Course Information

Class meetings: 3:00 pm - 4:20 pm  MW  Liberal Arts Building 303
Office hours: 12:30pm – 1:30pm (Monday) & 4:30pm – 5:30pm (Wednesday)
W. H. Freeman & Co. (Parts 1, 2, & 3)

Course Objectives

MATH 3305 (Conceptual Math I) is an inquiry-based course for pre-service elementary teachers. This course focuses on fractions, ratio and proportion, algebra with an emphasis on reasoning and conceptual mathematical thinking.

Students will
(a) conceive mathematics as a problem solving endeavor that involves sense-making and thinking;
(b) develop the habit of attending to meaning, of analyzing problem situations, and of making conjectures and providing justifications;
(c) strengthen their quantitative reasoning and algebraic reasoning;
(d) deepen their understanding of fractions, ratios, proportions, change, graphs, functions, and algebra.

To achieve these goals, the course will provide opportunities for you to analyze, both individually and in groups, with the mathematics. During class challenging problems will be posed. You must analyze and solve these problems before working as a team. You are expected to encounter obstacles in your attempts to solve some of these problems. It is by overcoming these obstacles that learning occurs. Your learning becomes explicit when you communicate your reasoning to your classmates. However, if you are not able to solve the problem, you must at least identify the difficulties you face prior to listening to someone else’s solution. This way, you will appreciate the reasoning behind their solution.

Some of the problems may be rather straightforward for you. In that case, please do not deprive your classmates of the opportunity of wrestling with the problem by showing them your solution. Instead, be a coach and help your classmates to overcome the obstacles on their own. You are encouraged to pay close attention to your classmates’ solving process by identifying the obstacles they encounter and how they eventually overcome them, as well as to the challenges you face, as a coach, in trying to help them overcome those obstacles. This skill will serve you well when you are a teacher.

To do well in this class, you must attend every class and be prepared to think and learn, read and understand the textbook, make your own notes, and do your homework.

Grading Scheme

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two Mid-term Examinations</td>
<td>30%</td>
</tr>
<tr>
<td>Final Examination (1:00pm – 3:45, Dec 7, Mon.)</td>
<td>25%</td>
</tr>
<tr>
<td>In-class Assessments</td>
<td>20%</td>
</tr>
<tr>
<td>Homework Assignments</td>
<td>15%</td>
</tr>
<tr>
<td>Term Paper (due, Nov 30, Mon)</td>
<td>10%</td>
</tr>
</tbody>
</table>

Last Day to Drop without a “W” Grade (Census Day): Sep 9, 2009
Last Day to Drop with an automatic “W” Grade: Oct 30, 2009
Content Objectives

1. Quantitative Reasoning
   a. Undertake a quantitative analysis for a problem situation by identifying quantities and understanding how they are related.
   b. Discuss the incorrect ways that children solve story problems.
   c. Discuss the importance of appropriate drawings in problem situation.

2. Fractions and Operations involving Fractions
   b. Given a part of a whole and the fraction it represents, find the whole.
   c. Generate drawings to illustrate equivalent rational numbers (e.g., \( \frac{2}{5} = \frac{4}{10} = 0.4 = 40\% = \frac{2}{4} = \frac{11}{4} \)).
   d. Be able to order a set of fractions, decimal numbers, and percents.
   e. Change terminating decimals and repeating decimals to fractions, and vice versa.
   f. Distinguish between rational numbers and irrational numbers.
   g. Understand the need for a common denominator for adding and subtracting fractions.
   h. Explain the meaning of fraction of a fraction and understand the referent unit for the multiplier, the multiplicand, and the product.
   i. Explain the meaning of dividing by a fraction (repeated-subtraction view) and understand the referent unit for the dividend, the divisor, and the quotient.
   j. Explain why the invert-and-multiply rule works.

3. Ratios and Proportions
   a. Differentiate between multiplicative reasoning and additive reasoning. Compare and contrast an additive comparison and a multiplicative comparison.
   b. Explain the difference between ratio as a multiplicative comparison and ratio as a measure.
   c. Perform a quantitative analysis to differentiate proportional situations from non-proportional situations. For a proportional situation, explain why the two ratios in a proportion are equal to one another.
   d. Solve proportional problems in ways other than cross-multiplying.
   e. Explain the definition of a proportion, of a unit ratio, and of a percent.
   f. Realize the importance of attending to the referent whole of a fraction and to the referent base of a percent.
   g. Make connections among percents, fractions, ratios, and decimals by distinguishing among different meanings of a rational number such as part-whole conception, sharing-equally division, multiplicative comparison, and value of a measure.

