

Math 205 - Mathematics for Elementary Teachers I - Fall, 2000
Math 206 - Mathematics for Elementary Teachers II - Spring, 2001

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Office Hours: Monday, Wednesday, Friday 1:30 3:30 p.m.

Text: *Mathematics for Elementary School Teachers, 2nd Edition*
by Tom Bassarear

Test Dates:	Test 1	Thurs, September 21	3:30 – 7:30 p.m.
(Fall)	Test 2	Thurs, October 19	3:30 – 7:30 p.m.
	Test 3	Thurs, November 9	3:30 – 7:30 p.m.
	Test 4	Tues, December 5	3:30 – 7:30 p.m.
Final Exam:		Tuesday, December 12, 8:00 am.	MA 205-02
		Wednesday, December 13, 10:30 am.	MA 205-01

Grading:

Tests	400 pts
Writing Assignments	100 pts
Attendance	50 pts*
Homework/classwork/quizzes	100 – 200 pts
Final Exam	<u>100 – 150 pts</u>
	750 - 900 pts

For any assignments which are 10 pts or less, LATE PAPERS WILL NOT be graded. Other late work will be graded approximately 10-25% lower. If you are unable to attend class, have a classmate or friend turn in your paper. (LATE = not turned in at the beginning of the class period when due)

***CLASS ATTENDANCE IS EXPECTED AND WILL BE RECORDED DAILY.**

Because of the numerous class activities, points will be awarded as follows:

Perfect attendance	55 points (a 5 pt bonus!)
1-3 absences	50 points
4 or more absences	50 points minus 10 pts for each absence beyond the 3rd

If you are unable to attend your own class for some reason, you are welcome to attend another section. Help me to keep my attendance records correct by sending me a short e-mail message about the switch, either before or after class. Section 01(8:30 a.m.) meets in VZ 151, and Section 02 (noon) meets in VZ 298. (Note that more than 8 absences will record a **negative** point value.)

DISCUS: An ongoing Discussion Board will be available on the web. This will allow you to check on assignment deadlines, ask/provide homework hints, view solution sets, and ask any pertinent questions. **You are responsible** for

checking the board regularly. To get there, choose “Discussion Board from the KnowHope screen and then select “Natural Sciences” to find our math class.

E-Mail: My address is: mdeyoung@hope.edu Please DO NOT forget the ‘m’ for Mary, since there is another professor named DeYoung. He will not know you or answer your questions!

Most reminders will be made via the website. You can set your personal account to notify you (via e-mail) of any new postings to the Discussion Board. Occasionally, I may send a message via e-mail. If you see messages from me, please take the time to read them, I check my e-mail each day, so feel free to use that as a means for asking questions which would not be of interest to the entire class.

Voice-Mail: I check mine regularly and will respond as quickly as possible.

A message sent through e-mail or voice-mail is just that, a message. It does NOT imply that I have granted any requests or given permission.

Study Partners can be a key to success in this class. The more you “talk mathematics” and ask questions, the more likely you are to understand the concepts. However, it is a **BIG MISTAKE** to simply “joy ride” and to accept answers from friends or the Discussion Board without knowing how to find them **for yourself**. As you talk about the solution method on any problems, **you MUST do your own written work**. **You will learn the most if you compare written solutions only after you have done them individually**. Both persons benefit when questions are asked. The explainer is forced to clarify his/her own thoughts, and the inquirer hears another perspective to help develop a deeper understanding of the topic.

Walk-in Center: The Academic Support Center sponsors help in the form of **student tutors**, available Sunday-Thursday in VZ 274, 7:30-9:30 p.m. More information about this will be available later about this opportunity.

Student work is sometimes shared with the class (as an anonymous overhead or handout) to demonstrate a sample of “high quality work.” Please advise me by email if you are not willing to have your work shared in this manner.

***Remember that I want to help you to do well in this class!
The chair in my office is a great place for learning more mathematics.***

What will the assignments for this course look like?

Mathematics assignments will take many forms. This practice accommodates different styles of learning as well as giving you some ways to demonstrate your learning to me.

Reading assignments: These will serve to introduce you to some of the topics covered in class. The style of this text is most likely quite different from any other math book that you have encountered. The author and I wish to **engage you** in active thinking as you read. You should always have paper and pencil when you read your math textbook; a highlighter will just not do it. When the text asks you to “try this” before reading on, that is exactly what you should do. Start by reading the author’s comments about “Owning versus renting” on page 12! As a classroom teacher, you need to “own” your knowledge.

