

Cedar Crest College
Mathematics for Elementary Education – MAT 202 (3 credits)
Spring, 2009

Instructor: R. Reynolds
Office hours: Monday, Wednesday, Friday: 7:00-7:45 AM; 10 – noon
Tuesday, Thursday: 7:00 – 9:15 AM; 11 AM - noon
(Or by appointment)
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COURSE DESCRIPTION:

This course is intended to provide elementary education majors with experiences in becoming independent problem solvers while providing a solid foundation for teaching early mathematics. Topics include set theory, systems of numeration, number theory, properties of whole numbers, rational numbers, and real numbers, estimation, beginning geometry, and measurement. Collaborative learning, discovery, and refinement of presentation skills are stressed through in-class experiences. Traditional mathematical content is covered in the context of developing student competence with respect to the abilities outlined in the process standards found in *Principles and Standards for School Mathematics* (National Council of Teachers of Mathematics, 2000)

COURSE OUTCOMES:

- Students will demonstrate critical reasoning skills and problem solving competency in the following areas: set theory, systems of numeration, number theory, properties of whole numbers, rational numbers, and real numbers, estimation, beginning geometry, and measurement.
- Students will develop competence with respect to the five process standards found in *Principles and Standards for School Mathematics* published by the National Council of Teachers of Mathematics in 2000:
 1. Problem solving – students will become more confident and independent problem solvers
 2. Reasoning and proof – the student’s ability to use deductive, inductive, and intuitive reasoning will grow, and she will be able to explain her solution process
 3. Communication – students will appreciate the role of discussion in learning mathematics and the value of notation and vocabulary as precise tools that make communication easier
 4. Connections – students will become more aware of connections between various mathematical topics and of connections between mathematics and many other application areas
 5. Representation – the student will increase her ability to create and use mathematical representations to model and interpret mathematical ideas and concepts
- Students will not only examine traditional mathematical content at the level at which they will be teaching but also at a deeper level (an "adult level perspective") so that they will be able to teach from a full understanding of the content (from a so-called "overflow of knowledge") and thus be able to examine topics from many different perspectives and appreciate multiple strategies.

INSTRUCTION METHODS:

The primary method of instruction will be lectures and discussions supported heavily by homework assignments. The homework will consist of pencil and paper problems as well as problems to be solved via the computer. One of the most effective ways to learn mathematics is through practice and individual exploration; thus, the course is heavily homework intensive. Daily homework problems will be assigned, and the student is expected to have completed these problems before the next class meeting and be prepared to share in class discussions relating to these assignments. Specific homework assignments will be collected and graded regularly. Active individual and small group class participation, sharing, and involvement will be expected and encouraged. The student should consult the instructor with any questions/difficulties encountered in her/his studies; a student may be referred to the advising center for

additional assistance. *Students with documented disabilities who may need academic accommodations should discuss these needs with the instructor during the first two weeks of class. Students with disabilities who wish to request accommodations should contact the Advising Center.*

ATTENDANCE:

Attendance will be taken at each class meeting. Students are strongly urged to attend class except in extenuating circumstances and are responsible for all material presented including lectures, announcements of tests and quizzes, and homework assignments. Excessive absence **guarantees** an adverse impact on a student's course grade. When present in class, students are expected to be **fully** engaged in the class. A student is expected to pay attention, listen carefully, think critically about the material being discussed, and participate; please do not do homework, study for other classes, sleep, etc., while in our class. If the instructor notices such behavior, she will mark the offending student absent. Makeup exams will be administered only if the student notifies the instructor **before** the exam with a valid medical or personal excuse. Late homework will generally be accepted but can earn a maximum grade of C.

CALCULATORS:

Technology is essential in teaching and learning mathematics, but it cannot be used as a replacement for basic understanding and intuition. The student will make use of calculators and the computer as the necessary tools to enhance student learning. A scientific calculator is necessary for this course – one that has, as a minimum, the usual arithmetic operations (+, -, x, /, ^) in addition to memory keys.

EVALUATION:

Three in-class quizzes and a cumulative final exam will be given. Homework will be collected and graded regularly. Class participation and individual effort will also enter into the computation of the student's grade. Your obligations for this course include attendance at the final exam, on the day and time scheduled by the Registrar's Office. You should not make travel arrangements until the final exam schedule is published; if you must make plans early, you should schedule your travel after the last final exam day. Each student is expected to do her own work; do not invite trouble by working directly with someone else (unless specifically encouraged to collaborate) or by using materials not authorized by the instructor. Violations of the Honor Code will be handled by the instructor, will be reported to the Dean, and will result in a grade of zero on the assignment/exam. Students are also reminded that theft or damage of library, computing, and other academic resources (including the homework solutions provided by instructors) is not only a violation of the Honor Code of Cedar Crest College but also prohibited by the laws of the Commonwealth of Pennsylvania.

Grades will be based on a relative scale with the following tentative weights:

Quizzes	45% (15% each)
Final exam	20%
Homework	25%
Instructor evaluation	10% (includes attendance, individual, and group participation)
	100%

REQUIRED TEXTS:

Mathematical Reasoning for Elementary Teachers, fifth edition, Long, Calvin, and DeTemple Duane, Addison, Wesley, Longman Publishing, 2008.

Tentative Course Outline

Class meeting

1/20

topic

1.1 - introduction; principles of problem solving, guess and check

1/22

1.2- solving problems using diagrams, lists, and tables

1/27

1.3 - searching for patterns, using variables, solving similar problems

1/29

1.4 – problem solving by working backwards, eliminating possibilities

2/3

review

2/5

Quiz #1 (chapter 1)

2/10

2.1 - sets and set operations

2/12

2.2 – 1-to-1 correspondence, set equivalence

2/17

2.3, 2.4 - whole numbers, operations with whole numbers

2/19

2.4 - exponents

2/24

3.1, 3.2 – numeration systems, bases other than base 10

2/26

3.3, 3.4 – algorithms for addition, subtraction, multiplication and division

3/3

Quiz #2 (chapter 2, 3.1 - 3.2)

3/5

3.5, 3.6 - estimation, mental math, calculator use

3/17

4.1, 4.2 - divisibility, prime and composite numbers

3/19

4.3 - greatest common factors, least common multiples

3/24

5.1, 5.2 - integers, integer addition, subtraction

3/26

5.3, 5.4 - integer multiplication, division

3/31

6.1, 6.2 - arithmetic of rational numbers

4/2

6.2, 6.3 - rational number system

4/7

Quiz #3 (chapters 4, 5, and 6)

4/9

7.1 - decimals

4/14

7.2, 7.3 - computation with decimals, ratio, proportion, and scale

4/16

7.4 - percent

4/21

8.1 - 8.3 - algebraic equations, functions

4/23

11.1, 11.2 - basic geometric notions, polygons

4/28

12.1, 12.2 - measurement, area and perimeter

4/30

13 - symmetry and tilings