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Welcome (or welcome back) to Mathematics for Elementary Education courses at Purdue!

Course goals are to prepare you to:

- Be a knowledgeable and confident math teacher in the elementary classroom
- Have a deep understanding of the reasoning behind math processes
- Be able to clearly articulate math ideas with correct vocabulary

What is Mathematics? Mathematics is a sense-making activity that **ALL** of you (and your future students) are capable of learning. You will make meaning of the mathematics in this course (and in your career) and help your students do the same. In this class, you will often be asked to explain your thinking or describe the process you use to solve a problem. Be prepared to detail and explain your thinking clearly. Homework, quizzes, and exams will be graded accordingly.

Official Course Description:

Credit Hours: 3.00. Elementary school teachers must understand how multiplication gives rise to exponents and how to represent, interpret, and compute exponents from problem situations. They must also understand how to represent practical situations using algebraic and fractional expressions, and verbally interpret graphs of functions. They have to know basic concepts of probability theory. This course covers conceptual and practical notions of exponents and radicals; algebraic and rational functions, algebraic equations and inequalities, systems of linear equations, polynomial, exponential, and logarithmic functions. Notions of probability.

- I. Learning Objectives:** There are four main course learning objectives that are:
- 1. To create, select, and evaluate appropriate topic and grade level tasks that have mathematical potential for algebra, data analysis, and probability at the K-12 and college level.**
 - i. To create or select a K-6 appropriate task with mathematical potential and identify how the mathematical standards addressed in that task develop across multiple grade levels.
 - ii. To create a MA 138 exam question involving algebra, data analysis, and/or probability, explain the connection of the question concepts to MA 138, and answer the question.
 - iii. To evaluate mathematical tasks with or without student work for mathematical potential by discussing mathematical concepts related to algebra, data analysis, and probability in written and oral forms.
 - iv. To utilize manipulatives in selected or designed tasks to demonstrate procedural and conceptual understanding of algebra, data analysis, and probability.
 - 2. To reason about algebra and change:**
 - i. To demonstrate conceptual and procedural understanding of algebraic operations, algebraic equations of degree two, exponents and radicals, and function graphs.
 - ii. To describe relationships among time, distance, and rates in words and abstractly.
 - iii. To describe, write, and solve inequalities involving linear functions.

- iv. To describe and write functions when given data in various formats; represent, and interpret data in more than one variable.
- v. To solve systems of equations with multiple methods (e.g., graphing, algebraic, quantitative reasoning)

3. To recognize and describe connections among mathematical concepts involving algebra, data analysis, and probability as well as their connection to elementary mathematics.

- i. To analyze position/time and speed/time graphs and justify the selection (or non-selection) of graphs to represent situations.
- ii. To calculate weighted averages, average deviation, and standard deviation and justify the appropriate use of each for given situations.
- iii. To compare measures of center and generate situations for given conditions (e.g., a data set where the mean and median are equal in value) and break down their appearance in elementary mathematics standards.

4. To perform and interpret statistical analyses.

- i. To quantify uncertainty in various formats: To calculate basic notions of probability, including combinations, permutations, probability of one and/or another event and conditional probability.
- ii. To create probabilistic situations that satisfy given requirements and carry out experiments when appropriate (e.g., feasible).

II. Textbook: 4th Edition by Sowder, Sowder, Nickerson, & Whitacre. W.H. Freeman, 2023. Loose-Leaf with Achieve access ISBN: 9781319554903; \$119.99 at MacmillanLearning.com

- This book provides activities, discussion ideas, and questions that stimulate a deep level of thinking. We will use this workbook daily in class, and reading the section in the text before class is recommended to assist in achieving a high grade in the course.
- We will also use manipulatives to help us understand or demonstrate concepts. These manipulatives will appeal to different learning styles, and you may find them useful in clarifying ideas. Because it will be important to use them in your teaching for the benefit of your students, you will gain valuable experience using manipulatives in this course.

