This course requires a performance assessment and covers 4 competencies and represents 4 competency units.

Introduction

Overview

Finite Mathematics covers the knowledge and skills necessary to apply discrete mathematics and properties of number systems to model and solve real-life problems. Topics include:

- sets and operations; prime and composite numbers,
- GCD and LCM,
- order of operations,
- ordering numbers,
- mathematical systems including modular arithmetic,
- arithmetic and geometric sequences,
- ratio and proportion,
- subsets of real numbers,
- logic and truth tables,
- graphs,
- trees and networks, and
- permutation and combination.

There are no prerequisites for this course.

Getting Started

Welcome to Finite Mathematics! In this course, you will study an interactive textbook and then take diagnostics to make sure you understand the material. If you need to increase your understanding, you can review what you missed in the interactive textbook and see other examples, extended solutions, and readings to help you clear up misconceptions before you retake the diagnostic. You will repeat this cycle until you understand the material well enough to pass the diagnostic. From there, you will continue through the course, completing each set of readings and diagnostics.

Please read the Teaching Dispositions Statement that follows. We hope that you enjoy the course!

Teaching Dispositions Statement
Please review theStatement.

Preparing for Success

Get ready to succeed by following the directions below.

Learning Resources

The following learning resources have been selected to help you complete this course successfully.

Learn to use the Interactive Textbook

Read the sectionindicated and use the interactive links in the textbook to supplement your learning. To evaluate your understanding of the material,access the diagnosticfor that section. Diagnostics are also available for the Topics, which group multiple sections together; these are optional. When you've finished a quiz, you shouldreview resultsfor that diagnostic to work on learning objectives that you've missed. You should consider yourself competent when you're regularly scoring above 60% on all diagnostics. In any section, if you'd like to see all of the recommended problems that were pooled together to make the diagnostic problems, you canaccess the homework problemsfor that section by adjusting the drop-down menu in your Diagnostic view from "Quizzes and Tests" to "Homework."

Know your Calculator

Refer to theWGU Calculator and Whiteboard Guidelinesdocument for calculators permitted on WGU exams. Acquire one of these if you don't already have one. You do not have an objective exam in this course, but you may have exams in other courses, so you should learn to use a calculator now while solving problems in this course.

Pacing Guide

The pacing guide suggests a weekly structure to pace your completion of learning activities. It is provided as a suggestion and does not represent a mandatory schedule. Follow the pacing guide carefully to complete the course in the suggested timeframe.

Week 1: Sets and Operations; Task 1
Week 2: Logic and Truth Tables; Prime and Composite Numbers; Task 2
Week 3: Order of Operations; Task 3
Week 4: Ordering Numbers; Task 4
Week 5: Mathematical Systems; Task 5; Number Patterns; Task 6
Week 6: Ratio and Proportion; Task 7; Graph Theory; Counting Principles

Note: This pacing guide does not replace the course. Please continue to refer to the course for a comprehensive list of the resources and activities.

Supplemental Activities

There may be times when you need more information or practice than what is provided in the course. In addition to consulting with your Course Instructor when you need help, you can access

optional and supplemental activities by using the word "supplemental" in the Course Search box. These activities can be enriching, but they are not essential for becoming competent.

Course Instructor Assistance

As you prepare to 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!

Competencies and Objectives

This course provides guidance to help you demonstrate the following 4 competencies:

- **Competency209.1.0: Readiness**
  This competency exists to assess the readiness of students.
- **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.

  Objectives:

  - Solve a given problem involving the union and intersection of a set, subset, or disjoint set.
  - Create a truth table to determine the truth value of a given logic statement.
  - Interpret a given statement that contains a logical connective.
  - Interpret a given statement that contains a logical quantifier.
  - Sketch a finite graph or tree based on a given set of points.
  - Draw a conclusion from information contained in a simple diagram, flowchart, path, circuit, network, or algorithm.
  - Make a conjecture, prediction, or generalization based on analysis of a given pattern or set of patterns.

- **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.

