THE UNIVERSITY OF TEXAS AT EL PASO
COLLEGE OF SCIENCE
DEPARTMENT OF MATHEMATICAL SCIENCES

Course #: MATH 3308 CRN 13239
Course Title: Proportional and Algebraic Reasoning
Credit Hrs: 3
Term: Fall 2009
Course Meetings & Location: MW 12:00 – 1:20 pm, QUIN 206
Prerequisite Courses: MATH 2303 with a grade of “C” or better
Course Fee: (if applicable) None
Instructor: Tuesday J. Johnson
Office Location: CRBL 404
Contact Info: Phone # 747 – 8908
E-mail address: tjohnson3@utep.edu

Office Hrs: MW 1:30 – 2:45 pm, TTh 10:30 – 11:45 am
Suggested: N/A
Course Objectives (Learning Outcomes): 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, and algebra.
Course Activities/Assignments: You will have two types of assignments for this course. The first will be teacher focused and will consist of explanations orally and in writing as if you were teaching a particular topic. Each section of the text will be introduced with a problem. It will be your task to spend the first 5 minutes of class writing an explanation as directed for that day. These will be turned in with your student focused work. Also, each student will be required to present on the board at least three times throughout the semester. Your student focused work will be work you need to do as a current student. Assignments and deadlines will be given during class. You are encouraged to work together on student focused work; however, you must turn in your own work. That is, no two students think and write the same. If you and a group member have exactly the same work submitted I will doubt the authenticity. You are not allowed the use of a calculator in this class. Also, incomplete homework assignments will result in a grade of a 0. It is much better than to try and not succeed that to never try at all.

Assessment of Course Objectives: You will have two midterm exams that will be completed individually with no books, no notes, no computer, and no calculator. This is an examination of how you are able to understand and synthesize the material from class individually. Exam questions will not be identical to homework questions. If you have an A average after all grading is complete after the Thanksgiving break, you will not need to take the final exam. Otherwise, it will be a comprehensive final exam on Wednesday, December 9th 1:00 pm – 3:45 pm.

Course Schedule: A chapter by chapter schedule will be distributed in class.

Grading Policy: Your grade will be computed as follows:

Homework 50%
Midterms 30% (15% each)
Final Exam 20%

Make-up Policy: Make up work will not be allowed without proper documentation of the emergency. If you know you will be missing a class it is in your best interest to let me know before the absence.

Attendance Policy: It is my sincere hope that you will not be learning any new mathematics in this course, instead you will be learning it in a more understandable manner and learn the “why” of mathematics. For this reason it is very important that you attend every class day.

Academic Integrity Policy: Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts. Refer to the UTEP’s Policy at http://academics.utep.edu/Default.aspx?tabid=23785.
Civility Statement: If a student’s cell phone or pager rings (buzzes, beeps, plays a song or sings) during class time, or if anyone uses their phone in the classroom during class time, that person will receive a score of 0 for their next graded work. Please make it easy and turn off your cell phone.

Disability Statement: If a student has or suspects she/he has a disability and needs an accommodation, he/she should contact the Disabled Student Services Office (DSSO) at 747-5148 or at <dss@utep.edu> or go to Room 106 Union East Building. The student is responsible for presenting to the instructor any DSS accommodation letters and instructions.

Military Statement: If you are in the military and there is a chance that you will be called away during the semester, please inform me of this before the end of the first week of classes.

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., \(\frac{2}{5} = \frac{4}{10} = 0.4 = 40\%\), \(2\frac{3}{4} = 11/4\))
   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. Proportional Reasoning
   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. Algebraic Reasoning
   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. Distinguish between simple average and weighted average.
   i. Relate algebra to generalized arithmetic; give parallel numerical and algebraic calculations, and point out how they are alike.
   j. Explain what a function is and why functions are important in mathematics.
   k. Find a general function rule for a given pattern and give a justification that it is 100% reliable.
   l. Illustrate and identify arithmetic sequences and geometric sequences.

Chapters 1, 6, 7, 8, 9, 12, 13, 14, and 15 in the *Reconceptualizing Mathematics* text will be covered. Understanding of Chapters 2-7 is a pre-requisite.