III. Grading: Grades consist of three (3) evening exams (100 points each), quizzes (100 points total), homework (50 points), and a comprehensive final exam (150 points). An instruction sheet for determining your grade is available on Brightspace. Note that a point on homework or quiz is not equivalent to a point for the course. The following will note the grading scale, description of graded assignments, and academic integrity expectations:

- **Homework:** You will turn in homework every class period. *Late homework is not accepted. Students are encouraged to work together on homework, but the work submitted should be their own and not match other students' work.* Occasions arise to prevent students from completing homework. Therefore, your 4 lowest homework scores will be dropped. Homework should be done neatly and with care, and all steps must be shown. Correct answers without work or with incorrect work may not receive credit. The instructor will decide which problems or parts of problems the grader will grade. Only a few problems on each assignment are graded, meaning that sometimes the problems selected are the ones you have incorrect or they might be ones that you have correct. Students are encouraged to attend office hours as a way of getting help with

assignments or checking answers. It is important to check your feedback on homework assignments so that you can learn from your mistakes. **If you feel that an assignment has been graded incorrectly, you have one week from the date that it was graded to request a regrade.** You may request a regrade by emailing your instructor. Be sure to include the HW number and which problem(s) you would like the instructor to regrade in your email.

- **Quizzes/Projects:** Quizzes will be given frequently. Some will be traditional answering of questions and others may be projects or take-home quizzes. It is wise to review recent lessons as a way of studying for quizzes. Two quiz scores will be dropped to allow for absences. **In-class quizzes cannot be made up without notice from a Purdue-governed body.**
- **Exams:** Exams are intended to cover the ideas from the text but not to mimic the homework questions. Questions may require thinking or problem solving not represented by the homework questions.
 - **Exam I is Tuesday 2/11/25 from 8:00-9:00pm in UC 114.**
 - **Exam II is Thursday 3/13/25 from 8:00-9:00pm in UC 114.**
 - **Exam III is Thursday 4/17/25 from 8:00-9:00pm in UC 114.**

Put these dates and times on your calendar. Make-up exams will be given only if you have a valid excuse *with documentation* and I have been notified prior to the exam. If you are unable to notify me prior to the exam, *a valid explanation with documentation for the missed exam must be provided.* Unexcused absence from an exam may result in a grade penalty.

Course grades are based on the following scale:

%	Grade	Points (out of 600)
98 – 100	A+	≥ 585
90 – 97	A	≥ 540
80 – 89	B	≥ 480
70 – 79	C	≥ 420
60 – 69	D	≥ 360
< 60	F	< 360

At the end of the semester, students whose total points out of 600 are within 6 points of an A, B or C, will be *considered* for the higher grade with a minus if they have missed 5 or fewer class sessions.

- **Academic honesty** is expected at all times. Academic dishonesty could result in a 0 for the assignment or exam or an F in the course. It also may result in a disposition form (D-2) filed with the College of Education. Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information that is submitted provides the greatest opportunity for the university to investigate the concern.

Purdue Honor Pledge:

*As a Boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do.
Accountable together – we are Purdue.*

