Your competence will be assessed as you complete the FXC1 performance assessment. This course of study may take up to 6 weeks to complete.

**Introduction**

**Overview**
Included in this course are the following main topics: proofs, set theory, logic, number theory, the real number system mathematical systems, modular arithmetic, and graph theory.

If this is your first time taking a finite mathematics course, please follow the course of study in the order it is presented. If you have significant previous coursework or are otherwise competent in this material, please skip to the Final Review section and take the skills checks. These skills checks will help you assess your competence.

**Outcomes and Evaluations**

There are 3 competencies covered by this course of study; they are listed in the "Competencies for Finite Mathematics (FXC1)" page.

**Teaching Dispositions Statement**
Please review the Statement of Teaching Dispositions.

You will complete the following assessments as you work through the course of study.

**Course Instructor Assistance**
As you prepare to successfully demonstrate competency in this subject, remember that course instructors stand ready to help you reach your educational goals. As subject matter experts, mentors enjoy and take pride in helping students become reflective learners, problem solvers, and critical thinkers. Course instructors are excited to hear from you and eager to work with you.

Successful students report that working with a course instructor is the key to their success. Course instructors are able to share tips on approaches, tools, and skills that can help you apply the content you’re studying. They also provide guidance in assessment preparation strategies and troubleshoot areas of deficiency. Even if things don’t work out on your first try, course instructors act as a support system to help you prepare for another attempt. You should expect to work with course instructors for the duration of your coursework, and you are encouraged to contact them as soon as you begin. Course instructors are fully committed to your success!

**Preparing for Success**

The information in this section is provided to help you become ready to complete this course of study. As you proceed, you will need to be organized in your studies in order to gain competency in the indicated areas and prepare yourself to pass the final assessments.

**Your Learning Resources**
The learning resources listed in this section will be required to complete the activities in this course of study. You will be automatically enrolled at the activity level for the following resources. Simply click on the links provided in the activities to access the learning materials.

Learning Resources

You can access the learning resources listed in this section by clicking on the links provided throughout the course. You may be prompted to log in to the WGU student portal to access the resources.

Pearson/VitalSource E-text
You will find links to the specific required readings within the course activities. These links will take you to the Pearson interactive e-text and are only available when online. We are also delivering this book to you via the VitalSource Bookshelf. Please watch this VitalSource tutorial for instructions on how to access both the online and offline versions.


Note: This e-text is available to you as part of your program tuition and fees, but you may purchase a hard copy at your own expense through a retailer of your choice. If you choose to do so, please use the ISBN listed to ensure that you receive the correct edition.

Thinkwell
You will access the materials in the following Thinkwell course at the activity level within this course of study. This web-based resource includes multimedia video lectures, review notes, interactive animations, and sample exercises.

- Thinkwell Prealgebra
- Thinkwell College Algebra
- Thinkwell Geometry

CollegeAnywhere
You will interact with one or more of these videos within your course.

Pearson's Thinking Mathematically
This resource includes videos, practice problems, and quizzes.

Additional Preparations

Graphing Calculator
Acquire a graphing calculator and familiarize yourself with how to use it. Refer to the WGU Calculator and Scratch Paper/Whiteboard Guidelines document for calculators permitted on WGU exams. If you are in a secondary mathematics program, refer to the WGU Calculator Recommendations for Secondary Math and Science Programs recommendations.pdf document for calculator suggestions for your degree program.
Problem Solving and Critical Thinking

This section presents an introduction to inductive and deductive reasoning in mathematics, including identifying and analyzing patterns and the problem solving process.

Inductive and Deductive Reasoning
You will learn strategies for thinking logically, view and analyze patterns, and use models and plans to problem solve in mathematics.

Critical Thinking and Problem Solving

Read the following sections from *Thinking Mathematically*:

https://lrps.wgu.edu/provision/33211684
https://lrps.wgu.edu/provision/33211694

Complete the following homework exercises:

https://lrps.wgu.edu/provision/34750925

In your study notebook, explain the difference between a proof using inductive reasoning and a proof using deductive reasoning. Give an example of both.

Rounding and Truncation
You will discover examples of how truncation and rounding are applied.

Rounding and Truncation

Review the following document for rules and examples about rounding and truncation:

- "The Rules for Rounding and Truncation"

Watch the following videos with examples of using rounding in real-world scenarios:

- Truncating and Rounding
- Estimation with Decimals
- Multiplying Whole Numbers and Applications 4

In your study notebook, complete the following exercises:

- Show how truncating a number can give a different value than rounding can.
- Show how truncating a number can give the same value as rounding can.
- Are there any consequences for truncating a number vs. rounding it?
- Make a list of reasons why you would round or truncate a number.