Textbook problems/exercises: Some will be assigned for each unit. They will be graded selectively, with 10-15 pts per assignment. Typically, 3-5 problems will be chosen for careful grading, with the remaining pts will be awarded for making a “reasonable effort” on the assignment as a whole.

Remember as a general rule that all **the work needed to solve a problem belongs with the problem!** A long answer tells me very little about your thinking and also does not provide you with much information when you go back to study a particular problem at test time.

The assigned problems are of two types, exercises and problems. “Exercises” allow you to practice a skill or deepen your understanding of a concept or vocabulary word. They are usually more straight forward. “Problems” are the ones where you really don’t know how to start! Play around with those, try some ideas, or talk to a friend. Spend some time and energy on them, but DO NOT spin your wheels endlessly so that you get discouraged; move on to another problem until you can get some hints on a solution method from me or from a classmate. A good reason to start early! Use sticky notes to record your questions when you need to ask for help. Or, you can use the Discussion Board to pose questions about individual problems.

Challenge Problems: A set of problems (approximately 7) will be required for each unit. Generally, you will be expected to **choose 5** of them to solve and then write complete and formal solutions. Solutions must be written in complete sentences with proper grammar and spelling; some solutions may be a page or more for one problem. Working together is allowed (and even encouraged) during the early solution stages. However, **your written work must be completed independently in your own words. That means, write your final draft without another person talking you through the problem as you write or using someone else’s written work as a guide.** These problems will each be evaluated on a 5-pt scale. The rubric will be given to you with the first problem set. Problems will be due daily during the middle of the unit. **Late Challenge Problems will NOT be accepted. Period.**

Daily Work: At various times throughout the semester there will be short follow-up assignments to class activities, or a short preparatory task may be assigned and be due on the following day. Some will be collected and graded for completion. (3-10 pts)

Writing Assignments: You will complete a variety of writing assignments for a total of 100 points. This may seem unusual in a mathematics class, but I believe that the act of writing helps you to clarify your thinking about a particular concept. You will have the opportunity to choose some of the assignments; others will be required of everyone.

1) Mathematics Autobiography: Your first assignment will help to acquaint me with your mathematical history. Specific instructions are given on the Patterns Menu.

2) Big Ideas: Stopping to think about what happened during a class period may be almost as important as time spent in class. Reflection can take the form of simply looking at your notes and then summarizing the “substance” of what happened. Some questions to guide your thinking: What was the main point of today’s activity? Does this new knowledge relate to anything I have done previously in this class or another math

class? What questions do I need to ask about this content to really understand it? Note that simply listing what happened in class is of very little use to either of us. I was also present in class, so I know what happened. What I am looking for in this assignment is what you thought about in relation to the day's activities. Did you see any "big ideas"? Did you have any "Ah-Ha" moments? How did the day's activities contribute to developing "mathematical habits of mind"?

Those entries should be written three times per week as a minimum. Be sure to date all entries. Use paragraph form, with careful attention to grammar and spelling. When I read and evaluate your reflective writings, I will be looking to see whether **you engaged yourself in thinking** about the day's activities. That is very different than writing at a surface level. (The amount of thinking evident in your work is usually directly related to the amount of time and energy spent doing this assignment.) Note that I will collect and make comments on a few entries prior to grading them for points. 10 points per unit

3) Math Awareness Journals: An important characteristic of good mathematics teachers is the ability to see numerical or mathematical connections to everyday life. To aid you in developing this skill, you should write three "math around me" entries each week, for the period 9/25 through 11/3. These should be brief observations and/or questions recorded regularly. These will be collected twice and graded for points.

For example:

Phone numbers--Holland uses 335 396, 392, 399, 394 and now 786, 355 and 494 as exchange prefixes. I wonder how many phones there are in Holland or how many numbers are possible? How does one go about calculating the total number? What happens when the population grows and they begin to run out of phone numbers?

Another example:

The slanted roof of the Peale greenhouse makes interesting shapes in the side windows. Some are triangles; some are trapezoids. How do engineers and architects make use of geometry? Are some shapes used more frequently than others? If so, why? Someone once told me that the triangle is the most "stable" shape. What makes it more stable?

4) Exploring Vocabulary: Optional (but highly recommended writing activity). I will not collect these, but rather encourage you to write "personal definitions" as a matter of "just good study skills" for ANY college course. One helpful organization technique is the following. Begin with 26 notebook pages labeled with letters of the alphabet. Write a personal definition of each term in your own words on the appropriate page. You might wish to include a diagram or an example to help you understand the meaning of a particular term. It is often helpful to show "non-examples" as well as examples.