IV. Logistical Information

- **Course Schedule:** This course will meet Monday, Wednesday, and Friday each week for 50 minutes each day. See the course calendar later in the syllabus for the semester's schedule of class dates.
- **Office Hours:** The instructors of MA 137, 138, and 139 welcome students of any of the three courses to their office hours. A list of those weekly hours and location can be found on Brightspace.
- **Attendance:** This course follows Purdue's academic regulations regarding attendance, which states that students are expected to be present for every meeting of the classes in which they are enrolled. It is common courtesy to let your instructor know if you are going to miss a class. However, it is not required. Please discuss illnesses or circumstances that lead to excessive absences privately with the instructor to make appropriate accommodations. With 4 homework scores and 2 quiz scores dropped, most absences should be accounted for.
- **Calculators:** Another goal of the Mathematics for Elementary Education courses is to be competent doing arithmetic of whole numbers, decimals, fractions, and percentages by hand. Because of this, **No calculators are allowed on quizzes and exams in the first part of the semester.** A scientific calculator will be allowed on Exam III and the Final Exam. Occasionally, a calculator will be useful for homework problems or in-class work. There will also be three no calculator quizzes given during the semester called "Arithmetic Skills Quizzes." To be prepared for those, a study guide is available on the course web page.
- **Course Evaluation:** During the last two weeks of the semester, you will be provided an opportunity to evaluate this course and your instructor. At that time, you will receive an official email from evaluation administrators with a link to the online evaluation site. Your feedback is vital to improving education at Purdue. You are strongly urged to participate in the evaluation system.
- **Campus Emergencies:** In the event of a major campus emergency, course requirements, deadlines, and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. If a fire alarm sounds, leave the building immediately and collect by the fountain outside. You may dial 911 for a campus emergency.
- **Quiet Period:** Per university regulations, the week preceding the final exams week is designated as the "Quiet Period." During this time, no assignments (including homework) can be assigned or collected, unless your course has no exams scheduled for the final exam week. Further details regarding this policy can be found at: <https://catalog.purdue.edu/content.php?catoid=16&navoid=19719#c-quiet-period>
- **Last Day to Drop a Course with a W or WF grade:** April 18, 2025

V. Resources

• Mental Health

- If you find yourself beginning to feel some stress, anxiety, and/or feeling slightly overwhelmed, try **WellTrack**, <https://purdue.welltrack.com/> Sign in and find information and tools at your fingertips, available to you at any time.
- **If you need support and information about options and resources**, please see the Office of the Dean of Students, <http://www.purdue.edu/odos> for drop-in hours (M-F 8am-5pm).
- **CAPS**: Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at (765)494-6995 and <http://www.purdue.edu/caps/> during and after hours, on weekends and holidays, or through its counselors physically located in the Purdue University Student Health Center (PUSH) during business hours.

• For students certified by ODOS adaptive services

- Purdue University strives to make learning experiences accessible to all participants. If you anticipate or experience physical or academic barriers based on disability, you are encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247.
- If you have been certified by the Disability Resource Center (DRC) as eligible for academic adjustments on exams or quizzes see www.math.purdue.edu/ada for exam and quiz procedures for your mathematics course. If you have questions please send email to Stephanie Foster (foster80@purdue.edu)
- In the event that you are waiting to be certified by the Disability Resource Center we encourage you to review our procedures prior to being certified.
- For all in-class accommodations please contact your instructor as soon as possible. Here are instructions for sending your Course Accessibility. Letter to your instructor: <https://www.purdue.edu/drc/students/course-accessibility-letter.php>

- Basic Needs

- Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact the Dean of Students for support. There is no appointment needed and Student Support Services is available to serve students 8 a.m.-5 p.m. Monday through Friday.

• Non-Discrimination Statement

- Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. Purdue's nondiscrimination policy can be found at http://www.purdue.edu/purdue/ea_eou_statement.html.

MA 138

Calendar

Spring 2025

	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1 01/13-01/17	Lesson 1		Lesson 2		Lesson 3
Week 2 01/20-01/24	MLK Jr Day No Class		Lesson 4		Lesson 5
Week 3 01/27-01/31	Lesson 6		Lesson 7		Lesson 8
Week 4 02/03-02/07	Lesson 9		Lesson 10		Lesson 11
Week 5 02/10-02/14	Review	Exam 1	No Class		Lesson 12
Week 6 02/17-02/21	Lesson 13		Lesson 14		Lesson 15
Week 7 02/24-02/28	Lesson 16		Lesson 17		Lesson 18
Week 8 03/03-03/07	Lesson 19		Lesson 20		Lesson 21
Week 9 03/10-03/14	Lesson 22		Review	Exam 2	No Class
Week 10 03/17-03/21	Spring Break				
Week 11 03/24-03/28	Lesson 23		Lesson 24		Lesson 25
Week 12 03/31-04/04	Lesson 26		Lesson 27		Lesson 28
Week 13 04/07-04/11	Lesson 29		Lesson 30		Lesson 31
Week 14 04/14-04/18	Lesson 32		Review	Exam 3	No Class
Week 15 04/21-04/25	Lesson 33		Lesson 34		Lesson 35
Week 16 04/28-05/02	No Class		No Class		Review
	Final	Exam	Week	05/05-05/10	

