Ma 109 ❖ Essential Mathematics for Teachers
Fall 2022

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Lecture: Section 1: MWF 10:00-10:50, AL 301
Section 2: MWF 3:00-3:50, AL 302

Welcome, future teachers! We hope that this course will give you the foundation and skills that you need to approach teaching math to your future students with confidence and enthusiasm, inspiring them to view the subject with confidence and enthusiasm as well!

Course Description

This course will give you an overview of mathematics properties, processes, and symbols used by teachers on the elementary/middle school level. Some topics covered will be problem solving and reasoning, sets, number theory, ratios and proportions, and the real number system.

Course Readings

Mathematics for Elementary School Teachers, Ricardo D. Fierro. 1st Edition. Cengage Learning.

Context

The faculty of the Division of Mathematical Sciences has developed five broad goals and has aligned these goals with the Bob Jones University Institutional Goals (IG) and the goals of the BJU Core (BJUC). We believe these goals support the IG/BJUC of the University. The Division Goals (DG) are designed to develop each student to:
1. Understand the essential theory of mathematics/computer science and appropriately apply the theory in solving problems.
2. Use critical-thinking/analytical skills.
3. Understand mathematical/computing problems and design solutions with the aid of appropriate tools.
4. Apply an understanding of how mathematics/computing can be used in service to Christ as tools to the examination of the world He created.
5. Construct a foundation upon which they, after graduation, can continue the development of their God-given abilities and the learning necessary for his work and life.

Because this course is required by the Education department for several of its majors, it also supports the following Education Department goals (EG):

The student will …
1. Demonstrate a knowledge of content and pedagogy to be effective teachers.
2. Create short- and long-range plans that consider the needs of diverse learners using a variety of instructional strategies and appropriate assessments.
3. Demonstrate the ability to have a positive effect on student learning.

Course Goals (CG)

1. To develop content skills in the area of elementary/middle school mathematics. (DG 1, 2, 3 and EG 1)
2. To develop an understanding of the reasoning and modeling used when performing operations on numbers in our number system. (DG 1, 2, 3 and EG 1)
3. To develop communication skills in regard to elementary/middle school level mathematics. (DG 4, 5 and EG 1, 3)
4. To develop a love of mathematics in its consistency and accuracy which point to our Creator. (DG 4, 5, and EG 3)
5. To work in collaboration with others on completing group assignments that will develop mathematical reasoning skills. (DG 2, 4, 5 and EG 1, 3)

Course Objectives:

Some of the specific skills we hope you will obtain in this course are listed below. Upon completion of this course, you should be able to …

1. Demonstrate competence in problem solving using inductive and deductive reasoning as well as algebraic reasoning. (CG 1, 2, 4) (Evaluated in Chap 1 Test and Final Exam)
2. Identify numbers, ways of representing numbers, relationships among numbers, and sets of numbers in our number systems. (CG 1, 2, 3) (Evaluated in Chapter 2&3 Test and Final Exam)
3. Develop concepts of counting and numerical relationships including cardinality and order. (CG 1, 2, 3) (Evaluated in Chapter 2&3 Test and Final Exam)
4. Define the four arithmetic operations, state the meaning of the operations, how they relate to one another, and identify those operations in the context of various models. (CG 1, 2, 3, 5) (Evaluated in Chapter 2&3 Test, Chapter 4&5 Test and Final Exam)
5. Demonstrate competence in base ten algorithmic calculations, including estimation and compute fluently with whole numbers, integers, rational numbers as both fractions and decimals, and real numbers. (CG 1, 2, 4) (Evaluated in Chapter 1 Test, Chapter 4&5 Test, Chapter 6 Test and Final Exam)
6. Know the meaning of divisibility and the divisibility tests. (CG 1, 2, 3) (Evaluated in Chapter 4&5 Test and Final Exam)
7. Compute the greatest common divisor and least common multiple of whole numbers. (CG 1, 2) (Evaluated in Chapter 4&5 Test and Final Exam)
8. Demonstrate an understanding of the real number properties by identifying which properties are used in a computation. (CG 2, 3) (Evaluated in Chapter 2&3 Test and Final Exam)
9. Model and solve ratio and proportion problems including the solution of problems using percent. (CG 1, 2, 3, 5) (Evaluated in Chapter 4&5 Test and Final Exam)
10. Work in groups with several of your classmates to explain mathematical solutions and to give mathematical instructions to elementary level students. (CG 3, 4, 5) (Evaluated with the Group Activities)

Daily Expectations for Effective/Efficient Study:

Before class: Take a few minutes to look over what the next lesson will cover. Ask yourself (1) Is this a concept that I already know? (2) How was I taught to do this particular function? (3) Are the concepts presented here like the way I learned or possibly different? (4) Which way do I find easiest to understand/explain?

