

Ball State University
Department of Mathematical Sciences
MATH 100-5: Mathematics for Elementary Teachers 1
Spring 2026

Course Meeting Schedule:

TR 11:00 am – 12:15 pm, RB 450

Instructor: Christopher Austin

Office: Robert Bell 482

Office Phone: 765-285-5907

E-mail: christopher.austin@bsu.edu

Office Hours: M 1:00 – 2:30, W 12:00 - 1:30, F 11:00 - 12:30, or by appointment.

About Me: You may refer to me as Dr. Austin, Prof. Austin, Mr. Austin, or just Chris. I have taught mathematics at the K-12, Community College, and University levels in Kentucky, Missouri, Maine, and Indiana. I always look forward to starting another semester of great interactions with future teachers! I usually read and respond to emails within about 24 hours on weekdays, or 48 hours over the weekend. If you would like to meet outside of class to talk about issues related to class, I am available in my office without appointment during the *Office Hours* listed above, but I will always work with you to arrange a different day/time to meet as-needed. If you need to meet on Zoom, including during Office hours, email me to schedule a day/time and I will send the Zoom link with an email confirmation.

Welcome: Welcome to MATH 100. I invite you to join me on a journey this semester, to help you develop a foundation for a lifelong relationship with powerful mathematics learning and teaching. MATH 100 is the first in a series of mathematics **content** courses that you will take for your major. These courses are designed to help you develop a **deep understanding of the mathematics you will teach**. (Later you will take a mathematics *methods* course that focuses on how to *teach* mathematics.) MATH 100 emphasizes key concepts and principles and guides you in giving explanations that draw on these key concepts and principles. By **learning to explain why** mathematics works the way it does, you will learn to **make sense of mathematics**. Through class activities and homework assignments, you will engage in mathematical practices, and you will discover who you are as a mathematics learner and imagine what you can become as a mathematics teacher.

Required Course Materials:

1. **E-textbook:** *Mathematics for Elementary and Middle School Teachers with Activities*, 6th edition -- Instant Access (24-Month), by Sybilla Beckman, 2022, Pearson, ISBN-13: 8220127085342.

You may purchase the digital textbook through the Ball State Bookstore or directly through Pearson during the MyLab registration process. Because you will use this textbook for other mathematics courses in your major, you should purchase the **24-month** access option.

2. **Basic Calculator:** A simple handheld calculator with basic arithmetic functions (for example the Casio HS-8V Basic Calculator, which the Ball State Bookstore sells for \$3.98).

MATH 100 Course Description: Introduction to mathematics for elementary teachers, with a focus on building mathematical proficiency — strategic competence, adaptive reasoning, productive disposition, conceptual understanding, and procedural fluency. In-depth exploration of numbers and the base-ten system, addition and subtraction, and multiplication and division, including analysis of children’s mathematical thinking and connections to the elementary mathematics curriculum.

Course Objectives & Rationale for Inclusion in UCC-21: The purpose of the course is to foster productive notions of doing mathematics, learning mathematics, and understanding mathematics, and to develop prospective teachers’ mathematical knowledge for teaching. As a Foundations course in the University Core Curriculum, MATH 100 focuses on foundational ideas in mathematics that provide a useful context for attaining UCC learning outcomes. The course objectives and the UCC cognitive skills are aligned as follows:

Course Objectives	UCC Cognitive Skills
Articulate a productive vision for learning mathematics for teaching	Develop strategies for reflecting on experience
Make sense of problems and persevere in solving them	Work independently as well as collaboratively to generate knowledge
Construct viable mathematical arguments and critique the reasoning of others	Explore diverse ways of knowing
Organize and consolidate mathematical thinking through written and oral communication, communicate mathematical thinking coherently, and use the language of mathematics to express mathematical ideas precisely	Develop the art of communication—oral, visual, and written—in more than one language (natural and/or symbolic)
Use mathematical models (manipulatives, number lines, math drawings) to interpret and describe concepts in counting, base-ten numbers, addition and subtraction, and multiplication and division	
Carry out procedures flexibly, accurately, efficiently, and appropriately, and explain why they make sense	

Course Expectations: Students in MATH 100 are expected to –

1. Come to class every day.
2. Come to class on time.
3. Participate in class activities and discussions.
4. Put away your cell phones (and other distractions) so you can participate fully.
5. Be prepared to think and learn mathematics in new ways.
6. Be committed to continue your thinking and learning outside the classroom.

