs.

Course Outcome(s):
Solve problems involving measurement, conversion of measurements, area, and volume.

Essential Learning Outcome Mapping:
Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):
 a. Solve problems involving measurement, conversion of measurements, area, and volume.
 b. Explain the central role of units in assigning values to measurements.
 c. Compute and verify ratios using U.S. customary units and metric units.
 d. Solve proportions involving measurements.
 e. Relate the processes of multiplication and division to the role of comparative sizing of units in unit conversion.
 f. Use dimensional analysis and unit rates to convert units and to solve problems involving measurement.
 g. Find the length of a line segment and represent it as a number of unit lengths.
 h. Find the perimeter and area of various figures and represent them as a number of unit lengths and unit areas.
 i. Apply the Pythagorean theorem to applications of measurement.
 j. Find the surface area and volume of three-dimensional figures and represent them as a number of unit squares and unit cubes.

  k. Define the distinction between precision and accuracy.
  l. Compare and contrast appropriate applications of precision and rounding.

Course Outcome(s):

Draw, construct, and describe geometrical figures and understand congruence and similarity.

Essential Learning Outcome Mapping:

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):
  a. Complete proofs using properties of congruence.
  b. Solve proportions involving similarity.
  c. Use similarity properties to find missing lengths in application problems.
  d. Complete constructions using compass and straightedge.
  e. Describe geometric shapes based on relationships of sides and angles.
  f. Use Euclidean geometry to solve applied problems.
  g. Complete proofs using Euclidean geometry along with compass and straightedge.

Course Outcome(s):

Use coordinate geometry to represent and examine the properties of geometric shapes.

Essential Learning Outcome Mapping:

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):
  a. Explain how the Pythagorean Theorem pertains to the distance formula.
  b. Use the Pythagorean Theorem and the distance formula to show three points are collinear.
  c. Find the midpoint of a line segment.
  d. Calculate the slopes of lines.
  e. Describe the relationship between slope and linear variation.
  f. Describe the relationship between variation, indirect variation, and linear variation.
  g. Find the equations of lines.
  h. Graph equations and find their simultaneous solutions.
  i. Illustrate the use of triangles to obtain the formulas for circumference and area of a circle.
  j. Use coordinate geometry to solve applied problems.
  k. Complete proofs using coordinate geometry.

Course Outcome(s):

Describe and examine the sizes, positions, and orientations of shapes under transformations.

Essential Learning Outcome Mapping:

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):
  a. Find the measure of directed angles.
  b. Find the image under various transformation, including, but not limited to, rotations, reflections, glide translations, and dilations.
  c. Describe the preservation of congruence and similarity under various transformations.
  d. Use transformations to solve applied problems.
  e. Complete proofs using transformational geometry.

Course Outcome(s):
Apply a variety of strategies to solve problems that arise in mathematics and other fields.

Essential Learning Outcome Mapping:
Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):
a. Use and apply strategies of look for a formula, do a simulation, and use a model.
b. Use and apply strategies of use dimensional analysis and identify sub goals.
c. Use and apply strategies of use coordinates and use symmetry.

Methods of Evaluation:
a. Periodic exams
b. Quizzes
c. Homework
d. Cooperative group work
e. Project
f. Portfolio
g. Calculator/computer application problems
h. Comprehensive final exam

Course Content Outline:
a. Statistics
    i. Organizing and displaying data
    ii. Charts and graphs
    iii. Measuring central tendency
    iv. Measuring dispersion
    v. Distributions
    vi. Misleading graphs
    vii. Sampling bias
b. Probability
    i. Simple experiments
    ii. Computing probability in simple experiments
    iii. Tree diagrams and counting techniques
    iv. Probability tree diagrams
    v. Permutations
    vi. Combinations
    vii. Pascal's triangle and combinations
    viii. Probability using counting techniques
    ix. Simulations
    x. Expected value
    xi. Odds
    xii. Conditional probability
c. Geometric shapes
    i. Recognizing geometric shapes
    ii. Analyzing geometric shapes
    iii. Symmetry
    iv. Relationships between geometric shapes
    v. Triangles and quadrilaterals
    vi. Points and lines in a plane
    vii. Angles
    viii. Angles associated with parallel lines
    ix. Regular polygons
    x. Angle measures in regular polygons
    xi. Tessellations

xii. Circles
xiii. Planes, skew lines, and dihedral angles
xiv. Polyhedral
xv. Curved shapes in three-dimensions
d. Measurement
    i. Nonstandard units
    ii. Standard units in English and metric
    iii. Dimensional analysis
    iv. Length
    v. Area
    vi. Pythagorean theorem
    vii. Surface area
    viii. Volume
e. Euclidean geometry
    i. Triangle congruence
    ii. Triangle similarity
    iii. Indirect measurement
    iv. Fractals and self-similarity
    v. Constructions using compass and straightedge
    vi. Geometric problem solving
f. Coordinate geometry
    i. Distance
    ii. Slope
    iii. Equations of lines
    iv. Simultaneous equations
    v. Equations of circles
    vi. Geometric problem solving
g. Transformational geometry
    i. Isometries
    ii. Symmetry
    iii. Escher-type patterns
    iv. Similitudes
    v. Congruence
    vi. Similarity
    vii. Geometric problem solving
h. Problem solving strategies
    i. Look for a formula
    ii. Do a simulation
    iii. Use a model
    iv. Use dimensional analysis
    v. Identify sub goals
    vi. Use coordinates
    vii. Use symmetry

Resources

Bassarear, Tom and Meg Moss. *Mathematics for Elementary School Teachers*. 7th ed. Cengage Learning, 2020.

Bennett, Albert B., Ted Nelson, and Laurie J. Burton. *Mathematics for Elementary School Teachers: A Conceptual Approach*. 10th ed. McGraw Hill, 2015.

Billstein, Rick, Shlomo Libeskind, and Johnny W. Lott. *A Problem Solving Approach to Mathematics for Elementary School Teachers*. 13th ed. Pearson Education, Inc., 2020.

Musser, Gary L., William F. Burger, and Blake E. Peterson. *Mathematics for Elementary School Teachers: A Contemporary Approach.* 10th ed. John Wiley & Sons, Inc., 2014.

O'Daffer, Phares, Randall Charles, Thomas Cooney, John Dossey, and Jane Schielack. *Mathematics for Elementary School Teachers.* 4th ed. Pearson Education, Inc., 2008.

"Ohio Journal of School Mathematics"

"Principles and Standards for School Mathematics"

"Teaching Children Mathematics; Mathematics Teaching in the Middle School; Mathematics Teacher; and Journal for Research in Mathematics Education"

Resources Other
Software:
The Geometer''s Sketchpad. McGraw Hill Education, 2014.
Website:
National Library of Virtual Manipulatives. nlvm.usu.edu. Utah State University.

Instructional Services

OAN Number:
Ohio Transfer 36 TMMSL

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