



Course Number and Title: MAT 172 Math for Teachers I: Numbers and Operations

Campus Location:

Georgetown, Dover, Stanton, Wilmington

Effective Date:

2022-52

Prerequisite:

SSC 100 or concurrent

Co-Requisites:

None

Course Credits and Hours:

3.00 credits

3.00 lecture hours/week

0.00 lab hours/week

Course Description:

Math for Teachers I explores the concept development of numeration systems, the base ten system, the meaning of the four operations, number theory, and integers. There is an emphasis as well on problem solving and general number sense. This course will focus on the mathematics needed to become an effective teacher and provide the space to see how the different topics in elementary and middle school mathematics fit together. There will be a focus on how children think about mathematics, the methods children are likely to use and why, and which concepts are essential for children to learn.

Required Text(s):

Obtain current textbook information by viewing the [campus bookstore - https://www.dtcc.edu/bookstores](https://www.dtcc.edu/bookstores) online or visit a campus bookstore. Check your course schedule for the course number and section.

Additional Materials:

Calculator (any type)

Schedule Type:

Classroom Course

Video Conferencing

Web Conferencing

Hybrid Course

Online Course

Hyflex

Disclaimer:

None

Core Course Performance Objectives (CCPOs):

1. Differentiate between procedural fluency and conceptual understanding. (CCC 2,6)
2. Show physical items can be represented by a numeral in any numeration system by decomposing the amount into parts equal in size to the measuring unit. (CCC 2,6)
3. Use all component ideas involved in conceptually understanding the Hindu-Arabic numeration system to better understand a child's struggle learning mathematics. (CCC 2,6)
4. Categorize addition and subtraction story problems. (CCC 2,6)
5. Relate conceptual understandings of addition and subtraction to algorithms. (CCC 2,6)
6. Interpret multiplication and division. (CCC 2,6)
7. Relate conceptual understandings of multiplication and division to algorithms and use representations to make sense of and justify why those algorithms work. (CCC 2,6)

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

Measurable Objectives (MPOs):

Upon completion of this course, the student will:

1. Differentiate between procedural fluency and conceptual understanding
 1. Explain there are math concepts underlying procedures.
 2. Distinguish between two types of competencies underlying procedures, conceptual understanding and procedural fluency.
2. Show physical items can be represented by a numeral in any numeration system by decomposing the amount into parts equal in size to the measuring unit.
 1. Explain that measuring units are physical amounts of items used to measure other amounts.
 2. Explain how symbols are used to represent the amount of items in a numeration system.
3. Use all component ideas involved in conceptually understanding the Hindu-Arabic numeration system to better understand a child's struggle learning mathematics.
 1. Analyze claims based on empirical, theoretical, and subjective probabilities.
 2. Identify all component ideas involved in conceptually understanding the Hindu-Arabic numeration system.
 3. Develop an understanding of base-b place-valued numeration systems.
 4. Develop the idea of a basic measuring unit in order to represent quantities with numerals.
 5. Construct measuring units smaller than a basic measuring unit (BMU).
 6. Create a place value chart including measuring units larger and smaller than the basic measuring unit.
 7. Represent the addition and subtraction of decimals in multiple ways.
 8. Represent non-whole number numerals with a constructed set of measuring units.
 9. Connect representations of numerals and base-10 words.
 10. Select basic measuring units appropriately and flexibly.
 11. Explain the standard addition and subtraction algorithms using the meaning of operations, measuring units, place value charts, and representations of quantities.
4. Categorize addition and subtraction story problems.
 1. Recognize all addition and subtraction problems involve a part-whole relationship.
 2. Explain addition and subtraction story problems can be categorized as missing part problems and missing whole problems.
 3. Explain story problems according to the action (or lack thereof) described – join, take-away, additive comparison, part-part-whole.
 4. Recognize why certain story problems are difficult for children.
 5. Explain how children will solve story problems and how their abilities develop over time.
5. Relate conceptual understanding of addition and subtraction to algorithms.
 1. Recognize that students invent valid solution strategies for addition and subtraction.
 2. Interpret student-invented algorithms for addition and subtraction and determine their validity.
 3. Connect conceptual explanation to each step of standard algorithm for addition and model with place value tables.
 4. Compare invented algorithms, intermediate algorithm, and standard algorithm.
 5. Explain how to teach the concept of exchanging in the context of algorithms.
6. Interpret multiplication and division.
 1. Explain meaning of number sentence $a \times b = c$.
 2. Interpret multiplication using the by place, all-at-once, and FOIL interpretation.
 3. Write story problems that involve multipliers less than one and make sense of and explain how the factors influence the size of the product.
 4. Use two interpretations of the division sign – portioning and repeated subtraction.
 5. Represent multiplication story problems, repeated subtraction, and partitioning division story problems with part-whole diagrams.
 6. Connect the various part-whole models.
 7. Write division problems and model on graph paper using both measurement (repeated subtraction) and partitioning interpretations of the division sign.
 8. Interpret repeated subtraction division problems when the answer is not a whole number.
7. Relate conceptual understanding of multiplication and division to algorithms and use representations to make sense of and justify why those algorithms work.
 1. Recognize that children invent strategies for computational problems involving multiplication and division and connect those strategies to more formal generalized algorithms.
 2. Interpret student-invented algorithms for multiplication and division and determine their validity.
 3. Solve multiplication and division problems using the intermediate and standard algorithms.
 4. Compare invented algorithms, the intermediate algorithm, and the standard algorithm for multiplication and division in order to identify difficulties children may experience and help them make connections.
 5. Connect conceptual explanation with each step of standard algorithm for multiplication and division.
 6. Recognize standard algorithm for division is based on a portioning interpretation of division, whereas the intermediate algorithm is based on a repeated subtraction interpretation of division.

Master the explanation of the standard algorithm for division.

Evaluation Criteria/Policies:

The grade will be determined using the Delaware Tech grading system:

90	-	100	=	A
80	-	89	=	B
70	-	79	=	C
0	-	69	=	F

Students should refer to the [Student Handbook - https://www.dtcc.edu/handbook](https://www.dtcc.edu/handbook) for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.

Final Course Grade:

Calculated using the following weighted average

Evaluation Measure	Percentage of final grade
Exams-Summative (Equally Weighted)	40%
Quizzes-Summative (Equally Weighted)	15%
Projects-Summative (Equally Weighted)	15%
Formative Assessment	30%
TOTAL	100%

Core Curriculum Competencies (CCCs are the competencies every graduate will develop):

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):

None

Disabilities Support Statement:

The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the [disabilities services - https://www.dtcc.edu/disabilitysupport](https://www.dtcc.edu/disabilitysupport) web page or visit the campus Advising Center.