After class: Take a few minutes to look over your notes. Are the important terms/concepts there? Are the procedures that were presented in class clear to you? Could you teach them to someone if needed?

Course Requirements

1. **Proficiency Test**
   You will be required to demonstrate competency in the essential skills of elementary mathematics. Competency is defined as at least 80% of the problems completed correctly on the proficiency test. **No calculators are allowed on this test.** You will have three attempts to pass the test. You will be given a Proficiency Test Practice Sheet prior to taking the Proficiency Test. If you fail to pass the Proficiency Test after three tries your overall grade will be lowered one letter grade.

2. **Homework**
   Homework problems are assigned for each section. Here are some tips for completing homework successfully:

   - Try to complete the homework problems before the next class period after a section is finished.

   - You are welcome to work together with classmates on the solutions.

   - If you get stuck on a problem, leave space for it, and go on to the next one. There are many ways to get help outside of class (see next page). We will also be happy to take some time in class to work through problems that students are struggling with.

   - You should make it a practice to do your work neatly and completely on full-sized notebook paper, working down the page (don't try to put 2-3 columns of work on the page—it is too crowded.) Be sure to number the problems and leave space as appropriate between problems as well for easy readability.

   - Don't just turn in a list of answers—we already know the answers! Your job is to show the thinking that led you to the answers—convince us that you know what you are talking about. You should also be thinking ahead to your future students. Clear and complete explanations will be vital for their understanding.

   - Part of the assignment is checking to make sure your answers are correct and fixing any that are not correct. There is a key with the answers available in Canvas. A fuller Solutions Manual with explanations of how to arrive at the answer is available in the Math Lab.

   Homework will be assessed by a 10-point student Homework Reflection that will be due in Canvas before class on days indicated on the Course Schedule. You will report what percent of the assigned problems that you completed, checked, and corrected. For the first chapter, you will also need to upload pictures of your finished homework pages. After that, you will not need to upload your work unless the teacher asks you to.

   Note that after the first test, students who have an A in the class going into each test will automatically get full credit for the homework. So homework is more or less optional for them. But A students know that the best way to *maintain* an A in the class is to be faithful to do their homework!

   Late Homework Reflections will be reduced by 2 points.

3. **Activities**
   We have developed class activities to be helpful in reinforcing the concepts found in the textbook. As a future teacher of mathematics, you need to know that mathematics is not a spectator sport. You cannot learn mathematical ideas solely by watching someone else present them. Instead, you need to learn to actively think through mathematical ideas. By discussing mathematical ideas and explaining the solution methods to one another, you can deepen and extend your understanding of mathematics.

The class will be broken into small groups to do activities. Sometimes you will have time in class to work together, but other times you will need to get together outside of class. If meeting in person is not convenient, consider using a tool like Microsoft Teams to "meet" online.

For each activity, one activity per group will be **turned in at the beginning of the class** on the indicated day on the schedule. All students in the group are expected to contribute to the solutions. All participates will receive the same grade. Non-participates will receive a zero on that activity. Each Activity will be worth 10 points. There will be a total of 6 graded activities. The lowest grade will be dropped making your activity grade worth 50 points.

Late activities will be reduced by 2 points per day.

4. **Article Readings**
   There will be 4 article reading assignments this semester. These articles will look at various topics on teaching mathematics and will include a summary activity to be turned in to Canvas before midnight on the day assigned. Each Article will be worth 10 points.

   Late article readings will be reduced by 2 points per day.