4. Algebra: Change, Graphs, Equations, and Functions
   a. Appreciate the power of algebra in modeling a phenomenon by identifying the relationship between two quantities.
   b. Use an algebraic equation, a graph, a table, or a verbal description to represent a relationship between two co-varying quantities.
   c. Explain the connection among the “steepness” of a straight-line graph, the slope in an equation, and the rate of change in a given context.
   d. Draw a qualitative graph for a situation, and conversely write a story for a qualitative graph.
e. Write or recognize an equation for a given situation or graph.
f. Explain and illustrate what is meant by the “graph as picture” misconception.
g. Solve a problem numerically, graphically, and algebraically.
h. Explain what a function is and why functions are important in mathematics.
i. Find a general function rule for a given pattern and give a justification that it is 100% reliable.

Chapters 1, 6, 7, 8, 9, 12, 13, 14.1, 14.2, and 15 in the *Reconceptualizing Mathematics* text will be covered. Understanding of Chapters 2-5 is a pre-requisite.

**In-class Assessments**

The in-class assessments serve as a means for you to know if you are on-track:

a) whether you have read and understood the **assigned readings**,  
b) whether you have understood your **homework**,  
c) whether you have understood the mathematical ideas underlying our **in-classes activities and discussion**.

**Mid-Term & Final Examinations**

The items in the examination assess your understanding and your ability to apply what you have learned in class to solve novel problems. Because the problems in the examination require you to think, the scoring of exam is based on the following scheme:

- **A**: 90% - 100%  
- **B**: 80% - 90%  
- **C**: 70% - 80%  
- **D**: 60% - 70%  
- **F**: 0% - 60%

Because the problems are not straight-forward, you are unlikely to pass an exam by memorizing facts and procedures without understanding. To do well in these examinations you need to analyze the problems and to attend to the meaning of numbers and symbols.

**Term Paper**

Your term paper must have these two components

1. **Teaching and Learning**  
   Compare and contrast your experience as a student in this course and those in other math classes.  
   Discuss whether this course has changed your ideas of teaching and learning mathematics.

2. **Mathematical Understanding**  
   Pick one particular topic/concept/procedure (e.g. fraction division, proportion) that you have learned a lot from this course and demonstrate your depth of understanding by discussing the connections you made (e.g. connections between fraction division and concepts like fraction multiplication, referent units, repeated subtraction, reciprocal, why division does not always make smaller)

The following rubric will be used for scoring the **Mathematical Understanding** component of your paper.

<table>
<thead>
<tr>
<th>Score</th>
<th>In-depth</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>Report what you know or paraphrase the textbook</td>
<td>Incorrect statements or statements that are devoid of mathematics</td>
</tr>
<tr>
<td>C</td>
<td>Discuss your understanding of the topic</td>
<td>Vague statements indicating that you have some but limited understanding</td>
</tr>
<tr>
<td>B</td>
<td>Discuss your understanding of the key ideas associated with the topic and explain the connections among those ideas</td>
<td>Specific statements indicating that you have understood the key ideas</td>
</tr>
<tr>
<td>A</td>
<td>Demonstrate a profound understanding of the topic (including new insights and significant connections, beyond those discussed in class)</td>
<td>Clear and concise statements/illustrations that indicates the depth of your understanding</td>
</tr>
</tbody>
</table>
Term Paper will be a printed Word document only.

Class Policies

1. **Class time is sacred!** A substantial portion of the class time is used for group work. Your discussion should be about mathematics and nothing else. There should virtually be no non-mathematics related disruption during class time. Come to class prepared.

2. Attendance will be taken.

3. You are expected to put in an average of two hours of study time for every hour of class time.

4. There will be no make-up for in-class assessments and exams. If you should miss an exam, the possibility of a make-up will be determined on an individual basis. If you cannot provide documentation to support your reason, your exam grade will be counted as the missed-exam grade.

5. In-class assessment will be given at the beginning of the class. Students who come in after the in-class assessment has started will not be allowed to take the assessment. Be punctual!

6. On the top right corner of each homework, write (a) your name, (b) # of the homework, (c) date when the homework was assigned.

7. Your lowest in-class assessment score and your lowest homework score will be dropped.

8. Late work will not be accepted. Illegible work will not be graded. You are advised to type your work if it helps with illegibility and neatness.

It is important for you to talk to me at an early stage if you think you are having problems with the class. Also, please inform me of any medical or other problems that impact your work.

**Cheating/Plagiarism:** Please refer no UTEP’s policy on Academic Dishonesty. Refer to [http://www.utep.edu/dos/acadintg.htm](http://www.utep.edu/dos/acadintg.htm) for further information.

**Disabilities:** I will make any reasonable accommodations for students with limitations due to disabilities, including learning disabilities. Please see me personally before or after class in the first two weeks or make an appointment, to discuss any special needs you might have. If you have a documented disability and require specific accommodations, you will need to contact the Disabled Student Services Office in the East Union Bldg., Room 106 within the first two weeks of classes. The Disabled Student Services Office can also be reached at [http://www.utep.edu/dsso](http://www.utep.edu/dsso), (915) 747-5148, or dss@utep.edu.