Welcome to studies in Number Systems!

As your course mentor, I will be available through office hours, e-mail, and IM to meet your needs and answer questions. My name is Kristin Spencer, and I will serve as your mentor as your work through this Precalculus Course of Study. Originally from Orem, Utah, I’ve also lived in Washington D.C.; Dallas, TX; and Philadelphia, PA. Now I live in Hanover, Indiana. I recently completed my Ph.D. in Curriculum and Instruction with an emphasis in Mathematics Education at the University of Florida in Gainesville, Florida. I also have an M.S. and a B.S. in Mathematics from Brigham Young University. My husband works as an athletic trainer for Hanover College. We have four young children.

I look forward to working with you and am here to support your learning experience. I am excited about working with you to help you to achieve your goal of obtaining a college degree! If you need help or if you are looking for a way to collaborate with other students, please contact me using the contact information below.

Course Mentor .....................Kristin Spencer

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Telephone ..........................1-866-895-9660, x5417

Office Hours .........................Monday, 9:00am – 5:00pm, Eastern Time

                                  Tuesday, 9:00am – 5:00pm, Eastern Time

                                  Wednesday, 9:00am – 5:00pm, Eastern Time

                                  Thursday, 9:00am – 5:00pm, Eastern Time

                                  Friday, 9:00am – 5:00pm, Eastern Time

So why are we here? As parents, grandparents, uncles, aunts, community members, employers, and teachers, we hear all the time, “I’m just not good at math,” or “I can’t learn math,” or “Math is hard!” How did math get such a bad reputation? Well, I hope you are here because, like me, you want to:
• Become a change agent to take our children’s fears, dislike and lack of confidence in learning mathematics and transform them into the love of the wonder, beauty and usefulness of mathematics!
• Make the most out of your investment at Western Governors University (WGU) by satisfying your own curiosity and your commitment to lifelong learning.
• Be or remain gainfully employed or be a valued volunteer tutor or mentor—we need competent and caring math teachers!

If you are just starting out on a teaching career, you will love learning all the intricate ways to stimulate and inspire your students’ learning. For those of you who have been in the classroom already, I trust you will find ways to expand your creativity and enhance your effectiveness as a teacher. Do all that you can to soak up what is offered to you in your WGU mathematics education program. Teaching is all about learning.

The subdomain of MBA covers topics assessed by three tasks, but Number Systems is a large subject area, with several other topics covered on the objective exam. This component of your work at WGU is designed to help you to gain a broad overview of the field of Number Systems with a fundamental understanding of some key concepts and principles. This course outline presents the required sequence of learning steps and activities to help you develop competence in the subject area of Number Systems. In this case, your competence will be assessed as you complete a series of performance tasks. The tasks are listed in the sequence below at the point in which you should have covered the learning necessary to build the necessary competence to successfully complete the task. Once all tasks are completed at the appropriate level of competence you will receive a PASS on your AAP for the MBA Assessment. As with any learning activity, steps may be completed more quickly than noted below, or they could take the full amount of time indicated. We provide the pacing (Week One, Week Two, etc.) as a guide to the amount of time you should take to develop the competencies necessary and prepare to complete the required assessment on time. Completing your assessments within the required timeline keeps you on pace for Satisfactory Academic Progress and Graduation.

**WGU Statement of Teaching Dispositions**

Western Governors University supports the development and demonstration of professional teaching dispositions throughout the course of its Teachers College (TC) licensure programs. All TC students and faculty will demonstrate the following dispositions described in the Teachers College's conceptual framework and code of ethics:

• Competent and caring
Respectful and embracing of diversity
• Reflective practitioners
• Equitable and fair
• Professional practice consistent with the belief that all students can learn
• Collaborative professionals
• Professional leaders and change agents

Please review the “Teacher’s College Code of Ethics” found in the WGU Student Handbook. Practice the dispositions above while working through this course of study. Reflect on your learning and believe that you will learn the material needed to pass your assessment(s). Care about your education by scheduling time each week to devote to your studies. Collaborate with other teachers by interacting in the learning community, and be a leader of change by making suggestions to improve this learning document.