In addition: Students in MATH 100 should be prepared to –

- Build new knowledge from prior knowledge
- Engage in productive struggle

- Demonstrate persistence in problem solving
- Treat mistakes as opportunities for learning
- Make sense of mathematics
- Represent your mathematical ideas with drawings, words, and symbols
- Collaborate with your classmates
- Talk about mathematics
- Provide explanations and justifications
- Listen carefully to your classmates' ideas
- Engage in reflective thought

Assessment of Your Work: Your course grade will be determined as follows:

Attendance/Participation	10%
e-Textbook Homework	10%
MyLab Homework	10%
UCC & Other Assessments	10%
Quizzes	10%
Exams (3 exams – 10% each)	30%
Comprehensive Final Exam TUESDAY, APRIL 28 th from 9:45-11:45 am	20%

Attendance/Participation: Your participation in class activities and discussions is **very important** not only for your own learning but also for the learning of others. You are expected to attend class and to be a collaborative participant in the work of the class.

Daily Attendance/Participation will be graded as follows:

- 5 pts: You attend class and participate*
- 4 pts: You are absent (excused) from class but submit the completed Class Activities within 1-2 weeks uploaded to Canvas WITH your documentation of excuse.
- 3 pts: You are absent (unexcused) from class but submit the completed Class Activities within 1-2 weeks uploaded to Canvas WITHOUT documentation of excuse.
- 0 pts: You are absent from class and do not submit the completed Class Activities

*One or more points may be deducted for arriving late, leaving early, and/or not participating in class (e.g., using/looking at your cellphone or your computer).

e-Textbook Homework: These assignments are extensions of class activities. They will help you make sense of key mathematical concepts and principles and practice writing mathematical explanations. They also will help you prepare for quizzes and exams. You will complete these assignments on paper and upload them to Canvas. At times, your instructor will provide feedback to help you grow as a mathematics learner.

MyLab Homework: These assignments are designed to supplement class activities and to help you practice independent learning. You will complete these assignments online and receive immediate feedback. Three attempts are allowed for each question.

UCC & Other Assessments: These assignments are focused on the development of other aspects of your mathematical power – your engagement in mathematical practices and processes, your mathematics disposition, and your exploration of children’s mathematical thinking.

Quizzes: Quizzes will be given periodically, either in class or as take-home assignments. These will help you organize your thoughts and solidify and demonstrate your mathematical understanding. Your lowest quiz grade will be dropped at the end of the semester.

Exams: Exams are designed to serve as culminating experiences, opportunities for you to demonstrate the results of your extensive efforts to make sense of mathematical concepts and principles and to write mathematical explanations. There are **three exams**, each worth 10% of your grade, and a **comprehensive final exam** worth 20% and will be on **TUESDAY, APRIL 28th from 9:45-11:45 am**. All exams will be taken in class.

Grading Scale:

A	$93 \leq x \leq 100\%$	B–	$80 \leq x < 83\%$	D+	$67 \leq x < 70\%$
A–	$90 \leq x < 93\%$	C+	$77 \leq x < 80\%$	D	$63 \leq x < 67\%$
B+	$87 \leq x < 90\%$	C	$73 \leq x < 77\%$	D–	$60 \leq x < 63\%$
B	$83 \leq x < 87\%$	C–	$70 \leq x < 73\%$	F	$0 \leq x < 60\%$

Policy for Late Assignments: Keeping up with assignments will help you succeed in this course. This policy is designed to assist you in that process. If an assignment is handed in late, 10% of the grade for the assignment will be deducted for each day beyond the due date.

Policy for Quizzes/Exams: Taking quizzes and exams during the scheduled times is an important part of taking responsibility for your own success. Make-up quizzes and exams will be given only in the event of a documented illness or emergency. In those cases, you must notify me **before** the quiz or exam.

Course Content: The course content includes the following topics and specific student learning outcomes:

Introduction to Mathematics for Elementary Teachers

What is Mathematics Proficiency?

