

Math 13900 Mathematics for Elementary Education III Spring 2018

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Course web page: www.math.purdue.edu/MA13900

Welcome 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

Your future students will need to know more than how to find a number answer. You will often be asked to explain your thinking or describe the process you use to solve a problem. Be prepared to show step-by-step math work and to explain your thinking clearly. Homework, quizzes, and exams will be graded accordingly.

I. Learning Objectives:

1. Differentiate between various polygons based on number of sides and measures of angles.
2. Find the sum of the measures of the interior angles of a polygon.
3. Draw nets for polyhedra.
4. Differentiate between various types of polyhedra including all regular polyhedra.
5. Determine number of lines of symmetry for a plane figure and orders of rotational symmetry.
6. Determine number of planes of symmetry for a solid figure as well as axes of rotational symmetry.
7. Recognize and draw shapes that tessellate the plane and solid figures that tessellate space.
8. Determine dimensions of similar planar figures.
9. Determine surface area and volume of similar solid figures.
10. Construct perpendicular bisectors and parallel lines using a compass and straightedge.
11. Recognize and draw rigid motions of shapes including translations, reflections and rotations.
12. Determine area of plane figures and surface area and volume of solid figures.
13. Use the Pythagorean Theorem to determine diagonals of solid figures.

II. Textbook: Reconceptualizing Mathematics 3rd Edition by Sowder, Sowder, and Nickerson, W.H. Freeman, 2017.

- 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.

- I. Grading:** Grades consists 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 the web page. 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:

Course grades are based on the following scale:

%	Grade
98 – 100	A+
90 – 97%	A

%	Grade
80 – 89	B
70 – 79	C

%	Grade
60 – 69	D
Below 60	F

A minimum of 360 points is required to earn a D or better in the course.

- **Homework:** You will turn in homework every class period. *Late homework is not accepted.* Occasions arise to prevent students from attending class. Therefore, your 4 lowest homework scores will be dropped. Homework should be done neatly and with care, all steps must be shown, and multiple pages should be stapled (one point will be deducted from each homework assignment not stapled). 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. This means 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.
- **Quizzes:** Quizzes will be given frequently. It is wise to review recent lessons as a way of studying for quizzes. Two quiz scores will be dropped to allow for absences. No make-up quizzes are given. Class participation will count towards one quiz grade. Be prepared to volunteer your ideas during class discussions.
- **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 1: Monday, February 5, 2018 from 8:00-9:30pm in RAWLS 1086.
 - Exam 2: Wednesday, March 7, 2018 from 8:00-9:30pm in RAWLS 1086.
 - Exam 3: Wednesday, April 11, 2018 from 8:00-9:30pm in RAWLS 1086.
 - Put these dates and times on your calendar. Make-up exams will be given only if you have a valid excuse *with documentation* and Brooke Max has been notified prior to the exam. If you are unable to notify her prior to the exam, *a valid explanation with documentation for the missed exam must be provided.* Unexcused absence from an exam will result in a grade penalty.

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.

Link to video description: <https://www.purdue.edu/provost/teachinglearning/honor-pledge.html>

- **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. Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breeches 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.

II. Logistical Information

- **Attendance:** 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.
- **Cell Phone Use:** Checking for messages and sending text messages is not appropriate during class time. Be polite and leave your cell phone alone during these 50 minutes.
- **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.** Occasionally, a calculator will be useful for homework problems or in-class work. There will also be three 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. I strongly urge you 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. Information will be available at www.math.purdue.edu/MA13700. If a fire alarm sounds, leave the building immediately and collect by the fountain outside. You may dial 911 for a campus emergency.
- **Last Day to Drop a Course:** Friday, March 9, 2018 @ 5:00 pm

III. Resources

- **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**
 - o If you have been certified by the Disability Resource Center (DRC) as eligible for academic adjustments on exams or quizzes, see <http://www.math.purdue.edu/ada> for exam and quiz procedures for your mathematics course or go to MATH 202 for paper copies.

- In the event that you want to be certified by the DRC, we encourage you to review the procedures prior to being certified.
- For all in-class accommodations, please see your instructor outside class hours – before or after class or during office hours – to share your Accommodation Memorandum for the current semester and discuss your accommodations as soon as possible.

