

SREB MIDDLE SCHOOL NUMBER AND ALGEBRA
Spring 2009

Number and Algebra is taught as two co-requisite courses taught in alternate weeks:

WVU Math 524: Middle School Number & Algebra 1	WVU C&I 524: Middle School Number & Algebra Teaching 1
Synchronous or Asynchronous Monday 7-9 p.m. Eastern time (2 hour live/recorded session)	Synchronous or Asynchronous Monday 7-8 p.m. (1 hour live/recorded session)
Synchronous Thursday 7:00-8:00 p.m. (1 hour live session)	Synchronous Thursday 7:00-8:00 p.m. (1 hour live session)
Credit: 2 hours	Credit: 1 hour
Instructor: Dr. Michael Mays	Instructor: Dr. David Miller
Email: Michael.Mays@mail.wvu.edu	Email: dmiller@math.wvu.edu
Phone: (304) 293-2011 ext. 2324	Phone: (304) 293-2011 ext. 2323

NOTE: The Middle School Number and Algebra sequence includes two semesters of course work. Math 525 and C&I 525 may be scheduled for a future offering, depending on the interests and desires of the class.

Context: Middle School Mathematics Course Cadres

The Institute for Mathematics Learning (IML) at West Virginia University, in partnership with Marshall University, the West Virginia Department of Education, the Benedum Foundation, and Project MERIT, created a graduate level professional development program for middle school mathematics teachers that addresses standards based mandated curriculum transformations and the No Child Left Behind (NCLB) call for highly qualified teachers. The distance education program includes four cadres of professional development courses, each with 4-credits of mathematics content courses integrated with 2-credits of mathematics education courses offered over an academic year. Middle School Number and Algebra is one of the cadres of courses in this program and is being brought to you through a partnership with the South Regional Education Board (SREB). Completion of the courses in this program can be used for:

1. **Endorsement in Middle School Mathematics** for those who have an Elementary education certificate and pass the state Middle School Mathematics certification exam.
2. **Application toward a Master's Degree in Secondary Education** with an emphasis in middle school mathematics for in-service teachers.
3. **Preparation for National Board Certification** or highly qualified teacher status as required by NCLB.

Expected learning outcomes:

Upon completion of the corequisite courses Math 524 and C&I 524, students will be able to

- identify and apply relevant algebraic concepts and properties to classify number systems, such as
 - binary operations
 - existence of inverses

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| <ul style="list-style-type: none"> ○ associativity and commutativity ○ existence of divisors of zero ○ groups, rings, integral domains, fields ● analyze middle school mathematics topics from an advanced perspective ● apply current research in teaching and learning mathematics ● use model curricula such as Connected Mathematics to enhance their classrooms |
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Texts

- Musser, G., Burger, W. & Peterson, B. (2008). *Mathematics for Elementary Teachers: A Contemporary Approach, 8th Edition*. John Wiley & Sons, Inc.
- Kilpatrick, J., Martin, W. G., and Schifter, D. (2003). *A Research Companion to Principles and Standards for School Mathematics*. NCTM: Reston, VA.

Additional Text for follow up course Math/C&I 525

- Crauder, B., Evans, B., Noell, A. (2007). *Functions and Change: A Modeling Approach to College Algebra (Third Edition)* Houghton Mifflin.

Support Texts: You do not have to purchase the support texts. We will view the topics of number and algebra from an advanced perspective. We will also apply cognitive science and classroom based research on the teaching and learning of mathematics to the topics of number and algebra. Resources used to support these goals include:

- McCoy, N. & Janusz, G. (2001). *Introduction to Modern Algebra, 6th Edition*. Newton, MA: WCB Publishers.
- Sowder, J. and Schappelle, B. (2002). *Lessons Learned from Research*. NCTM: Reston, VA. Cost: \$35.95 (\$28.76 if NCTM member)
- Usiskin, Z., Peressini, A., Marchisotto, E., Stanley, D. (2003) *Mathematics for High School Teachers An Advanced Perspective*, Prentice Hall, ISBN 0-13-044941-5
- Ore, O. *Number Theory and Its History*. Dover Classics of Science and Mathematics. Paperback ISBN: 0486656209
- National Council of Teacher of Mathematics. (2000). *Principles and Standards for School Mathematics*. Reston, VA. Cost: \$52.95 (\$42.36 if NCTM member)
- Wagner, S. (1993). *Research Ideas for the Classroom, Volume 2: Middle Grades Mathematics*. NCTM: Reston, VA. Cost: \$22.95 (\$18.36 if NCTM member).
- Curcio, F. et.al. (1994). *Understanding Rational Numbers and Proportion: Addenda Series, Grades 5-8*. NCTM: Reston, VA. Cost: \$21.95 (\$17.56 if NCTM member)
- *Navigating through Algebra in Grades 6-8*. NCTM: Reston, VA. Cost: \$31.95 (\$25.56 if NCTM member)
- Addenda Series of Grades 6-8 offers significant support for teaching number and algebra, including *Patterns and Functions: Addenda Series, Grades 5-8*; *Dealing with Data and Change: Addenda Series, Grades 5-8*; and *Developing Number Sense in the Middle Grades: Addenda Series, Grades 5-8*.