Sample entry:

Commutative means that an operation can be done in any order. For example, addition and multiplication are both commutative because it does not make a difference which order you add or multiply.

$$4 + 5 = 5 + 4 \text{ because both } = 9$$

But subtraction and division do not work the same, so they are NOT commutative.

$$6 - 4 = 4 - 6$$

(Survival Secret: Those students who took this practice seriously and **really** explained concepts and definitions to themselves in writing seemed to understand those concepts at test time much more than those students who never tried to explain the concept in writing.)

PATTERNS/PROBLEM SOLVING UNIT

Goals: This section of the course is designed to help you see the pervasive nature of patterns in mathematics. Class and homework exploration should help you to develop an increased awareness of patterns. In particular, we will work at describing a pattern, first with words and then symbols if possible. We will begin to develop problem-solving skills, which we will continue to work on throughout the two semesters. Set terminology, Venn diagrams and function notation will also be introduced.

Class Session	Date	Assignments Due
Consecutive Sums	8/29	
Shaking Hands	8/31	Photo card, read syllabus info
Reading the Paper	9/1	Sections 1.1 – 1.4
WOW (crayons, markers)	9/4	Math autobiography, DISCUS intro
Problem Solving – squares/poison	9/5	Chal #1, Sections 1.5 – 2.2
Problem Solving – patio prob	9/7	Chal #2, Text probs #1
Geometric Patterns (crayons)	9/8	Chal #3, big ideas (comments only)
Arithmetic/Geometric Sequences	9/11	Chal #4, Text probs #2
Dare to be Different	9/12	Chal #5
Set Notation	9/14	Chal #6, Text probs #3
Functions	9/15	Chal #7
Problem Solving	9/18	
Review Time	9/19	
Test 1 3:30 – 7:30	9/21	Big ideas (for ALL of Patterns menus)

‘Need to Know’ Vocabulary

Patterns

arithmetic sequence
 Fibonacci Numbers
 geometric sequence
 natural numbers
 palindrome
 Pascal’s Triangle
 pentagonal numbers
 square numbers
 triangular numbers
 whole numbers

Sets/Logic

complement
 deductive reasoning
 disjoint
 element
 empty set
 equal sets
 equivalent sets
 finite
 inductive reasoning
 infinite
 intersection
 one-to-one correspondence

set builder notation
 subset (also proper subset)
 union
 universal set
 Venn diagram

Functions

Domain
 Mapping
 Range
 Variable
 (independent/dependent)

Textbook Problems

Text Problem Set #1

Pages 27~30: #1,2,3,5,6,8,10,11,12(1 way),14,17,19,22-28,30,32,38,41,44

(due 9/7)

Text Problem Set #2

Pages 52-54: #3,9,13,19,19*How long would it take?,20,21,27(a-c)

(due 9/11)

Text Problem Set #3

Pages 71-74: #1,2,5,6,7,8,12,13,14,15,18

Pages 91-94: #2,4,6,7,9,15,16,17,23,25

(due 9/14)

Problem Solving

Challenge Problems will be handed out by 9/1 with individual problems due beginning on 9/5.

ID Flash Card - due 8/31

In order to assist me in getting to know you (and memorizing names), please make a flash card for me to study. On the **front** of a 3x5 or 4x6 card, please list the following:

Name & E-mail address	Hometown
Your ideal teaching situation	Year at Hope
Sports or hobbies that you enjoy	
A distinguishing characteristic or little known fact about you which will aid my memorization process	

On the **back** of the card, attach a picture. If you use a snapshot, I will be happy to return it to you after I have learned names. A photocopy of a snapshot (or even your ID) will also serve the purpose of helping me to learn names. Please use a photo that looks like you now! No points without the photo!!

Writing Assignment - due 9/4

I would like to hear about your personal mathematical history. Please write a short (2-3 typed pages) mathematical autobiography. Tell me about your past, what mathematics you have studied and how you feel about your experiences. Were there any topics/concepts that you loved or hated? any you would like to explore further? Conclude by telling me what hopes, dreams or fears you have for this present mathematics class. Please include anything special you would like me to know in order to help you learn mathematics this year.

A title page is not necessary, but a **good title** is. Please use a title that gives more information than a generic "My Mathematical Autobiography."