MA 13900**Calendar****Spring 2018**

	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1 01/08-01/12	Lesson 1		Lesson 2		Lesson 3
Week 2 01/15-01/19	No Class – MLK Day		Lesson 4		Lesson 5
Week 3 01/22-01/26	Lesson 6		Lesson 7		Lesson 8
Week 4 01/29-02/02	Lesson 9		Lesson 10		Lesson 11
Week 5 02/05-02/9	Review Exam I RAWLS 1086		No Class		Lesson 12
Week 6 02/12-02/16	Lesson 13		Lesson 14		Lesson 15
Week 7 02/19-02/23	Lesson 16		Lesson 17		Lesson 18
Week 8 02/26-03/02	Lesson 19		Lesson 20		No Class (IMERS)
Week 9 03/05-03/9	Lesson 21		Review Exam II RAWLS 1086		No Class
Week 10 03/12-03/16	Spring Break No Classes				
Week 11 03/19-03/23	Lesson 22		Lesson 23		Lesson 24
Week 12 03/26-03/30	Lesson 25		Lesson 26		Lesson 27
Week 13 04/02-04/06	Lesson 28		Lesson 29		Lesson 30
Week 14 04/9-04/13	<i>In SC 179</i> Lesson 31		Review Exam III RAWLS 1086		No Class
Week 15 04/16-04/20	Lesson 32		Lesson 33		Lesson 34
Week 16 04/23-04/27	Lesson 35		Review		Review
	Final	Exam	Week	04/30-05/04	

Exam 1: Monday, February 5, 2018 from 8:00-9:30pm in RAWLS 1086.

Exam 2: Wednesday, March 7, 2018 from 8:00-9:30pm in RAWLS 1086.

Exam 3: Wednesday, April 11, 2018 from 8:00-9:30pm in RAWLS 1086.

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Assignment Sheet

Spring 2018

Text: Reconceptualizing Mathematics, 3rd Edition by Sowder, Sowder, & Nickerson. W.H. Freeman, 2014.

Follow instructions written here in addition to instructions in the text.

Lesson	Section	Title	Page	Problems
1	16.1	<i>Review of polygon vocabulary</i>	p. 406	1bdgi, 2bdfhjlnp, 3a, 5, 6cd, 7def, 9 <i>Bring Lesson 2 Worksheet and protractor for Lesson 2.</i>
2	16.1 & 16.2	<i>Organizing shapes</i>	p. 407 & 412	p. 407: 10, 11, 12, 13 (Extend the table), 15 p. 412: 1(Redraw Venn diagram correctly.), 2bdfhjln, 3bd, 4bdf
3	16.3	<i>Triangles and Quadrilaterals</i>	p. 417	2(Copy and complete chart.), 3bde, 4b(Draw <u>large</u> (5 cm or more per side length) scalene triangle on unlined paper, and measure all angles and sides (cm) after following instructions.), 6bc, 7a, 8a (Find 4 more examples that work and show arithmetic to verify.) <i>Bring isometric dot paper for Lesson 4.</i>
4	16.4/5	<i>A focus on problem-solving strategies/issues for learning: some research on 2-D shapes</i>	p. 421 & 426	p. 421: #1, 2, 3, 4, 6, 10a p. 426: #1, 3, 5b, 6 (analyze two students' work)
5	17.1	<i>Shoebboxes have faces and nets!</i>	p. 431	1, 2, 3, 4, 5ab (Draw front, right, top, and left for each.), 6ab (Use the dot paper in the text and then make a photocopy.), 7; Also do p. 433 Activity 3 – follow the instructions <i>Bring the kit with you for L5 along with the worksheet for Lesson 5.</i>
6	17.2	<i>Introduction to polyhedra</i>	p. 434	1, 2b, 3, 4, 5bc, 6ab, 7a, 9, 10, 13, 14 <i>Bring isometric dot paper and graph paper for Lesson 6.</i>
7	17.3	<i>Representing and visualizing polyhedra</i>	p. 441	3, 4abc, 5cd, 7, 10ac, 13(Use <u>graph</u> paper to draw all possible pentominoes. Determine the perimeter of each, and answer all questions.), 14a, 16a, 17a, 19bc <i>Bring isometric dot paper for Lesson 7.</i>
8	17.4	<i>Congruent polyhedra</i>	p. 446	1(Use isometric dot paper; Shade 2 cubes to right in I and 2 cubes on top in II), 3, 4, 6, 9(Use unlined paper to draw a LARGE quadrilateral with no equal sides or angles, each side length 5 cm or greater. Draw the second figure upside down.) <i>Bring kit of shapes for Lesson 8.</i>
9	17.5/17.6	<i>Some special polyhedra/dealing with 3D shapes</i>	p. 449	1bdfhjl, 4ac, 6, 7b(Count F, V, E for first figure.), 9ab, 10(Draw a total of 4.) <i>Bring unlined paper, protractor, and ruler for Lesson 9.</i>