Learning Resources (see listing on the resources tab of your AAP to enroll or order): Required:

• Blitzer, R. (2007). *Algebra & Trigonometry, 3rd ed.* Boston: Pearson Addison-Wesley. ISBN: 9780132191401. For additional materials at no cost to you, sign up for Blitzer using Available Learning Resources, which will give you free Web access to MyMathLab, which includes some videos, lots of quizzes, and other interactive capabilities as well as the full text of the book. This textbook is used for other assessments in the Math 5-12 program.

Optional:


• Thinkwell’s Precalculus: Website available free via your AAP: less interactive but more extensive lecture videos.

Appropriate Calculator: The TI-84+ graphing calculator, its predecessors TI-82, TI-83, or TI-83+, or equivalent calculators of other brand are recommended. Graphing calculators possessing built-in **Computer Algebra Systems (CAS) are not allowed** to be used on competency exams, so we recommend you do not use such a calculator while working on the mathematics tasks and topics. To download your

**PLEASE NOTE:** The resources you are using to master the competencies for this assessment will also be valuable as you as you prepare for future assessments, namely, the MEC objective exam, the Praxis II exam, and any state-mandated mathematics content exams. Therefore, we recommend that you complete each activity contained in this document.

**WEEK # 1**

**Subject Title:** An introduction to complex numbers

**Subject Description:** Complex numbers are of the form $a + bi$, where $i$ is defined as the square root of $-1$.

**Background Information:** Complex numbers were developed to solve problems of the type $x^2 + 2 = 0$.

**Competency Title:** Real and Complex Number Systems

**Numerical Code:** 203.1

**Competency Description:** The graduate has algebraic, geometric and polar understanding of the complex number system and can apply properties of the real and complex numbers to explain and justify algebraic algorithms.

**Topic Title:** Complex Numbers

**Instruction Text:** Perform the four basic arithmetic operations on complex numbers in rectangular coordinate form.

**Activity Title:** Read Section 1.4 in Blitzer

**Activity Type:** Text

**URLs:** Associated website: ([www.coursecompass.com](http://www.coursecompass.com))

**Description:** Complex Numbers
**Activity Title:** Read *John and Betty’s Journey into Complex Numbers*: pages 12 - 24

**Activity Type:** Online-text

**URLs:** [http://mathforum.org/johnandbetty/frame.htm](http://mathforum.org/johnandbetty/frame.htm)

**Description:** Complex Numbers

**Activity Title:** Derivations

**Activity Type:** Study tip

**Description:** For the derivations required of these tasks, you can use all the properties of the real numbers that you know [commutative, associative, distribution of multiplication over addition, and so on], but the key is to do the complex number computations a single step at a time and to justify each of those steps with one of the properties of real numbers or with some other known property or rule.

**Activity Title:** Properties

**Activity Type:** Online text

**URLs:**


**Description:** Wikipedia can help you understand these properties by showing how they apply to systems other than the real numbers.

**Activity Title:** Read section P.1, parts 9 and 10, pages 11-14, and Page 15 and complete exercises 75 to 84 in Blitzer
**Activity Type:** Text with Exercises

**URLs:** Associated website: (www.coursecompass.com)

**Description:** Completing these exercises will help you practice applying the properties with complex numbers

**Activity Title:** MBA Task 3

**Activity Type:** Performance assessment

**Description:** Complete MBA task 3 **Summary:** Derive the addition formula for complex numbers in rectangular form. **Clarification:** The arithmetic is very simple, but make sure to justify each and every step of your work by citing the property or law of the real numbers that you are following.

**WEEK # 2**

**Subject Title:** Continued introduction to complex numbers.

**Subject Description:** Complex numbers can be written in rectangular or polar form.

**Background Information:** Complex number computation is facilitated by converting a + bi to its polar equivalent.

**Competency Title:** Real and Complex Number Systems

**Numerical Code:** 203.1

**Competency Description:** The graduate has algebraic, geometric and polar understanding of the complex number system and can apply properties of the real and complex numbers to explain and justify algebraic algorithms.