Set Theory

This study of set theory includes symbolic and graphical representations of set operations.
Sets and Operations
You will learn definitions and symbols associated with sets, subsets, and disjoint sets. You will also learn how to represent set relationships through Venn diagrams, find union and intersection, and apply set theory to real-world applications.

Language, Symbols, and Application of Set Theory

Read the following sections from *Thinking Mathematically*:

https://lrps.wgu.edu/provision/33220691

https://lrps.wgu.edu/provision/34378040

Complete the following homework exercises:

https://lrps.wgu.edu/provision/34750949

Define the following terms in your study notebook:

- empty set
- universal set
- subset
- disjoint set
- joint set

Performing Set Operations

Read the following sections from *Thinking Mathematically*:

https://lrps.wgu.edu/provision/33220726

https://lrps.wgu.edu/provision/33220762

Complete the following homework exercises:

https://lrps.wgu.edu/provision/34750955

Logic and Truth Tables
The study of logic includes truth tables.

**Statements and Negation**
You will learn how to symbolically represent logic statements and negation

**Statements of Symbolic Logic**

Read the following section from *Thinking Mathematically*.

https://lrps.wgu.edu/provision/33220774

Complete the following homework exercises:

https://lrps.wgu.edu/provision/34750983

Respond to the following prompts in your study notebook:

- What is the difference between an English sentence and a statement in the study of logic?
- Define and give examples of statements in the study of logic.
- What does negation mean?
- What is the symbol for negation in logic?

**Logical Quantifiers and Connectives**
You will learn the meanings of the following quantifiers in logic statements: some, all, and none (or no). You will also learn the different symbols and meanings used to illustrate connectives in compound logic statements: and, or, but, yet, if-then, and if and only if.

**Working With Quantifiers**

Read the following section from *Thinking Mathematically*:

https://lrps.wgu.edu/provision/33220784

Complete the following homework exercises:

https://lrps.wgu.edu/provision/34751010

In your study notebook, summarize in your own words the difference between quantifiers and connectives. Can you give examples of their use in logic statements? How do you apply the dominance of connectives?

**Truth Tables**
You will learn how to determine the truth value of a logic statement by creating a truth table.

**Creating Truth Tables**
Read the following sections in *Thinking Mathematically*:

https://lrps.wgu.edu/provision/33220791

https://lrps.wgu.edu/provision/33220825

Complete the following homework exercises:

https://lrps.wgu.edu/provision/34751013

**Number Theory and the Real Number System**

Number theory consists of understanding counting numbers, operations, and properties involving prime and composite numbers, odd and even numbers, factors, and multiples.

This section also encompasses the study of basic number systems and their properties.

**Prime and Composite Numbers**

You will define and solve problems with prime and composite numbers. Be sure that you understand and can explain the concepts of divisibility, multiples, and factors. Work to develop conceptual understanding, rather than memorization, of these numbers and properties.

**Working with Prime and Composite Numbers**

Watch the following video with an introduction to prime numbers and basic number theory from the series "Mathematics Illuminated" produced by Annenberg Learner:

- **Episode 101: The Primes**

Read the following section from *Thinking Mathematically*:

https://lrps.wgu.edu/provision/33220839

Complete the following homework exercises:

https://lrps.wgu.edu/provision/34751020

In your study notebook, define prime and composite numbers and how they are important for divisibility of numbers. Explain how knowing divisibility of numbers will allow you to create even groups (as in problems 92 to 100 in the homework).

**Explaining Proofs**
In this activity, you will learn the definition of theorem. Watch the video lectures and review notes for the following chapter in *Thinkwell Geometry*:

- **Chapter 2 Deductive Reasoning**

The following web page gives examples of proofs in number theory. Read through these proofs to gain an understanding of how proofs are often approached in number theory.

- *"Number Theory/Elementary Divisibility"*

For example, read Theorem 1 on the web page above. It is very formal in its notation and structure. However, the proof can be explained less formally: If a number, call it \(d\), is a factor of two other numbers, call them \(a\) and \(b\), then it is also a factor of multiples \(a\) and \(b\), as well as the sum of those multiples. For example, because 3 is a factor of 6 and 9, it is also a factor of 12 (which is 2 times 6, a multiple of 6) and 36 (which is 4 times 9, a multiple of 9). Also, it is a factor of 48, which is 12 + 36.