10	18.1	<i>Symmetry of shapes in a plane</i>	p. 457	1, 4bdf, 5bde, 6, 7bd, 8bde, 11, 12 <i>Bring kit for lesson 10.</i>
11	18.2/18.3	<i>Symmetry of polyhedra/ Issues for learning: What is the geometry curriculum in the PreK-8 curriculum?</i>	p. 462	2bd, 3bd, 4(Label one vertex 'A'; its opposite vertex 'B'; and the remaining vertices 'C,D,E,F.' Use those to list the vertices or edges or faces that the plane or axis will go through.), 5c, 6(Make two separate drawings for each.), 7, 8, 9; Read p. 463-465 & list 2 geometry parts in the curriculum <i>Bring scissors and unlined paper for Lesson 11.</i>
<i>Exam 1: Monday, February 5, 2018 from 8:00-9:30pm in RAWLS 1086.</i>				
12	19.1	<i>Tessellating the plane</i>	p. 471	2c*(Show two distinct tessellations.), 3a(Start with a 3cm square, use both methods – p. 470 – on the same square, and make 8 copies of your figure to show that it tessellates.), 4*, 6a, 7*(Use the "w" pentomino.) *Use graph paper. <i>Bring kit and scissors for lesson 12.</i>
13	20.1	<i>Similarity and dilations in planar figures</i>	p. 482	1b, 2, 3, 5a*, 6a* (scalene) (* Use vertex for center point), 8, 9bd, 15bd, 17def, 19bdfh, 22
14	20.2	<i>More about similar figures</i>	p. 491	1, 3bd, 4ad(Also ratio of areas.), 5abcd, 6, 7, 8 <i>Print off and bring worksheet for Lesson 15 as well as isometric dot paper.</i>
15	20.3	<i>Similarity in 3D figures</i>	p. 496	4*, 5* (*List dimensions in increasing order), 6, 8, 9, 11, 12, 16, 18ac, 22, 23 <i>Bring a compass starting at lesson 16 until the end of the semester.</i>
16	21.1	<i>Planar curves and constructions</i>	p. 508	1, 2(Use 4cm radius.), 3a, 4ab(Draw figure for b – show lines of symmetry and points of rotational symmetry.), 5cdg(use 4cm radius for each), 6(f is 180°), 8XY
17	21.1	<i>Planar curves and constructions</i>	p. 510	Unlined paper: 9(Each side should be 5 cm or greater.), 10ac, 11a, 12d, 13bd, 15b, 16cd, 19, 20c, 21bd <i>Print off and bring worksheet for Lesson 18. Bring cone and cylinder from kit; scissors and tape.</i>
18	21.2/21.3	<i>Curved surfaces/ Issues for learning: Standards for Mathematical Practice</i>	p. 482	1, 2, 3bc, 4ab, 6bd, 7, 8, 9 Read Vignette 1 p. 519
19	22.1	<i>Some types of rigid motions</i>	p. 525	1, 2, 3, 4, 7 (Make 7 distinct shapes – put matching sides of triangles together.) <i>Bring isometric dot paper and quarter inch dot paper for Lesson 20.</i>