Problem Solving/Explaining Solutions

Developing a Strength-Based Mathematics Identity

Numbers and the Base-Ten System

1.1 Counting in Base Ten and Other Bases

1. Identify, demonstrate, and describe children’s levels of thinking and strategies for counting.
2. Describe the two views of the counting numbers — as a list and as used for cardinality. Discuss connections between the two views.
3. Explain what it means for the base-ten system (and other base systems) to use place value. Discuss what problem the development of the base-ten system solved.

4. Describe base-ten units and describe how adjacent place values are related in the base-ten system.
5. Describe and make math drawings to represent a given counting number in terms of bundled objects in a way that fits with the base-ten representation for that number of objects.
6. Write numbers in base ten using expanded form.
7. Describe and make math drawings of bundled objects to represent counting numbers in other bases.
8. Write base-ten numbers in other bases.
9. Use expanded form to represent numbers in other bases and translate those numbers to base ten.

1.2 *Decimals*

11. Describe and draw rough pictures to represent a given positive decimal in terms of bundled objects in a way that fits with the decimal representation of the number of objects.
12. Discuss how decimals fill in a number line, label tick marks on number lines, and plot numbers on number lines.
13. Show how to zoom in on portions of number lines to see the portions in greater detail.

1.3 *Reasoning to Compare Numbers in Base Ten*

14. Given any two numbers in base ten, determine which is greater, and put any collection of numbers in order from least to greatest.
15. Given two distinct (positive) numbers in base-ten, find another number in between them.

Addition and Subtraction

3.1 *Interpretations of Addition and Subtraction*

1. Identify and write Add To, Take From, Put Together/Take Apart, and Compare problems of all subtypes. Write situation equations and draw strip diagrams or bar models to represent the problems.
2. Recognize that keywords alone are not effective for solving problems and that problems whose keywords indicate the opposite operation of a solution are difficult.
3. Identify, demonstrate, and describe children's levels of thinking and strategies for solving addition and subtraction problems.

3.2 *The Commutative and Associate Properties of Addition, Mental Math, and Single-Digit Facts*

4. Use the *make-a-ten* and *doubles ± 1* strategies to solve basic addition facts.
5. Use the *make-a-ten with the unknown addend*, *subtract from ten*, and *subtract down to ten first* strategies to solve basic subtraction facts.
6. Write correct equations to go along with a mental method of addition or subtraction. Identify where the commutative or associative properties of addition have been used in these calculations.

3.3 *Why Algorithms for Addition and Subtraction in Base-Ten Work*

7. Explain how to add or subtract by using methods other than the common addition and subtraction algorithms, including children's invented strategies.
8. Use number lines to demonstrate thinking strategies for addition and subtraction.
9. Demonstrate and explain how to add and subtract using non-standard algorithms (e.g., *partial sums*, *column addition*, *partial differences*, and *equal additions*).
10. Use bundled objects and base-ten math drawings to explain the steps of the standard addition and subtraction algorithms, paying special attention to regrouping. Explain that we

line up like places so that we add or subtract hundreds and hundreds, tens and tens, ones and ones, and so on. Use the language of "regrouping" and "trading" instead of using the terms "carrying" and "borrowing."

Addition and Subtraction in Other Bases

11. Use base blocks and drawings to directly model and solve word problems involving addition and subtraction with multi-digit whole numbers in other bases.
12. Use addition and subtraction algorithms with whole numbers in other bases.

Multiplication

4.1 Interpretations of Multiplication

1. Explain why multiplication solves a problem by exhibiting or describing equal groups and re-interpreting the problem as asking how many units are equal to M groups of N units. Write a corresponding multiplication expression ($M \cdot N$) or equation ($M \cdot N = P$).
2. Write Array, Ordered Pair, and Multiplicative Comparison word problems for a given multiplication equation, as well as multiplication word problems for which the equal groups are more evident.
3. Identify, demonstrate, and describe children's levels of thinking and strategies for solving multiplication problems.