Exam I is Tuesday, 2/11/25 from 8-9PM in UC 114
Exam II is Thursday, 3/13/25 from 8-9PM in UC 114
Exam III is Thursday, 4/17/25 from 8-9PM in UC 114

Text: Reconceptualizing Mathematics, 4th Edition by Sowder, Sowder, Nickerson, & Whitacre. W.H. Freeman, 2023. Loose-Leaf with Achieve access ISBN: 9781319554903; \$119.99 at MacmillanLearning.com

Follow instructions written here in addition to instructions in the text. All documents referenced for printing can be found on Brightspace.

Lesson	Section	Page	Topic	Problems
1	12.1	234	<i>Algebraic reasoning in elementary school</i>	1abcg, 4, 6, 7, 10, 12ade, 14, 15
2	12.2	240	<i>Numerical patterns and algebra</i>	1, 4ac, 7, 9, 10 Write a function rule for these sequences: a. 2, 10, 50, 250, 1250... b. 7, 15, 23, 31, 39... c. 240, 120, 60, 30, 15...
3	12.3	247	<i>Functions and algebra</i>	1, 2, 3, 5, 8, 9, 12bd, 19
4	12.4	256	<i>Algebra as generalized arithmetic</i>	2, 4ace, 5, 6, 13, 16ab, 17, 18acd
5	12.5/6	264	<i>Algebraic reasoning about quantities/Issues for learning: NAEP</i>	3, 4ab, 6, 11, 14a Read pp 266-267, do items 1, 3, 4
<i>Note: Please print off or buy graph paper. Bring some to class and also use it for your homework unless you are making qualitative graphs. Please bring a ruler to class.</i>				
6	13.1	272	<i>Using graphs and algebra to show quantitative relationships</i>	1acd, 3acd, 4, 6, 10abcd
7	13.2	280	<i>Understanding slope</i>	1abde, 3, 4, 6, 9, 10
8	13.4	292	<i>Nonlinear functions</i>	1, 2, 3 Make a graph going from $x = -3$ to $x = 3$ for $y = x^2 - 1$ and $y = (x - 1)^2$. How are the graphs similar and different?
9	NCTM Illuminations		<i>Mathematically Rich Tasks</i>	Mathematically Rich Tasks – see Brightspace
10	14.1	299	<i>Distance-time and position-time graphs</i>	1ab, 2a, 4abc, 6, 10 (for #10, tell what 1 billion is in days and years)
11	14.3	306	<i>Graphs of speed against time</i>	3, 4, 5, 6, 7b(do a speed-time graph and a position-time graph), 8, 10 Make a speed-time graph for your day. use negative speeds when necessary. Give a brief description that describes your graph.