  Objectives:

- Perform a specified operation on real numbers written in scientific notation.
- Distinguish between whole numbers, integers, rational numbers, and real numbers.
- Perform a given operation on rational numbers expressed in a specified form.
- Recognize equivalent forms of a given number.
- Determine whether the closure, commutative, associative, or distributive properties hold for a newly defined operation on a number system.

- **Competency 209.1.3: Number Theory**
  The graduate represents numbers in different forms, recognizes relationships among number and number systems, deduces the meanings of operations, and demonstrates a conceptual understanding of numbers.

  Objectives:

- Apply ratio, proportion, or percent to solve a given problem.
- Find a power or root.
- Solve a given problem that involves counting numbers.
- Apply the order of operations to a given problem.
- Solve a given problem involving proportions.
- Tell how to add or multiply in a given mod n.
- Explain how to prove a given theorem involving the concepts of prime and composite numbers.
- Explain the concept of truncation.
- Explain the concept of rounding.
- Explain how truncation and rounding apply in mathematics at grade levels 5-9.

Sets and Operations

Succeed by carefully reading the directions for each activity and following them carefully.

Complete 2.1, 2.2, 2.3, and 2.4: read in *Thinking Mathematically*, take the diagnostic, and then review results. When you've completed these sections, take the diagnostic on Sets and Operations to make sure you understand the topic as a whole.

Performance Task 1

Complete and submit Task 1. If you do not pass, meet with your Course Instructor.

Logic and Truth Tables

Succeed by reading the directions for each activity and following them carefully.

Complete 3.1, 3.2, 3.3: read *Thinking Mathematically*, take the diagnostic, thenreview results. When you've completed these sections, take the diagnostic on Logical Quantifiers and Connectives to make sure you understand the topic as a whole.

Prime and Composite Numbers

Succeed by reading the directions for each activity and following them carefully.

Complete 5.1: read in *Thinking Mathematically*, take the diagnostic, and then review results. When you've completed these sections, take the diagnostic on Prime and Composite Numbers to make sure you understand the topic as a whole.

Performance Task 2

Complete and submit Task 2. If you do not pass, meet with your Course Instructor.

Order of Operations

Succeed by reading the directions for each activity and following them carefully.

Complete 5.2: read in *Thinking Mathematically*, take the diagnostic, and then review results. When you've completed these sections, take the diagnostic on Integers and Order of Operations to make sure you understand the topic as a whole.

Performance Task 3

The meaning of not true as a rule: An example of 'not true as a rule' would be 2(x-3)=2x-3, because the error is forgetting to distribute. You would show the correct algebra by working on one side and showing it doesn't match the other side. In this one, start on the left hand side with 2(x-3).

2(x-3)=2x-6 by distributing

2x-6=2x-3 gives -6 = -3 by subtracting 2x from both sides

That is NOT true, so the original equation is not true as a rule.

This is very different from solving for x in an equation:

Of course 3x-5 = 2x +5 isn't true as a rule (all the time) because the algebra is already simplified and is obviously different, but it is true for the specific solution of x=10. The equation is sometimes true (only for specific values of x), so it is not true as a rule. In contrast, 2(x-3)=2x-6 is true as a rule (the rule of distribution, to be specific) because it is true all the time.

This strategy of working out the algebra should be followed even when the computations are more challenging, for example, squaring a polynomial by working it out by partial products/FOIL method: (2x+3y)^2=(2x+3y)*(2x+3y) by the definition of squaring, and (2x+3y)*(2x+3y) =2x*2x+2x*3y+3y*2x+3y*3y, and the work should continue until it is completely simplified.

Whether you're looking for a solution to an equation or checking whether or not an equation is true as a rule, they key is to do the algebra in slow steps, explaining each step, and determining whether the two sides come out the same ('true as a rule') or come out with solution(s) to x or a false statement ('not true as a rule').

Complete and submit Task 3. If you do not pass, meet with your Course Instructor.

Ordering Numbers

Succeed by reading the directions for each activity and following them carefully.