4.3 The Commutative and Associate Properties of Multiplication, Areas of Rectangles, and Volumes of Boxes

4. Explain why we can multiply to find the area of a rectangle by describing rectangles as subdivided into groups of 1-unit-by-1-unit squares
5. State the commutative property of multiplication and explain why it makes sense (for counting numbers) by subdividing rectangles or arrays in two different ways
6. Explain why we can multiply to find the volume of a box by describing boxes as subdivided into groups of groups of 1-unit-by-1-unit-by-1-unit cubes
7. State the associative property of multiplication and explain why it makes sense (for counting numbers) by subdividing boxes into two different ways or by subdividing groups of groups of objects in two different ways.
8. Give examples of how to use the associative and commutative properties of multiplication in problems and recognize when these properties have been used

4.4 The Distributive Property

9. State the distributive property and explain why it makes sense (for counting numbers) by describing the total number of objects in a subdivided array in two different ways. Use simple situations to explain or illustrate the distributive property.
10. Give examples of how to apply the distributive property in problems and recognize when the distributive property has been used.

4.6 Why the Standard Algorithm for Multiplying Whole Numbers Works

11. Relate a multiplication problem to an array and subdivide the array so that the pieces correspond to the lines in the partial-products algorithm. Use the subdivision to explain the validity of the partial-products algorithm. Show the portions of the array that correspond to the lines in the standard algorithm.
12. Solve a multiplication problem by writing equations that use expanded forms and the distributive property. Relate the equations to the lines in the partial-products algorithm. Use the relationship to explain why the partial-products algorithm calculates the correct answer to the multiplication problem

13. Understand that multiplication algorithms can be explained in terms of the definition of multiplication, place value, and properties of arithmetic.
14. Demonstrate the lattice method of multiplication, explain how the lattice method is related to the partial-products method, and discuss advantages and disadvantages of using the lattice method.

Division

6.1 Interpretations of Division

1. Write and recognize whole number division word problems for both interpretations of division.
2. Identify, demonstrate, and describe children's levels of thinking and strategies for solving division problems.
3. Explain why we can't divide by 0, but why we can divide 0 by a nonzero number.
4. Use division to solve problems.

6.3 Why Division Algorithms Work

5. Use the scaffold method of division and interpret the process from either the "how many groups?" or the "how many in each group?" point of view.
6. Use the standard long division algorithm and interpret the process from the "how many in each group?" point of view. Explain the "bringing down" steps in terms of unbundling the remaining amount and combining it with the amount in the next-lower place.
7. Understand and use nonstandard methods of division.

Number Theory

8.1 Factors and Multiples

1. State the meaning of the terms factor and multiple.
2. Given a counting number, find all its factors in an efficient way and explain why the method finds all the factors. Given a counting number, list several multiples of a number.

8.5 Greatest Common Factor and Least Common Multiple

3. State the meaning of GCF and LCM.
4. Write and solve word problems that can be solved by finding a GCF. Write and solve word problems that can be solved by finding a LCM.

University Policies & Resources

University Statement: We are committed to ensuring that all members of the community are welcome, through valuing the various experiences and worldviews represented at Ball State and among those we serve. We promote a culture of respect and civil discourse.

Disability Statement: If you need course adaptations or accommodations because of a disability, please contact the instructor of record as soon as possible. Ball State's [Disability Services Office](#) coordinates services for students with disabilities; documentation of a disability needs to be on file in that office before any accommodations can be provided. Disability Services can be contacted at 765-285-5293 or dsd@bsu.edu.

Freedom of Expression: In this course, we are committed to fostering a learning environment that values intellectual diversity, encourages free expression, and promotes open inquiry. As members

of the Ball State Community, we treat each person in the Ball State community with civility, courtesy, compassion, and dignity and respect and learn from differences in people, ideas, and opinions. Please review Ball State University's [Statement on Freedom of Expression](#), the resources on Ball State's [Freedom of Expression webpage](#), and [Ball State's Beneficence Pledge](#).

Title IX: Ball State University is committed to providing a safe and inclusive learning environment for all students. If you or someone you know has experienced sexual harassment—including sexual assault, dating violence, domestic violence, or stalking, please know that you are not alone. The University offers support services and resources. For more information or to report an incident, please visit [bsu.edu/titleix](https://www.bsu.edu/titleix) or contact the Title IX Coordinator at 765-285-1545 or at titleix@bsu.edu

University Grade Appeal Policy: If you believe you received a final course grade that does not reflect your performance due to fairness or a procedural issue, you have the right to file an appeal within 5 school days after final grades are posted by the Office of the Registrar. Review the [University Grade Appeal Policy and Process](#).