20	22.2	<i>Finding images for rigid motions</i>	p. 530	(Two kinds of dot paper are needed.) 2bce, 4, 5abce, 6abce, 7, 8abc, 10 <i>Print off and bring worksheet for Lesson 21.</i>
21	22.3	<i>A closer look at some rigid motions</i>	p. 535	Unlined paper and dot paper needed: 2, 3ad, 4, 5, 6 <i>Print off and bring 3 worksheets for Lesson 22.</i>
<i>Exam 2: Wednesday, March 7, 2018 from 8:00-9:30pm in RAWLS 1086.</i>				
22	22.4	<i>Composition of rigid motions</i>	p. 541	1, 2(Use a non-symmetrical figure.)bd f(if $a > b$) h, 4bdf, 5(Use unlined paper.), 6b, 7(Just name the rigid motion.), 8, 9a, 13bdf, 16(Do the first part only.) <i>Print off and bring worksheet for Lesson 23.</i>
23	22.5	<i>Transformations and earlier topics</i>	p. 546	1, 2b, 3, 4, 5ac, 6, 8, 10, 11b, 12(Do not use right angles.) <i>Bring centimeter grid paper and tape. Look for the grid paper on the 13900 web page.</i>
24	22.6 & 23.1	<i>Issues for learning: Promoting visualization in the curriculum</i>	p. 549 & 555	p. 515: 1(Google “cross section of a pear” and make 2 drawings/each.), 2, 4(Label the pictures 1, 2, 3 for reference.), 5(Create a core square without rotational symmetry and then create your pattern by rotating it.), 7 p. 521: 1bdfhj, 2bdfhj, 4bcfhjln, 5bdf, 6b, 8bcd, 9efgh, 10
25	23.1	<i>Key ideas of measurement</i>	p. 556	12(no exp), 13, 14acd, 15, 16bdfh, 17bd, 18bd, 19, 22bdf, 23, 25
26	23.2	<i>Length and angle size</i>	p. 564	1c, 3, 4, 5, 6bdhi, 7a(name 10) c(name 6), 9, 12, 14, 16bdfh, 17, 18ac, 20
27	23.2	<i>Length and angle size</i>	p. 566	22b, 24, 25bdf, 26defg, 27bcd, 31, 34a, 35, 39bdf, 40bdf, 41b, 42a, 43
28	24.1	<i>Area and surface area</i>	p. 582	5ab, 6bdfh, 7b, 9bd, 11bd, 12bdfhj, 13b, 14b, 15a, 16, 17, 21a, 26, 28d
29	24.2	<i>Volume</i>	p. 591	1bdfjl, 2bd, 3bdf, 4ac, 6, 7bd, 8bc, 9b, 10bd, 12, 14b, 17, 19bdfhj, 21bd
30	24.3 & 25.1	<i>Issues for learning: measurement of area and volume</i>	p. 597 & 605	p. 597: 1, 2 p. 605: 2bd, 3, 4b, 5, 6, 8b, 9bce, 14, 16ab, 17, 18bdfh <i>Lesson 31 will be located in a computer lab in SC 179</i> <i>Print off and bring worksheet for Lesson 31.</i>
<i>Exam 3: Wednesday, April 11, 2018 from 8:00-9:30pm in RAWLS 1086.</i>				

31	25.1	<i>Circumference, area, and surface area formulas</i>	p. 607	<i>Lesson 31 will be located in a computer lab in SC 179 18ijkl, 19b, 21acfg, 23ab, 24b, 25bd, 26, 29, 35, 37(let r = 10, 13)</i> <i>Bring shape I from kit for Lesson 32</i>
32	25.2	<i>Volume formulas/ Issues for learning: What measurement topics are in the curriculum?</i>	p. 615	2, 3a, 4, 5, 7, 8, 12; Read p. 621-1 and list 2 measurement items for the K-8 curriculum
33	25.2 & 26.1	<i>The Pythagorean Theorem</i>	p. 617 & 627	p. 617: 13, 16, 18bd, 20, 21, 22bd p. 627: 1bc, 2, 3bdf(Give exact answer only.), 4bd, 6bd
34	26.1	<i>The Pythagorean Theorem</i>	p. 628	7, 8, 9(Give exact answer only.), 10a, 13abcde, 14, 15bc, 17(Find all 19 exact lengths.), 18b, 20ab, 22
35	26.2	<i>Some other kinds of measurement</i>	p. 635	4bc, 9, 10ac, 11, 12, 13ab, 16ab, 18a, 20, 23bde, 27b

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