You will receive 30 points for taking this assignment seriously. Spend time on it and use appropriate grammar and spelling (worth 5 pts of total). I will not be evaluating your previous mathematics experience as "good" or "bad." Rather, I hope to be able to help you learn mathematics more easily this year by knowing about some of the things that may have caused problems in the past. I also believe that the process of reflection is important for your mathematical learning and growth this year.

Geometry Unit

Goals: During this section of the course we will explore a variety of hands-on geometry activities. Class and homework explorations should help you to improve your visualization skills, to develop vocabulary, and to discover/describe relationships between various geometric shapes or solids. (Formal proof is not our goal.) We will also have lots of fun with geometry! It is my favorite part of mathematics.

Class Session	Date	Assignments Due
Shapes in a Circle	9/22	BEGIN Math Awareness (see guide for writing in syllabus)
Teachable Tangrams	9/25	
Polygons & Properties	9/26	
Angles	9/28	Text Probs #1
Symmetry	9/29	Chal #1
Tessellations	10/2	Chal #2, Math Awareness (feedback only, approx 3-4 entries)
Be Ye Transformed	10/3	Chal #3
Problem Solving	10/5	Text Probs #2
Pea Soup	10/6	Chal #4
Similarity	10/9	Chal #5
Pentominoes	10/10	Chal #6, Text Probs #3
Problem Solving	10/12	Chal #7
Review	10/13	
Optional Review	10/18	No attendance taken today
Test 2 3:30 – 7:30	10/19	Big Ideas (Geometry unit only)
Whole Numbers/Numeration Unit	10/23	Math Awareness (3.5 wks, approx 10-11 entries)

“Need to know” Vocabulary

acute angle
 altitude
 angle bisector
 collinear/non-collinear
 concave
 congruent
 convex
 diagonal
 dihedral angle
 equilateral triangle
 isosceles triangle
 kite
 line/line segment
 line of symmetry

median
 oblique
 obtuse angle
 parallel
 parallelogram
 perpendicular
 perpendicular bisector
 plane
 point
 polygon/regular polygon
 polyhedron/regular
 polyhedra
 prism
 pyramid

ray
 rhombus
 right angle
 right triangle
 scalene triangle
 similar
 skew
 symmetry-reflective
 symmetry-rotational
 tessellation
 transformation
 trapezoid
 vertex (pl. vertices)

Whole Numbers and Operations

Goals: During this portion of the semester, we will explore our number system. It is important to see our system as it compares to other systems, considering how its characteristics relate to other systems. We will approach our tens system by first looking at a base six system. We will examine the four basic operations and how they relate to real world situations.

Class Sessions	Date	Assignment Due
1,2,3 Go	10/20	
Pick A Base, Any Base	10/23	Math Awareness (first ½)
Patterns	10/24	Add/mult tables patterns handout, Chall #1
Super Six Stuff	10/26	Popsicle Sticks, Text Probs #1
Operation +-* /	10/27	Chall #2
Secrets of the Universe	10/30	Text Probs #2, Chall #3
Secrets of the Universe (Part II)	10/31	Chall #4
GCF/LCM	11/2	Chall #5
Patterns	11/3	Text Probs #3, Chall #6
Problem Solving	11/6	Chall #7
Review	11/7	
Test (3:30 – 7:30 pm)	11/9	Big Ideas
Fraction Unit begins	11/10	
	11/13	Math Awareness (second ½)

Need to Know Vocabulary: Remember to explain in your own words!

associative properties (for addition and for multiplication)
 closure properties (for addition and for multiplication)
 commutative properties (for addition and for multiplication)
 distributive property (for multiplication over addition)
 Fundamental Theorem of Arithmetic
 addition models
 additive identity
 composite
 dimensional analysis
 divides
 division models
 divisor
 factor/proper factor
 factor tree
 expanded notation
 greatest common factor/greatest common divisor
 product
 scientific notation
 subtraction models

multiplicative identity
 order of operations
 least common multiple
 multiplication models
 multiple
 prime
 product
 relatively prime
 quotient
 sum
 twin primes

Reading Assignments are not scheduled for any particular due date. Many different operational strategies are covered in the reading and give an excellent overview of the four operations. You should be most concerned with specific strategies discussed in class or covered in homework problems. It will be VERY HELPFUL to read a particular section prior to attempting the homework from it.