Pre-requisite: These courses are offered to teachers who are certified to teach in grades 6-8 with either multi-subject or mathematics certification, and who have a minimum of 6-9 hours of math or math education.

Course Description: The overall objective of the course is to increase knowledge and competence for middle school mathematics teachers in both content and pedagogy related to the teaching and learning of number and algebra. There are two primary mathematics objectives in each of these content areas:

1. Improve understanding of basic concepts and skills in the area of number and algebra.
2. View number and algebra from an advanced perspective.

The mathematical topics will include:

Sets, whole numbers, integers, rational numbers, real numbers, Binary Operations, Division Algorithm, Well-Ordering Principle, General Sums/Products, Order, Dense, and Complete properties, Rings, Integral Domains, and Fields, Concepts of Divisibility, Fundamental Theorem of Arithmetic, Distribution of Primes, Number Theory, Sequences and Inductive Reasoning, Proof by Induction, Recursive Reasoning and Recurrence Relations

The curriculum and instruction course has the following goals:

1. Relate the advanced mathematical topics above to topics taught in the middle school classroom.
2. Examine current research in teaching and learning mathematics.
3. Explore model curriculum such as Connected Mathematics.

In addition, applications of each topic will be explored to demonstrate the utility of the mathematics in the real world. Technology will be used to explore number and algebra concepts, and to model and solve real world problems. Technology for this course will include graphing calculators, CAS, web resources, Vista WebCT course management software, JAVA applets, and a variety of software tools for exploring number and algebra. Finally, hands-on manipulative activities for exploring number and algebra concepts will be demonstrated.

Course Format: The Middle School Number and Algebra courses are designed to be delivered via distance education during the teachers' academic school year, offering access to content based professional development.

- The courses consist of six 2 week blocks, with the first week focusing on mathematical content and the second week focusing on the teaching and learning of mathematics.
- Teachers will be given assignments on-line that focus on mathematical concepts and skills as well as teaching and learning mathematics. Vista WebCT will serve as the course management software for posting assignments and assessment.

- Teachers will communicate with the instructor concerning their understanding of the assignments via discussion groups and chat rooms. A virtual office hour will be held where questions can be addressed using a discussion group format conducted via the Adobe Connect software package.
- An on-line class session that focuses on exploring middle school mathematical concepts from an advanced perspective as well as mathematics education research and model curriculum will be provided via Adobe Connect.

The following is a more detailed account of weekly course activities, called the **ACT Paradigm**: Active Assignment, Conceptual Class session, Talk Together about session.

1. Math Content week activities

- **ASSIGNMENT: Understanding Basic Concepts and Skills (1 contract hour):** On Friday by 5:00 p.m. an active reading assignment over the text and other support materials will be assigned. Active reading will involve:
 - a. Focus questions for the reading that will stress key concepts and skills to be mastered.
 - b. Focus problems assigned to assess conceptual understanding and skill acquisition. A quiz over skills and concepts will be posted on **Vista WebCT**. The Quiz must be completed by the following Friday.
 - c. A forum will be established on **Vista WebCT** where students will be required to post responses to the focus questions. Responses should be posted by Thursday at 6:00 p.m. so they can be incorporated into the evening's discussion.
- **CLASS SESSION: Number and Algebra from an advanced perspective (2 contact hours):** On Monday from 7:00 p.m. to 9:00 p.m. a live class session will be provided for teachers. Teachers can attend the session live via **Adobe Connect** or can watch the session tape delayed. The focus will be explorations of mathematical concepts, applications, and theory related to the basic concepts and skills reviewed earlier in the week.
 - a. Adobe Connect allows for two-way audio and video communication with teachers, interaction on a white board or Power Point slides, demonstrations using the overhead camera, and sharing software tools and web resources. We will demo this software at the first meeting.
 - b. Teachers can attend the sessions live or view them tape delayed. The sessions must be viewed before Thursday at 6:00 p.m.
- **TALK TOGETHER: about Discussion Session (1 contact hour):** On Thursday from 8:00-9:00 p.m. a synchronous (live) session will be held which all participants must attend. The focus of this session will be discussion of the readings and review of questions over Monday's class session.