The explanation of the proof is fairly straightforward. If \(d\) is a factor of \(a\), then it is a factor of a multiple of \(a\), call it \(ra\). Similarly, if \(d\) is a factor of \(b\), then it is a factor of a multiple of \(b\), call it \(sb\). It must also be a factor of the sum, \(ra + sb\) because if it is a factor of both \(ra\) and \(sb\), then it can be factored out of each term.

Numerous proofs involve prime and composite numbers. Here are some examples of theorems:

1. "Every positive integer greater than 1 has a prime divisor."
2. "Every composite number has two divisors less than it."
3. "The only two consecutive prime numbers are 2 and 3."
4. "There are an infinite number of composite numbers."

In your study notebook, explain how to prove the example proofs listed above. Will you use induction or deduction on these proofs? Conduct an internet search for the proofs to get some hints and ideas. You will want to be able to explain how to prove a theorem involving prime and composite numbers. Use the following websites to read the formal proof, then explain how the proof works for the task.

- [Infinitude of Primes](#)
- [Euclid’s Proof of the Infinitude of Primes](#)
- [Why are there infinitely many prime numbers?](#)

**Integers and Order of Operations**

You will learn to apply the order of operations in a problem with integers. You will need to review powers and exponents.

**Using Order of Operations**

Watch the video lectures and review notes for the following section in *Thinkwell Prealgebra*:
• **section 2.2 Operations with Integers**

In your study notebook, note how the integers differ from counting (natural) numbers.

**Order of Operations of Integers**

Read the following section from *Thinking Mathematically*:

[https://lrps.wgu.edu/provision/33220863](https://lrps.wgu.edu/provision/33220863)

Watch the video lectures and review notes in the following chapter at *Thinkwell Prealgebra*:

• **Chapter 2 Integers**

Complete the following homework exercises:

[https://lrps.wgu.edu/provision/34751037](https://lrps.wgu.edu/provision/34751037)

**Rational Numbers**

You will learn the meaning of a rational number. You will also learn how to reduce, convert between mixed numbers and improper fractions, and perform basic operations. You should become proficient at identifying and solving problems with equivalent forms of numbers, such as equivalent fractions and rational numbers as decimals.

**Fractions and Decimals**

Watch the video lectures and review notes in the following chapters at *Thinkwell Prealgebra*:

• **Chapter 3 Fractions**
  • **Chapter 4 Decimals**

Practice rational number operations and changing to decimals.

**Rational Numbers**

Read the following section in *Thinking Mathematically*:

[https://lrps.wgu.edu/provision/33220872](https://lrps.wgu.edu/provision/33220872)

Complete the following homework exercises:

[https://lrps.wgu.edu/provision/34751043](https://lrps.wgu.edu/provision/34751043)

In your study notebook, explain how a repeating decimal occurs and how it’s different than a terminating decimal.

**Irrational Numbers**

You will define irrational numbers.

**Irrational Numbers**
Read the following section in *Thinking Mathematically*:

[https://lrps.wgu.edu/provision/33220908](https://lrps.wgu.edu/provision/33220908)

Complete the following homework exercises:

[https://lrps.wgu.edu/provision/34751059](https://lrps.wgu.edu/provision/34751059)

In your study notebook, explain the difference between a rational number and an irrational number. What is meant by rationalizing a denominator?

**Real Numbers**

You will learn, not only to define real numbers, but also to distinguish between the relationships between natural numbers, whole numbers, integers, rational numbers, irrational numbers, and real number systems and subsets. You will also apply closure and other properties to new mathematical constructs.

**Examining Number Systems**

Read the following section of *Thinking Mathematically*:

[https://lrps.wgu.edu/provision/33220944](https://lrps.wgu.edu/provision/33220944)

Complete the following homework exercises:

[https://lrps.wgu.edu/provision/34751065](https://lrps.wgu.edu/provision/34751065)

In your study notebook, create a Venn diagram of all the different types of numbers: real numbers, irrational numbers, rational numbers, integers and natural numbers. Do an internet search for hints on how these sets of numbers are related.

**Scientific Notation**

You will learn how to read and interpret scientific notation, and how to conduct operations using scientific notation.

**Exponents and Scientific Notation**

Watch the videos and read the notes from the following section in *Thinkwell Prealgebra*:

- [Section 10.1 Exponents and Polynomials](#)

**Scientific Notation**

Read the following section of *Thinking Mathematically*:

[https://lrps.wgu.edu/provision/33220934](https://lrps.wgu.edu/provision/33220934)

Complete the following homework exercises:

[https://lrps.wgu.edu/provision/34751947](https://lrps.wgu.edu/provision/34751947)
In your study notebook, explain the reason scientists use scientific notation, and give some examples of its use in practice.

