

**MA 109**  
**Essential Mathematics for Teachers**  
*2020–21 First Semester*

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Welcome, future Christian 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. 1<sup>st</sup> 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 Great 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 in order to explain mathematical solutions and to give mathematical instructions to elementary level students. (CG 3, 4, 5) (Evaluated with the Group Activities)

## BIBLICAL MANDATE FOR THIS COURSE

The source of wisdom and knowledge is the Lord and a keen mind is a gift from God. It is our hope that mathematical study will show you the greatness of God and increase Christlikeness in you (Colossians 1:17 and Philippians 2:5). God has given man the capacity to reason mathematically and expects you to be able to reason logically (Isaiah 1:18). The study of mathematics helps to develop your God-given ability to reason. As a Christian, you need to be able to discern truth and filter ideas through a biblical worldview. Also, mathematics is the study of the underlying structure of the universe and its intelligent design. Mathematics is an avenue of studying the God-created universe in its complexity, harmony, and precision. Math is a tool that can help you fulfill the God-given mandate found in Genesis 3:28 to exercise dominion over the earth.

The study of mathematics from a Christian perspective will help you to better know God and imitate Him more closely. You can see the consistency of God in the consistency of His universe. Because of this consistency, we can model a physical law and study it through mathematics. The study of mathematics can also help you to develop Christ-like character traits such as diligence, honesty, precision, perseverance, and humility.

## Daily Expectations for Effective/Efficient Study:

**Before class:** Take a few minutes to look over what the lesson of the day will cover (schedule at the end of the syllabus.) 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. The test will consist of 24 problems. **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 Proficiency Test 1. If you fail to pass the Proficiency Test after 3 tries your overall grade will be lowered one letter grade.

### 2. Homework

- a. Your homework is due in class on the day that it is listed in the syllabus. Each homework section will be worth 3 points. *Note that sometimes more than one section is due on a given day.* The assigned problems are listed in the Homework Exercise section. You may work together on homework assignments without seeking permission, but each person must turn in their own homework solutions. You should check your answers before turning your homework in to the teacher using the answers provided in the back of the textbook.

Note: In order to more greatly benefit from the homework problems, you should attempt each problem before you look at the answer. You are encouraged to contact your teacher for help if there are homework problems that you do not understand.

- b. There are a total of 21 homework assignments. The lowest homework grade will be dropped making homework worth 60 points total.

### 3. Activities

Class activities have been developed 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 participants will receive the same grade. Non-participants 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.

### 4. Article Readings

There will be 4 article reading assignments this semester. The first article reading assignment requires you to read two articles while the other three require you to read one article each. These articles discuss a Biblical Philosophy of teaching mathematics. Each article reading assignment instructions are found in Canvas. The instructions include a link to the required article(s) to be read. After you have read the article you are to write a ½-1 page single-spaced summary of the article(s) and upload that file to the appropriate assignment in Canvas. Each Article reading summary will be worth 10 points.

### 5. Bonus

The Review Questions at the end of each chapter may be completed and turned in the day of the chapter test for 3 bonus points each. The assigned problems will be listed in the Homework Exercise section.

### 6. Tests

- a. Unit Tests—100 points each
- b. Final Exam—150 points

**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 2<sup>nd</sup> floor of the Mack Building. It is a free service and is open all of the hours that the library is open.

**Test Schedule**

Content	Point Value	# of class days including test day	Date of Evaluation
Chapter 1	100	7	Sept. 4
Chapter 2 & 3	100	11	Sept 30
Chapter 4 & 5	100	11	Oct 28
Chapter 6	100	7	Nov 16
Final Exam	150		Section 1 (10:00) Monday, Nov 23 @ 9:30 Section 2 (3:0) Saturday, Nov 21 @ 3:30

**Grading**

Item	Pts.	Total	Scale	
Homework	3 each	60	90-100	A
Activities	10 each	50	80-89	B
Article Readings	10 each	40	70-79	C
Unit Tests	100 each	400	60-69	D
Final Exam	150	150	59 ↓	F
<b>Total Points</b>		<b>700</b>		

**Cell Phones and Laptops**

Keep your cell phone muted or off during class. The cell phone should be placed in your bag or pocket unless you are aware of an emergency call that might be coming. In that case, be sure to let your teacher know before the start of the class. There is little reason why a laptop should be used during a math class. You should have pencil, paper, and your textbook out and ready to use in class. If for some reason you have a legitimate need of a laptop in class, please see your teacher and we will discuss this need.

**Attendance Policy**

We want you to be successful in this class. The main sources of learning are the daily classroom activities and related discussions. Therefore, it is important to attend and arrive on time for all class sessions.

See the Student Handbook for the official university policy on class absences including how many you are allowed. The policy is clear that you are not to be absent from class for reasons such as talking with friends or to study for another class. Only for reasons that are beyond your control.

If you know in advance that you will be absent from a class session, please notify your teacher as early as possible, and include the reason for your absence. If there is work due on the day you will be absent, you should make arrangements to turn in the work ahead of time or send it to class with a classmate. Tests should be taken ahead of time.

If your absence is unexpected, please notify your teacher within 24 hours of the absence with the reason for the absence and work out arrangements for any needed work submission or test makeups in a timely way.

If your absence is due to quarantine, we will try to make arrangements for you to attend class/turn in your homework in a virtual way. Please let us know as soon as you know if such arrangements need to be made.