5. **Bonus**
   The Review Questions at the end of each chapter may be completed and turned in the day of the test for 3 bonus points each. The assigned problems will be listed in the Homework section, and for these you will be required to turn in the actual work pages—either by handing them in in person or uploading pictures of the finished pages to Canvas. You must turn in your bonus work before the test to receive credit.

   There will be no late bonus accepted.

6. **Tests**
   a. 4 Unit Tests—100 points each
   b. Final Exam—150 points

   Missed tests will receive a grade of 0.
   A student may retake one unit test during the final week of regular classes for grade replacement.

Where to seek help for this class
   1. Talk to your teacher during an office hour or make an appointment for non-office hour.
   2. Study with another student in your section or in the other section.
   3. Visit the Math Lab in MB 201 (top of the stairs) on 2nd floor of the Mack Building. It is a free service and is open all of the hours that the library is open. The HW solutions manual is in the Math Lab.

Grading

Item	Pts.	Total		Scale	
Homework	10 each	60		90–100	A
Activities	10 each	40		80–89	B
Article Readings	10 each	50		70-79	C
Unit Tests	100 each	400		60–69	D
Final Exam	150	150		59 ↓	F
Total Points		**700**			

Other Policies

Classroom Deportment

The classroom is a professional environment. Students are expected to be respectful to their instructor and peers in behavior, attitude, attire, and use of technology. The instructor has the right to require students who are participating in distracting behavior to leave the class.

Absences:

Students who miss more than 3 lectures may be dropped from the course. Missing more than 20 minutes of any part of a lecture or lab may count as a full absence. Students should notify the instructor by email as soon as possible after an absence (preferably within 24 hours). If the absence is planned, the student should notify the instructor before missing class. Students who are absent are personally responsible to obtain notes from fellow classmates.
BJU attendance policy is in effect (see https://home.bju.edu/bju-policies/ for details).

Academic Honesty and Integrity Policy:

BJU academic honesty and integrity policy is in effect (see https://home.bju.edu/bju-policies/ for details).

University Policies: We will follow University guidelines.

Changes to Syllabus: This syllabus is a guide to course goals and objectives, procedures, requirements, assignments and grading. The instructor reserves the right to amend the syllabus when circumstances dictate.

Copyright Policy:

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MA 109 Course Tentative Schedule: Fall 2022

Date	Day	Class	Due dates
Aug 24	W	Course Introduction	
Aug 26	F	Begin chapter 1	
Aug 29	M		Math Bio Due/ Math Puzzles 1 Procedures Due
Aug 31	W		
Sept 2	F		
Sept 5	M	***Labor Day, No Class***	
Sept 7	W		How to… Procedure Due
Sept 9	F		
Sept 12	M		Praxis Practice Due
Sept 14	W	Catch-up/Review	Article 1 Due
Sept 16	F	***Washington Center Day, No Class***	
Sept 19	M	**Test: Chapter 1**	HW Reflection 1 Due/ Activity 1 Due
Sept 21	W	Begin chapter 2	Article 2 Due
Sept 22	F		
Sept 26	M	**Activity 2**	HW Reflection 2 Due
Sept 28	W	Begin chapter 3	Activity 2 Due
Oct 1	F		
Oct 3	M		
Oct 5	W	**Activity 3**	
Oct 7	F	Catch-up/Review	Activity 3 Due
Oct 10	M		
Oct 12	W		HW Reflection 3 Due
Oct 14	F	**Test: Chapters 2 & 3**	
Oct 17	M	***Fall Break, no class***	
Oct 19	W	**Proficiency Test 1**	Article 3 Due
Oct 21	F	Begin chapter 4	
Oct 24	M		
Oct 26	W		
Oct 28	F	**Activity 4**	HW Reflection 4 Due
Oct 31	M	Begin chapter 5	Activity 4 Due
Nov 2	W		
Nov 4	F		
Nov 7	M	**Activity 5**	
Nov 9	W	Catch-up/Review	Activity 5 Due
Nov 11	F	**Test: Chapters 4 & 5**	HW Reflection 5 Due
Nov 14	M	Begin chapter 6 with section 5.4	Article 4 Due
Nov 16	W		
Nov 18	F		**Proficiency Test 2 (if needed)**
Nov 21-25		***Thanksgiving Break***	
Nov 28	M		
Nov 30	W		
Dec 2	F	**Activity 6**	
Dec 5	M	Catch-up/Review	Activity 6 Due
Dec 7	W	**Test: Chapter 6 + 5.4**	HW Reflection 6 Due
Dec 9	F	Final Exam Review	
Dec 12/13		**Final Exam**	Section 1 (10:00) December 13, 9:30-10:40 am Section 2 (3:00) December 12, 3:30-4:40 pm