**Powers and Roots**
Calculating powers and roots has applications in several areas of mathematics. You will review how to calculate powers and roots.

**Powers and Roots**
In your study notebook, list some applications in which it is necessary to use powers and roots.

- Review [https://lrps.wgu.edu/provision/33220908](https://lrps.wgu.edu/provision/33220908) in *Thinking Mathematically* to recall how to find square roots.
- Review [https://lrps.wgu.edu/provision/33220934](https://lrps.wgu.edu/provision/33220934) in *Thinking Mathematically* to recall how to calculate with exponents.

For additional practice with roots, watch the following videos in section 9.4 *The Pythagorean Theorem* in *Thinkwell Prealgebra*:

- examples 1 and 2 found in section 9.4.1 ("Square Roots and the Pythagorean Theorem")

**Ratio, Proportion, Percent**

In this subject, you will learn how to set up ratios, proportions, and percents to solve problems.

**Ratio, Proportion and Percent**
This topic addresses the following competency:

- **Competency 209.1.2: Real Number System**
The graduate demonstrates computational proficiency with real numbers and recognizes the properties of the real number system and its subsets.

**Ratio, Proportion, Percent**
Watch the video lectures and review the notes in the following chapter at *Thinkwell Pre-algebra*:

- [Chapter 7 Ratios, Proportions, and Percents](https://lrps.wgu.edu/provision/34751106)

**Solving Problems**

Complete the following homework exercises:

[https://lrps.wgu.edu/provision/34751106](https://lrps.wgu.edu/provision/34751106)

Read the following section in *Thinking Mathematically*:

[https://lrps.wgu.edu/provision/33220997](https://lrps.wgu.edu/provision/33220997)

Complete the following homework exercises:
Mathematical Systems and Modular Arithmetic

You will explore the concepts of modular arithmetic and closure. You will also review the following properties: associativity, commutativity, and distributivity.

Mathematical Systems
You will apply closure and other properties to new mathematical constructs.

Read the following section of *Thinking Mathematically*:

https://lrps.wgu.edu/provision/33220944

In your study notebook, explain a mathematical system and give an example of one. What is the difference between a closed system and an open system? For example, what does it mean that whole numbers are closed under addition, but not under subtraction?

Modular Arithmetic
You will learn how to add and multiply with mod n.

Access the following web pages for an introduction to modular addition with negative numbers and modular multiplication:

- "The Math Dude – What Is Modular Arithmetic?"
- "Modular Arithmetic Examples"

Use the following web page to get a visual of clock arithmetic and practice adding and multiplying in different bases:

- "Clock Arithmetic Demonstration"

Use the following web page to calculate modular additions and subtraction:

- "Modular Addition, Multiplication, and Exponentiation"

These web pages give an overview of modular arithmetic. You should read the materials found on these sites, play around with the applets, and reflect upon what modular arithmetic means and how to compute within a modular system.

Modular Operations
Review page 305 the following section of *Thinking Mathematically*:

https://lrps.wgu.edu/provision/33220944

Complete the following homework exercises:

https://lrps.wgu.edu/provision/34764254

**Graph Theory**

Graph theory includes sketching graphs from data sets, recognizing patterns, and analyzing circuits, paths, networks, and other similar visual representations of data, as well as making predictions and generalizations.

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**Finite Graphs, Paths, Circuits, and Trees**

You will learn how to construct a finite graph demonstrating relationships with a given set of data.

This Topic addresses the following competencies:

- **Competency 209.1.1: Discrete Mathematics**
  The graduate applies the fundamental ideas of discrete mathematics including logic, set theory, and graph theory in formulating and solving problems.

**Finite Graphs, Paths, Circuits, and Trees**

Watch the following video in Mathematics Illuminated, which introduces the mathematical study of "connectedness:"

- **Episode 111: Connecting with Networks**

**Graphs, Paths, and Circuits**

Read the following section in *Thinking Mathematically*:

https://lrps.wgu.edu/provision/33211754

Complete the following homework exercises:

https://lrps.wgu.edu/provision/34764195

Answer the following questions in your study notebook:

- What is the definition of a finite graph?
What are vertices, edges, and loops?
How do you recognize equivalent graphs?
How does a finite graph differ from circle, bar, or line graphs?
What is a path?
What is the difference between a path and a circuit?