Exam I is Tuesday, 2/11/25 from 8-9PM in UC 114

12	14.4/ 14.5	312	<i>Interpreting graphs/Common graphing errors</i>	1ab, 2, 3, 6, 7 Read 316-317. Do activity 10, part 3a. Is the candle burning at a constant rate? How do you know?
13	15.1	321	<i>Finding linear equations</i>	3, 4, 8, 10, 12, 17, 20
14	15.2	328	<i>Solving two linear equations in two variables</i>	2(use substitution), 5(use elimination), 16a, 17, 18, 19, 22, 24
15	15.3	335	<i>Different approaches to problems</i>	3, 8, 10, 12, 13 (Hint for #8: How far does the turtle get during the head start?)
16	15.4	339	<i>Average speed and weighted averages</i>	3, 5, 8c, 9, 11, 12
17	15.5 & 15.6	344 348	<i>More about functions/Topics in algebra</i>	p. 344: 2ab, 3, 4, 7, 8, 10(Do only $3 \times 4 \times 6$) p. 348: 1, 2, 3ab, 4bef
18	27.1	570	<i>Understanding chance events</i>	1cef, 2, 4, 6abc Read pp 583-585. Do “Think about it” on pp 585
19	27.2/4	577	<i>Methods of assigning probabilities/Research on the understanding of probability</i>	1b, 4, 6, 7, 9bd, 12, 14, 15ab, 18abc, 26
20	28.1	593	<i>Tree diagrams and lists for multistep experiments</i>	3, 4ab (You do NOT need to copy the table onto your paper), 7, 9 Write out the sample space for tossing 4 coins. Find the following probabilities: 0 heads, 1 head, 2 heads, 3 heads, 4 heads.
21			<i>Procedural vs. Conceptual Tasks</i>	Assignment #21 – See Brightspace
22	28.2	596	<i>Probability of one event or another event</i>	2, 3, 4, 6, 10abdefg, 11

Exam II is Thursday, 3/13/25 from 8-9PM in UC 114

23	28.3	601	<i>Probability of one event and another event</i>	3, 6abcdfg, 7, 8, 10, 11, 12
24	28.4	607	<i>Conditional probability</i>	4, 6, 7, 9, 11

25	33.1	709	<i>Expected value</i>	2(Refer to the table on p.593, & make a new table of <u>sums.</u>), 4, 5, 6ab, 7, 9, 10
26	33.2	716	<i>Permutations and combinations</i>	1, 2, 4, 5ab, 6b, 9, Write and solve 2 different word problems using the numbers 11 and 4. Make one problem a combination and the other a permutation.
27	33.2	716	<i>Permutations and combinations</i>	8, 10, 11abc, 12, 13, 16, 17 (Hint for 16: you are finding 5C0, 5C1, 5C2...)
28	29.1 & 29.2	614 619	<i>What are statistics?/Sampling: The why and the how</i>	p. 614: 2, 3 p. 619: 3, 4, 5, 7a, 8bcd, 9, 11 <i>Please bring a compass and protractor to the next class. Have graph paper and unlined paper with you.</i>
29	29.4 & 30.1	625 632	<i>Types of data/Representing categorical data</i>	p. 625: 1, 2, 3acd p. 632: 2a (Show arithmetic with % to nearest 0.1 & angle to nearest degree.), 2b (Use graph paper.) Give one advantage and disadvantage to each type of graph in #2 p. 632: 6, 7ab, 8, 9
30	30.2	638	<i>Representing and interpreting measurement data</i>	2a, 3, 4ab, 5,
31	30.3	645	<i>Examining the spread of data</i>	2, 3, 4*, 5*abcde (*Make up a data set when possible.), 6, 9, 16, 17
32	30.4	652	<i>Measures of center</i>	1, 2 (Write data sets for each.), 5, 9, 12, 15, 17ac
Exam III is Thursday, 4/17/25 from 8-9PM in UC 114				
33	30.5	658	<i>Deviations from the mean as measures of spread</i>	2, 3, 9a (Add 10 to each), 9b (Divide each by 5). Be sure to tell how these changes affect the mean and standard deviation
34	30.6	666	<i>Examining distributions</i>	3, 5, 9, 16
35	30.6 & 30.7	666 669	<i>Examining distributions/ Understanding the mean</i>	p. 666: 4, 11 (Show z-scores.), add part c: 400 six-year-olds: How many are taller than 48.6 in?; How many are shorter than 44.4 inches?, 12, 13, 14 p. 669: 1, 2

Syllabus is subject to change with notification from the instructor.