## Masks

Students are expected to comply with BJU guidelines in regard to wearing masks in the classroom. If you have a medical exemption to having to wear a mask, please let us know as soon as possible so we can make decisions about a safe seating location for you.

## Cheating

Cheating is defined as any use of unauthorized helps. In today's age of technology, this includes getting unapproved help from a source on the internet and/or using your calculator to store formulas or information that you are to know from memory. If you have a question about any source you are considering using, please gain teacher approval before using it. The presence of any material on your desk containing formulas, notes, etc. (except those allowed by the instructor) while taking a test, will be construed as cheating and will be dealt with as such. Cheating on a test will result in a zero on the test plus any penalties imposed by the university.

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## MA 109 Course Tentative Schedule: Fall 2020

Homework (HW) and Activities are due on the date listed.

Biblical Philosophy articles instructions found on Canvas (listed as Article Reading Assignments)

**Schedule subject to change. See Canvas Syllabus for the most up-to-date schedule.**

Schedule			
Date	Day	Class	Assignment Due Dates
Aug 19	W	Course Introduction	
Aug 21	F	1.1	
Aug 24	M	1.2	
Aug 26	W	1.3	HW Due: <b>Sec. 1.1:</b> 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) and <b>1.2:</b> 4, 8, 9, 13, 14, 18, 19, 21, 23, 25, 28, 31, 33, 38, 40, 47 (16 problems)
Aug 28	F	1.3; 1.4	<b>Article 1</b> (“Why Learn Math?” And “Whither Mathematics Education in the 21 <sup>st</sup> Century”) Summary due to Canvas
Aug 31	M	1.4	<b>Activity 1</b> Due
Sept 2	W	Catch-up/Review	HW Due: <b>Sec. 1.3:</b> 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) and <b>1.4:</b> 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)
Sept 4	F	<b>Test: Chapter 1</b>	Bonus: <b>Review Exercises Chapter 1:</b> 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)
Sept 7	M	2.1	<b>Article 2</b> (“The Wonders of the Fibonacci Sequence”) Summary due to Canvas
Sept 9	W	2.1; 2.2	
Sept. 11	F	2.2	HW Due: <b>Sec. 2.1:</b> 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) and <b>2.2:</b> 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)
Sept. 14	M	2.3	
Sept 16	W	2.4	<b>Article 3</b> (“Counting, Teaching, and the Trinity: Changing Perspectives”) Summary due to Canvas
Sept 18	F	3.1, 3.2	HW Due: <b>Sec. 2.3:</b> 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) and <b>2.4:</b> 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)

Sept 21	M	3.1, 3.2	<b>Activity 2 Due</b>
Sept 23	W	3.2	
Sept 25	F	3.3	HW Due: <b>Sec. 3.1:</b> 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) and <b>3.2:</b> 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) and <b>3.3:</b> 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)
Sept 28	M	Catch-up/Review	<b>Activity 3 Due</b>
Sept 30	W	<b>Test: Chapters 2 &amp; 3</b>	Bonus: <b>Review Exercises Chapter 2:</b> 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); <b>Review Exercises Chapter 3:</b> 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)
Oct 2	F	<b>Proficiency Test 1</b>	
Oct 5	M	Review Tests; 4.1	
Oct 7	W	4.1	<b>Article 4</b> ("Restoring the Third "R") Summary due to Canvas
Oct 9	F	4.1; 4.2	HW Due: <b>Sec. 4.1:</b> 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)
Oct 12	M	4.2	
Oct 14	W	4.3	
Oct 16	F	5.1	HW Due: <b>Sec. 4.2:</b> 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) and <b>4.3:</b> 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)
Oct 19	M	5.1; 5.2	<b>Activity 4 Due</b>
Oct 21	W	5.2; 5.3	
Oct 23	F	5.3	HW Due: <b>Sec. 5.1:</b> 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) and <b>5.2:</b> 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)
Oct 26	M	Catch-up/Review	HW Due: <b>Sec. 5.3:</b> 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)
Oct 28	W	<b>Test: Chapters 4 &amp; 5</b>	Bonus: <b>Review Exercises Chapter 4:</b> 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 Bonus: <b>Review Exercises Chapter 5:</b> 2, 3, 4, 5, 8, 10, 14, 18, 19, 23, 24, 25, 28, 31 (a), 33, 36, 39, 40 (18 problems)
Oct 30	F	5.4	
Nov 2	M	6.1	<b>Activity 5 Due</b>
Nov 4	W	<b>Proficiency Test 2</b>	
Nov 6	F	6.1, 6.2	HW Due: <b>Sec. 5.4:</b> 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) and <b>Sec. 6.1:</b> 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),
Nov 9	M	6.2	<b>Activity 6 Due</b>
Nov 11	W	6.3	
Nov 13	F	Catch-up/Review	HW Due: <b>Sec. 6.2:</b> 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) and <b>6.3:</b> 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)
Nov 16	M	<b>Test: Chapter 6 + 5.4</b>	Bonus: <b>Review Questions Chapter 5:</b> 43 (a), 44 (a), 45, 47, 49 and <b>Review Questions Chap 6:</b> 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)
Nov 18	W	<b>Day of Rest</b>	No Class
Nov 20	F	Final Exam Review	
		<b>Final Exam</b>	Section 1 (10:00) Monday, Nov 23 @ 9:30 Section 2 (3:0) Saturday, Nov 21 @ 3:30