**Euler Paths and Euler Circuits**

Read the following section in *Thinking Mathematically*:

https://lrps.wgu.edu/provision/33211770

Complete the following homework exercises:

https://lrps.wgu.edu/provision/34764215

Answer the following questions in your study notebook:

- What are the benefits of trial and error in solving circuit problems?
- What are the drawbacks of using trial and error in solving circuit problems?
- How do you know, without finding it, whether a path is an Euler path?
- How do you know, without finding it, whether a circuit is an Euler circuit?

**Hamilton Paths and Hamilton Circuits**

Read the following section in *Thinking Mathematically*:

https://lrps.wgu.edu/provision/33211778

Complete the following homework exercises:

https://lrps.wgu.edu/provision/34764236

Answer the following questions in your study notebook:

- What is the Brute Force method?
- What is the Nearest Neighbor method? How does it compare to the Brute Force method?

**Additional Resources**

**Skills Checks**

Read the following section in *Thinking Mathematically*:

https://lrps.wgu.edu/provision/33211778

Complete the following homework exercises:

https://lrps.wgu.edu/provision/34764236

Answer the following questions in your study notebook:

- What is the Brute Force method?
- What is the Nearest Neighbor method? How does it compare to the Brute Force method?

**Finite Mathematics Skills Check: Discrete Math**

https://lrps.wgu.edu/provision/34765032
- Finite Mathematics Skills Check: Real Numbers
  https://lrps.wgu.edu/provision/34765048

- Finite Mathematics Skills Check: Number Theory
  https://lrps.wgu.edu/provision/34765064

Refer to “Using Skills Checks” for information about how to appropriately use this learning resource tool.

**Practice Assessments**

**Practice Assessments**

For extra practice, complete the following exercises:

- Finite Math Preassessment
  https://lrps.wgu.edu/provision/34765015

- GAC Preassessment
  https://lrps.wgu.edu/provision/34765070

- Finite Math Prep 1
  https://lrps.wgu.edu/provision/34765167

- Finite Math Prep 2
  https://lrps.wgu.edu/provision/34765209

- Finite Math Prep 3
  https://lrps.wgu.edu/provision/34765221

- Order of Operations/NumProp/Exp/ScienNot 5.1-5.4, 5.6
  https://lrps.wgu.edu/provision/34765337

- Common Roadblocks Extra Practice
  https://lrps.wgu.edu/provision/34765418

- Proportions Story Problems
Final Steps

Congratulations on completing the activities in this course of study! This section will guide you through the assessment process.

Assessment Information
The activities in this course of study have prepared you to complete the performance assessment. If you have not already completed the assessment, you will do so now.

Accessing Performance Assessments

You should have completed the following tasks as you worked through this course of study. If you have not completed the tasks in TaskStream, do so now.

- FXC1: Task 1

For directions on how to receive access to performance assessments, see the “Accessing Performance Assessments” page.

The WGU Library

The WGU Library is available online to WGU students 24 hours a day.

For more information about using the WGU Library, view the following videos on The WGU Channel:

Introducing the WGU library

*Note: To download this video, right-click the following link and choose “Save as...”: [download video]*

Searching the WGU library

*Note: To download this video, right-click the following link and choose “Save as...”: [download video]*

Center for Writing Excellence: The WGU Writing Center
If you need help with any part of the writing or revision process, contact the Center for Writing Excellence (CWE). Whatever your needs—writing anxiety, grammar, general college writing concerns, or even ESL language-related writing issues—the CWE is available to help you. The CWE offers personalized individual sessions and weekly group webinars. For an appointment, please e-mail writingcenter@wgu.edu.

**Feedback**

WGU values your input! If you have comments, concerns, or suggestions for improvement of this course, please submit your feedback using the following form:

- [Course Feedback](#)

**ADA Policy**

Western Governors University recognizes and fulfills its obligations under the Americans with Disabilities Act of 1990 (ADA), the Rehabilitation Act of 1973 and similar state laws. Western Governors University is committed to provide reasonable accommodation(s) to qualified disabled learners in University programs and activities as is required by applicable law(s). ADA Support Services serves as the principal point of contact for students seeking accommodations and can be contacted at ADASupport@wgu.edu. Further information on WGU?zs ADA policy and process can be viewed in the student handbook at the following link:

- [Policies and Procedures for Students with Disabilities](#)

**Student Gradebook**

Check your progress and scores within MyMathLab:

[https://lrps.wgu.edu/provision/34035429](https://lrps.wgu.edu/provision/34035429)