2. Math Education Content week activities

- **ASSIGNMENT: Innovative Curriculum and Research on Learning (1 contact hour):** On Friday by 5:00 p.m. an active reading assignment over the text and other support materials will be assigned. Active reading will involve:

- a. Focus questions over a model curriculum, such as Connected Mathematics, and over research on learning and teaching the mathematical concept of the week.
 - b. Focus problems and pedagogical questions assigned to assess understanding of teaching and learning concepts. A quiz over concepts and teaching ideas will be posted on **Vista WebCT**. The Quiz must be completed by the following Friday.
 - c. A forum will be established on **Vista WebCT** where students will be required to post responses to the focus questions. Responses should be posted by Thursday at 6:00 p.m. so they can be incorporated into the evening's discussion.
- **CLASS SESSION: Resources and Connections (1 contact hour):** On Monday from 7:00 p.m. to 8:00 p.m. a live class session will be provided for teachers. Teachers can attend the session live via **Adobe Connect** or can watch the session tape delayed. The focus will be discussion of a model curriculum, relating research on learning and teaching to the classroom, and demonstration of web-based and hands-on instructional activities.
 - **TALK TOGETHER: about Discussion Session (1 contact hour):** On Thursday from 7:00-8:00 p.m. a synchronous (live) session will be held which all participants must attend. The focus of this session will be questions on the model curriculum, questions on relating research to the classroom, and sharing innovative methods for teaching the topic of the week.

Evaluation: Multiple forms of assessment will be used to measure your understanding. The distribution of these assessments is:

Assessment	Percent of Grade
1. Focus Questions and Homework	20%
2. Participation in Group Discussions	10%
2. Exams	50%
3. Activities/Projects	20%

GRADING SCALE: 100-90 A; 89-80 B; 79-70 C; 69-60 D; 59-0 F.

West Virginia University is committed to social justice. We concur with that commitment and expect to foster a nurturing learning environment based upon open communication, mutual respect, and non-discrimination. Our University does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sexual orientation, color or national origin. Any suggestions as to how to further such a positive and open environment in this class will be appreciated and given serious consideration.

If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise us and make appropriate arrangements with Disability Services (293-6700).

**Middle School Number and Algebra
SCHEDULE FOR SPRING 2009**

Week	Day	Mode	Topic
0	<i>Arranged</i>	Async	<i>Pre-test on line</i>
0	<i>Arranged</i>	Sync	<i>Introduction to Adobe Connect and eCampus</i>
1	<i>F 1/23</i>	Assignment posted	<i>Math Content 1: Sets and Whole Numbers</i>
1	<i>M 1/26</i>	Sync/Async	
1	<i>R 1/29</i>	Sync	
2	<i>F 1/30</i>	Assignment posted	<i>Math Teaching 1: Sets and Whole Numbers</i>
2	<i>M 2/2</i>	Sync/Async	
2	<i>R 2/5</i>	Sync	
3	<i>F 2/6</i>	Assignment posted	<i>Math Content 2: Integers and Exponents</i>
3	<i>M 2/9</i>	Sync/Async	
3	<i>R 2/11</i>	Sync	
4	<i>F 2/13</i>	Assignment posted	<i>Math Teaching 2: Integers and Exponents</i>
4	<i>M 2/16</i>	Sync/Async	
4	<i>R 2/19</i>	Sync	
5	<i>F 2/20</i>	Assignment posted	<i>Math Content 3: Order and Number Theory</i>
5	<i>M 2/23</i>	Sync/Async	
5	<i>R 2/26</i>	Sync	
6	<i>F 2/27</i>	Assignment posted	<i>Math Teaching 3: Order and Number Theory</i>
6	<i>M 3/2</i>	Sync/Async	
6	<i>R 3/5</i>	Sync	
7	<i>F 3/6</i>	Assignment posted	<i>Math Content 4: Rational Numbers and Fields</i>
7	<i>M 3/9</i>	Sync/Async	
7	<i>R 3/12</i>	Sync	
	<i>3/14-3/22</i>		<i>WVU SPRING BREAK</i>
8	<i>F 3/20</i>	Assignment posted	<i>Math Teaching 4: Rational Numbers and Fields</i>
8	<i>M 3/23</i>	Sync/Async	
8	<i>R 3/26</i>	Sync	
9	<i>F 3/27</i>	Assignment posted	<i>Math Content 5: Rational Numbers Operations and Properties</i>
9	<i>M 3/30</i>	Sync/Async	
9	<i>R 4/2</i>	Sync	
10	<i>F 4/3</i>	Assignment posted	<i>Math Teaching 5: Rational Numbers Operations and Properties</i>
10	<i>M 4/6</i>	Sync/Async	
10	<i>R 4/9</i>	Sync	
11	<i>F 4/10</i>	Assignment posted	<i>Math Content 6: Real and Complex Numbers</i>
11	<i>M 4/11</i>	Sync/Async	
11	<i>R 4/16</i>	Sync	
12	<i>F 4/17</i>	Assignment posted	<i>Math Teaching 6: Real and Complex Numbers</i>
12	<i>M 4/20</i>	Sync/Async	
12	<i>R 4/23</i>	Sync	
13	<i>M 4/27</i>	Async	<i>Final exam posted, to be completed by 5:00 on 5/4</i>