**Topic Title:** Complex Numbers

**Instruction Text:** Perform the four basic arithmetic operations on complex numbers in polar coordinate form.

**Activity Title:** Read Section 7.5 in Blitzer
Activity Type: Text

URLs: Associated website: (www.coursecompass.com)

Description: Complex Numbers in polar form

Activity Title: Read John and Betty’s Journey into Complex Numbers: pages 24 and on

Activity Type: Online Text

URLs: http://mathforum.org/johnandbetty/frame.htm

Description: Complex Numbers in polar form

Activity Title: Read Dave’s Short Course on Complex Numbers

Activity Type: Online Text

URLs: http://www.clarku.edu/~djoyce/complex/polar.html

Description: shows the gritty computational details; remember that argument and amplitude are equivalent and radius and modulus are also equivalent.

Activity Title: Read Dave’s Short Course: a more vector-oriented feel for the topic

Activity Type: Online Text

URLs: http://www.clarku.edu/~djoyce/complex/plane.html

Description: shows the gritty computational details; remember that argument and amplitude are equivalent and radius and modulus are also equivalent.
Activity Title: Read Wikipedia: a succinct description of operations on complex numbers

Activity Type: Online Text

URLs: http://en.wikipedia.org/wiki/Complex_numbers#Notation_and_operations

Description: Description of operations on complex numbers

Activity Title: Read wingkei9 at Hong Kong Cyber Campus

Activity Type: Online Text

URLs: http://home.netvigator.com/~wingkei9/javagsp/complex.html

Description: An interactive applet that lets you observe how the sum, difference, and product of two complex numbers change as the numbers change

Activity Title: Read Mathworld

Activity Type: Online Text

URLs: http://mathworld.wolfram.com/ComplexArgument.html

Description: Pay attention to the third paragraph down. Modulus, amplitude, radius, angle: Make sure you know the relationships among modulus, amplitude, radius, and angle of a complex number in polar form. See the link for guidance if you’re confused.

Activity Title: Read Blitzer section 6.2, part 2, page 601

Activity Type: text

URLs: Associated website: (www.coursecompass.com)
**Description:** Sum-of-angle formulas

**Activity Title:** Read S.O.S. Math
**Activity Type:** online text
**URLs:** [http://www.sosmath.com/trig/addform/addform.html](http://www.sosmath.com/trig/addform/addform.html)

**Description:** Sum-of-angle formulas

**Activity Title:** MBA task 1
**Activity Type:** Performance assessment

**Description:** Complete MBA task 1 Summary: Show how the radii and angles of two complex numbers interact when they are multiplied.
**Clarification:** Show the computation of their product and rewrite using algebraic properties. Make sure to justify each and every step of your work by citing the property or law you are following. You will find reviewing the sum-of-angle formulas for trigonometry to be useful.

**WEEK # 3**

**Subject Title:** Consider a specific case of DeMoivre’s Theorem.

**Subject Description:** Computation of complex numbers in polar form revisited.

**Background Information:** DeMoivre’s Theorem introduced with a simple example. This theorem will be explored further in MEC4 & MEC5.

**Competency Title:** Real and Complex Number Systems

**Numerical Code:** 203.1

**Competency Description:** The graduate has algebraic, geometric and polar understanding of the complex number system and can apply properties of the real and complex numbers to explain and justify algebraic algorithms.

**Topic Title:** Complex Numbers
**Instruction Text:** Complete MBA task 2

**Activity Title:** Special case of DeMoivre’s Theorem

**Activity Type:** Study tip

**Description:** This is a special case of DeMoivre’s Theorem. Write up this task as a separate proof of its own, justifying each step of the proof. Don’t treat this task as a corollary.

**Activity Title:** Read Blitzer section 6.2, part 2, page 601

**Activity Type:** Text

**URLs:** Associated website: ([www.coursecompass.com](http://www.coursecompass.com))

**Description:** Sum-of-angle formulas

**Activity Title:** Read Blitzer section 6.3, part 1, page 608

**Activity Type:** Text

**URLs:** Associated website: ([www.coursecompass.com](http://www.coursecompass.com))

**Description:** Double-Angle Formula

**Activity Title:** MBA task 2

**Activity Type:** Performance Assessment

**Description:** Complete MBA task 2. **Summary:** Do NOT to do an induction proof, but re-create the work from the task above in the special case where the two numbers are the same.

**Feedback**

If you wish to provide feedback on this course of study, please contact Rob Duncan, Mathematics Program Coordinator, at rduncan@wgu.edu.