Homework Problems

1.1: 2, 3, 5, 7, 8, 9, 10, 11, 12, 15, 16, 19, 20, 22, 24, 25, 31, 34, 36, 39, 41, 42, 48, 50 (24 problems)

1.2: 4, 8, 9, 13, 14, 18, 19, 21, 23, 25, 28, 31, 33, 38, 40, 47 (16 problems)

1.3: 1, 2, 3, 5, 7, 9, 12, 15, 16, 19, 20, 23, 24, 26, 29, 31, 33, 35, 38, 44, 46, 53, 55 (23 problems)

1.4: 1, 2, 4, 6, 8, 9, 11, 13, 14, 16, 18, 20, 22, 24, 25, 28, 30, 31, 32, 37, 39, 40, 42, 43 (24 problems)

Bonus Review Exercises Ch 1: 2, 4 (a), 6 (a, b, c), 11, 13, 14, 16, 17, 20, 23, 25, 28, 30, 32, 33, 35, 37, 38, 40, 41, 42, 43, 44, 45, 50, 52 (26 problems)

2.1: 1, 3, 5, 8, 9, 10, 11, 14, 15, 17, 20, 21, 24, 25, 27, 28, 30, 32 (d), 34, 39, 43, 46 (22 problems)

2.2: 2, 3, 4, 5 (a), 8, 13, 18, 19, 26, 27 (a), 28 (b), 29 (b), 30 (a), 31, 35, 36, 39, 40, 42, 44, 45, 48, 49, 55, 56, 61, 62 (27 problems)

2.3: 1, 2, 3, 5, 7, 11, 13, 19, 22, 36, 38, 39, 40, 42, 44, 45, 46, 49, 52, 53, 54, 55, 58, 62 (24 problems)

2.4: 1 (a, c), 2, 3, 5, 11 (a), 14 (a, b, c), 15, 16 (a), 17 (a), 18 (a, b), 21, 22, 24 (a, c), 27, 29, 31 (b), 32 (c), 36, 38, 39, 42, (a, b) 43 (a, b), 46, 47, 50 (a, c) (25 problems)

3.1: 1, 4, 5, 6 (a), 8, 11, 13, 17, 19, 20, 21, 23, 25, 29, 30, 31, 33, 34, 35 (d, e, f, g), 37, 39, 41, 44, 48, 51, 57, 58, 61 (28 problems)

3.2: 1, 2, 4, 5, 6, 7, 10, 11, 14, 15, 19, 20, 24, 25, 26 (b), 27 (b), 28 (c), 29, 33, 34, 35 (a), 36 (b), 37, 40, 42, 45, 50, 54, 56 (a), 58 (30 problems)

3.3: 1, 2, 3, 7, 8, 10, 13 (a), 15 (b, c, d), 16 (a, b), 17, 19, 20, 23, 24 (a), 28, 30, 32 (a), 33 (a), 34 (a), 35 (a, b), 36, 37, 42, 43 (a, b), 45, 47 (a, c), 48 (a, c), 51, 52, 55, 58 (31 problems)

Bonus Review Exercises Ch 2: 2, 3, 4, 6, 7, 10, 11, 14, 15, 16, 20, 22, 23, 25, 26, 35 (a, b), 36 (a), 37, 41, 44 (a, b), 48, 49, 52, 55, 59, 60 (26 problems); and **Ch 3:** 2, 4, 6 (a, b, c), 8, 9, 10, 11, 14 (a), 17 (a), 22, 24 (a), 25, 32 (a), 34, 37, 42, 50 (a), 52. 54(a), 56 (a) (20 problems)