Complete 5.3, 5.4: read in *Thinking Mathematically*, take the diagnostic, then review results. When you've completed these sections, take the diagnostic on Rational Numbers to make sure you understand the topic as a whole.

Performance Task 4

Examples can't prove rules: Using examples is *never* a proof of a general rule, but it is a common error. Otherwise checking the odd numbers 3, 5, 7, and 13 would result in noting that they are all prime, and that would lead to the FALSE conclusion that 'All odd numbers are prime' - which isn't true because 9 is odd but not prime. Just checking examples might miss the important counterexample, so checking examples can never prove something is true as a rule.

You need to check a bunch of other actual examples and try to figure out the extreme cases to see why a particular rule is or is not true. If you can break the rule, it isn't true. If you can't break the rule, then exploring examples that get close to breaking it will help you understand why it is a rule. Checking examples is done only to help you write up the general proof that uses only variables and a verbal description of their general relationships leading to the truth of the rule.

For example, try the values listed below for A and B to compute A/B and B/A, which should help you see an underlying pattern of the values of the fractions that make one always bigger than the other. Then you'll be able to explain it in words that discuss relationships without using examples.

1 and 2

2 and 3

9 and 10

999 and 1000

999,999 and 1,000,000

For this example, another path to the general explanation would be thinking about the definitions of 'proper fraction' and ' improper fraction' to see how they relate to A/B and B/A and help describe why one is always bigger than the other.

Complete and submit Task 4. If you do not pass, meet with your Course Instructor.

Mathematical Systems

Succeed by reading the directions for each activity and following them carefully.

Complete 5.5: read in *Thinking Mathematically*, take the diagnostic, and then review results. When you've completed these sections, take the diagnostic on Real Numbers and Math Systems to make sure you understand the topic as a whole.

Performance Task 5

Complete and submit Task 5. If you do not pass, meet with your Course Instructor.

Number Patterns

Succeed by reading the directions for each activity and following them carefully.

Complete 1.1 and 5.7: read in *Thinking Mathematically*, take the diagnostic, then review results. When you've completed these sections, take the diagnostic on Number Patterns to make sure you understand the topic as a whole.

Performance Task 6

The completely general formula for an arithmetic or geometric sequence has *all* variables and *no* numbers. When considering a specific sequence, the general formula refers to the "*n*th term formula" where the only variable is *n*. To help with Part A, see Example 4 in Section 5.7. Number patterns do not always conform to being arithmetic or geometric sequences. When you are looking for other kinds of patterns, such as in Part B, the best thing to do is compute the beginning of the sequence, starting with the values of $n=1, 2, 3, 4, 5, 6, \ldots$ That way, you will be able to do simple computations in order to figure out what the pattern is. Then your only job would be to figure out how to extend that pattern up to much larger numbers, so that you could figure out what value the sequence has for much larger values of *n*.

Complete and submit Task 6. If you do not pass, meet with your course instructor.

Ratio and Proportion

Succeed by reading the directions for each activity and following them carefully.

Complete 6.2: read in *Thinking Mathematically*, take the diagnostic, then review results. When you've completed these sections, take the diagnostic on Ratio, Proportion, and Percent to make sure you understand the topic as a whole.

Performance Task 7

Complete and submit Task 7. If you do not pass, meet with your course instructor.

Graph Theory

Succeed by reading the directions for each activity and following them carefully.

Complete 14.1, 14.2, 14.3, 14.4: read in Thinking Mathematically, take the diagnostic, then review results. When you've completed these sections, take the diagnostic on Finite Paths Graphs Circuits Trees to make sure you understand the topic as a whole.

Counting Principles

Succeed by reading the directions for each activity and following them carefully.

Complete 11.1, 11.2, 11.3: read in Thinking Mathematically, take the diagnostic, then review results . When you've completed these sections, take the diagnostic on Counting Principles to make sure you understand the topic as a whole.

Final Steps

Congratulations on completing the activities in this course! The content of this course has prepared you to complete the course's assessments. If you have not already completed the assessments, schedule and complete your assessments now.