Text Problems #1

Due 10/26

Section 2.3 on page 107:

5,6,7,11,12,15,16,17 (optional 13 & 14 – extra practice with bases)

Section 3.1 on page 134:

7,8,9,10,13,16,17,18

Section 3.2 on page 161:

6,7,10,14,19,20,21,29,30,31,36,41,43,44,51,52

Text Problems #2

Due 10/30

Section 3.3 on page 156:

Problems 1-5 Do a,b,f (without writing long explanations of your strategies.) Be sure that you understand the difference between “mental arithmetic” and “estimation.”

Problems 23-42 Choose 6 problems and follow author’s instructions to find a “quick estimate,” you “best estimate” and the exact answer

Section 4.1 on page 202:

2,4,5,6,9,11,15,27,28,29,30

Text Problems #3

Due 11/3

Section 4.2 on page 212:

3c,g,e, 4e,g,h,7,10,13,16,19a,c,d

Section 4.3 on page 225:

2,4,5,7,11,13,14,16

Make it Materials: Follow instructions for making base six materials from popsicle sticks. **THESE MUST BE BROUGHT TO CLASS ON THURSDAY, OCTOBER 26 FOR USE ON THAT DAY!**

To construct your set of base six manipulatives:

1) Draw six symbols or dots with colored marker on 100 sticks.

2) Make fifteen ‘flats’ in the following manner. Lay 6 sticks next to each other with sides touching (and colored marks face down). Apply Elmer’s or wood glue to 2 of your “unmarked” sticks for supports. The supports should then be glued cross-wise to the row of six sticks. You should then have a “flat” with 36 symbols showing when the glue dries and you turn it over.

3) Make a “cube” by stacking six flats together. You can rubber band the stack together with two rubber bands.

4) Your finished set should include 1 cube, 9 flats, 10 longs. We will use beans for the “ones.” (Somehow I could not get excited about cutting the longs into 6 pieces!

5) Bring your set with you to class on Thursday, October 26. If you are short of sticks, I will have extras then. **Be sure that you make the flats and cube first; longs can be made quickly with no glue!**

Rational Numbers Unit

Goals: The activities of this unit are designed to help you understand the extension of our numeration system in the world of fractional parts. We will focus on different physical representations of such numbers, operations and relationships, how they are used in the real world and the properties they demonstrate.

Class Session	Date	Assignments Due
Fraction World	11/10	
Fraction World	11/13	Math Awareness (last ones), $\frac{3}{4}$ Day
Operations with Fractions	11/14	Challenge #1
Operations with Fractions	11/16	Text Probs #1, Challenge #2
Decimal Connections	11/17	
Per Cent Primer	11/20	Fraction Wheel, Challenge #4
Ration & Proportion	11/21	Challenge #5
Problem Solving	11/27	Text Probs #2, Challenge #6
Games	11/28	
Practical Percents	11/30	Text Probs #3, Challenge #7
Big Picture	12/1	
Review	12/4	
Test 4 3:30 – 7:30 p.m.	12/5	Big Ideas

Looking Ahead

Activity Day	12/7
Exam Review	12/8

Final Exam	Tuesday,	12/12, 8:00 am.	MA 205-02
	Wednesday	12/13, 10:30a.m.	MA 205-01

Text Problems #1 _Due 11/16

Section 5.1, Page 237:	1,2,5,6,16,20
Section 5.2, Page 253:	2,3,7,8ab,9,10,11,17,23, 25,26,28

Text Problems #2 _Due 11/27

Section 6.3, Page 274:	3,5,6,9,14,21,25,32,36,37
Section 5.4, Page 299:	2,4,5,6,7,8,15,16,17,20,28,39,40

Text Problems #3 _Due 11/30

Section 6.1, Page 320:	1,4,5,11,14,19,20,21,25,28,41
Section 6.2, Page 338:	2,3,4,6,10,11,13,16,18,20,23,26,28,36,51

Need to Know Vocabulary

closure

density

equivalent fractions

improper fraction

integers

irrational numbers

means:extremes

mixed numeral

multiplicative inverse

numerator

per cent

proper fraction

proportion

rational numbers

relatively prime (anything to add?)

repeating decimal

repetend

terminating decimal

ATTENTION! Monday, November 13 has been officially declared by some supreme power as

THREE - FOURTHS DAY

To celebrate this momentous event, we will have a show-n-tell session of physical representations of $3/4$. Each of you should bring to class one PHYSICAL OBJECT that demonstrates the numerical value of $3/4$ in a visibie way. **No drawings on paper--it must be an object.** Points will be awarded--**do not forget!**