4.1: 2, 3, 4, 5, 7, 8, 10, 12 (a, b, c, d, e), 13, 15 (a, c), 16, 25, 26, 30, 32 (a, b, e), 39, 40, 41 (a, b), 42 (a, b), 43 (a, b), 44 (a, b), 45, 48, 50, 56, 57 (26 problems)

4.2: 3, 4, 6, 7, 8, 9 (a), 10, 13, 14, 17, 20, 24 (a, c), 25, 26, 27 (a, b), 30, 32, 36, 38 (a), 39 (a, c), 40, 46 (a), 49 (a, b), 51, 53 (a), 55, 57, 58 (a, b), 59, 63, 64 (b) (31 problems)

4.3: 1, 2 (a, b), 3 (a, b), 4, 5 (a, b), 6, 7 (a, b), 11, 12, 14, 22, 23, 24, 26, 28, 31, 32, 33, 34, 35, 39, 40, 45, 46, 48, 49, 50 (a, b), 51, 55 (a, b), 56, 59 (a, b), 61 (a, b) (34 problems)

5.1: 1, 3 (a, c), 4, 6, 7, 8, 9, 13, 15, 16, 17, 20, 22, 25, 26, 28, 30 (a, b), 31 (b, d), 32 (a), 33 (a, c), 34 (a, c), 35 (a, b), 37 (a, b, c), 38, 41 (a), 44, 46, 48 (a, b), 49 (a, b), 53, 55, 60, 61 (a, c) (33 problems)

5.2: 2, 4, 5 (a, b), 6 (a, b), 7, 8, 9, 14 (a, b, c), 15 (a), 16 (b), 19, 21, 26, 30 (a), 31 (a), 32 (b), 33 (b), 34, 35, 36, 37, 38, 39 (b, c), 41, 42 (a, b, d), 46, 47, 50, 52, 53 (30 problems)

5.3: 1, 2 (a), 3 (a), 4, 5, 6, 8, 9, 13, 14, 16 (c), 17 (a), 18, 19 (a), 22, 28, 29 (a, c), 30 (a), 31 (a), 34, 36, 38, 39, 42, 43 (a, d), 44, 47 (a), 48 (a), 49, 51, 57 (a), 58, 59, 62, 63 (35 problems)

Bonus Review Exercises Ch 4: 4, 6, 8, 14, 15, 23, 28 (a, b), 29 (a), 30, 35 (a, b), 36, 38 (a), 39 (a), 42, 45, 47, 49, 52, 53, 54 (20 problems) and **Ch 5:** 2, 3, 4, 5, 8, 10, 14, 18, 19, 23, 24, 25, 28, 31 (a), 33, 36, 39, 40 (18 problems)

5.4: 1, 3, 4, 7, 10, 13, 15, 17, 18, 21, 23, 24, 27, 29, 32, 33, 34, 35, 38, 40, 42, 44, 45, 47, 50 (25 problems)

6.1: 1, 2 (a, b), 3, 4, 6, 8 (a, c), 9, 10 (c, d), 12, 15, 17, 19, 20, 21 (a, b), 22 (a, b, c), 24 (b), 26, 28, 30 (a), 31 (b), 32 (a), 33, 35, 37, 39, 40, 41, 43, 46 (b, c), 47, 48, 49, 51, 55, 57, 58 (a, c), 59 (a, c), 63 (a, b), 64, 67, 68 (41 problems)

6.2: 1, 5, 6, 7 (a, b), 8, 9, 10, 14, 16, 19, 21, 22, 25, 26, 27, 29, 33, 34, 37 (a, b), 38 (a, c), 39 (a, b), 44 (b, c), 45 (a, b), 47 (b, c), 54, 57, 58, 66 (28 problems)

6.3: 1, 2, 4, 6, 9, 12, 15, 17, 18, 19, 20, 24, 25, 27, 31, 33, 34, 36, 38, 40, 44, 46, 47, 48 (a, b), 49 (a, b), 52, 53, 59, 60, 61, 62 (31 problems)

Bonus Review Questions Ch 5: 43 (a), 44 (a), 45, 47, 49 and **Ch 6:** 3 (a, b), 4, 5, 6 (b), 9, 11, 17, 19, 20 (a), 24, 25, 28 (a, b, c), 29, 30, 32, 35, 36, 39, 42, 44, 45 (26 problems)