Course Withdrawal: The course withdrawal period ends **Thursday, March 19th, 2026**. Before this can elect to receive a "W" for the course by completing and submitting the proper form. The instructor's permission is not required. For details, see <https://www.bsu.edu/about/administrativeoffices/registrar/registration-activities/withdraw-from-classes> as well as Degree Requirements and Time Limits in the current Undergraduate Catalog.

Canvas Accessibility: Canvas provides a user experience that is easy, simple, and intuitive. Special attention has been paid to making Canvas screen-readable. The Rich Content Editor encourages users to create accessible content pages (i.e. text formatting is accomplished using styles). Canvas is designed to allow limited customization of colors and schemes to be accessible for all users. The National Federation of the Blind granted Canvas the Gold Level Web Certification in 2010. **Find more information by visiting the [Canvas Voluntary Product Accessibility Template \(VPAT\)](#).**

FERPA and Privacy: As a student, your educational records are considered confidential. Under FERPA (Family Educational Rights and Privacy Act), your records are confidential and protected. Under most circumstances, your records will not be released without your written and signed consent. However, some directory information may be released to third parties without your prior consent unless a written request to restrict this is on file. You can learn more about student rights to privacy by reading [Ball State's FERPA and Privacy and Protection](#).

The Learning Center: The Learning Center offers free Tutoring and Academic Coaching for many courses at Ball State. Students can make appointments for online (Zoom) or in-person (NQ 350) appointments. To make an appointment, visit myballstate.bsu.edu and click on "Navigate" in the Academic Tools section, or just go directly to bsu.navigate.eab.com.

Testing accommodations for students with disabilities are available for students who have received the appropriate documentation from Disability Services. Tests may be administered in the Learning Center.

Supplemental Instruction is available in select courses. If you have an SI leader for your course, that person will provide students with information the first week of school regarding weekly study sessions. For more information about Learning Center programming, visit [bsu.edu/learningcenter](https://www.bsu.edu/learningcenter) or call 765-285-1006. Follow us on Instagram: [BallStateLC](#).

Student Academic Ethics Policy: <https://www.bsu.edu/about/administrativeoffices/vice-provost/student-services/academic-integrity>

Course Schedule

To support a learning experience that is responsive to the needs, interests, and pace of our class community, the course schedule may shift over the semester. The most current version of the schedule will always be available on Canvas. I encourage you to check Canvas regularly for updates and contact me if you have any questions.

The tentative schedule is available on the following page.

MATH 100 Tentative Schedule – Spring 2026

Week 1	January 6 Intro/Welcome	January 8 Numbers & Base Ten
Week 2	January 13 Numbers & Base Ten	January 15 Numbers & Base Ten
Week 3	January 20 Numbers & Base Ten	January 22 Numbers & Base Ten/ Quiz 1
Week 4	January 27 Numbers & Base Ten	January 29 Numbers & Base Ten/ Quiz 2
Week 5	February 3 Numbers & Base Ten	February 5 Exam 1
Week 6	February 10 Addition & Subtraction	February 12 Addition & Subtraction
Week 7	February 17 Addition & Subtraction	February 19 Addition & Subtraction/ Quiz 3
Week 8	February 24 Addition & Subtraction	February 26 Addition & Subtraction/ Quiz 4
Week 9	March 3 Spring Break (No Class)	March 5 Spring Break (No Class)
Week 10	March 10 Addition & Subtraction	March 12 Exam 2
Week 11	March 17 Multiplication & Division	March 19 Multiplication & Division
Week 12	March 24 Multiplication & Division	March 26 Multiplication & Division/ Quiz 5
Week 13	March 31 Multiplication & Division	April 2 Multiplication & Division
Week 14	April 7 Multiplication & Division	April 9 Multiplication & Division Quiz 6
Week 15	April 14 Multiplication & Division	April 16 Exam 3
Week 16	April 21 Additional Topics/Review	April 23 Additional Topics/Review
Final Exam TUESDAY, APRIL 28 9:45-11:45 am		