

# Departmental Syllabus

Math 113. Mathematical Reasoning.

Text: *The Heart of Mathematics 2/e* by Burger and Starbird

The schedule plans 32 of the 42 days of instruction for classes which meet three days per week (abbreviated as MWF) and 22 of the 28 days for classes which meet twice a week (abbreviated as TR). The remaining days can be used for exams, review, extra coverage of topics in this syllabus, extra topics from the book, departmental business, or other activities the teacher feels are of value to the class.

Departmental Grading Scale:

Assessment	% of grade	Points
Midterm Exam Total (3 or 4 exams)	50%	240
Written work/Quizzes	25%	120
Other	4.2%	20
Final Exam	20.8%	100
Total:	100%	480

Letter	Points	Letter	Points
A	432–480	C	336–349
A–	417–431	C–	321–335
B+	398–416	D+	302–320
B	384–397	D	288–301
B–	369–383	D–	274–287
C+	350–368	F	0–273

During the semester (in addition to the final exam), there should be three exams for classes that meet twice a week and four exams for classes that meet three times a week. Homework assignments should be based on this syllabus. Teachers may choose how to organize the homework (as short daily assignments, as longer problem sets, or in some other form) and to what extent it is graded or otherwise evaluated. Problems numbered 1–5 are very basic checks of concrete concepts; those numbered 6 and higher should be the focus of the assignments. The most in depth problems are indicated in **bold** on this syllabus.

A project may be included in this course. The project can be a structured activity where students write a paper (and possibly create a poster) explaining a section of the textbook not covered in class or it can be an open-ended assignment in which the students

demonstrate their understanding of a mathematical idea through scholarly or creative means. Other written assignments are also possible.

The “other” category of the grade may come from attendance, participation, effort, or other such incidental scores.

The *Instructor Resources* contains valuable information for planning lessons. Everyone should take advantage of its advice for effectively teaching from this textbook.

**Problem Solving: Chapter 1** (MWF: up to 2 classes, TR: up to 2 classes)

<b>Topic</b>	<b>Homework problems</b>
problem solving	Write up solutions to four problems of teacher’s choice.

Problem solving can be supplemented with additional materials.

**Numbers: 2.1–2.3, 2.6–2.7** (MWF: 7 classes, TR: 5 classes)

<b>Topic</b>	<b>Homework problems</b>
counting and pigeonhole principle	2.1: 1, 2, 8, 15, <b>19</b>
Fibonacci numbers	2.2: 2, 3, 6, 7, 17, <b>28, 30, 37</b>
prime numbers	2.3: 1–5, 7, 12, 14, 15, <b>32, 35</b>
irrational numbers	2.6: 1–5, 6, 10, 15, <b>30</b>
real numbers	2.7: 1–5, 7, 10, 20, 23, 25, <b>36</b>

Optional: To spend more time on this topic, cover 2.4 and/or 2.5

**Infinity: 3.1–3.3** (MWF: 4 classes, TR: 3 classes)

<b>Topic</b>	<b>Homework problems</b>
What is infinity?	3.1: 1, 3, 8, 14, <b>16</b>
one-to-one correspondences	3.2: 14, 16, <b>26</b>
different sizes of infinities	3.3: 1–5, 9, 11, 14, <b>16, 19</b>

Optional: To spend more time on this topic cover 3.4 (power set) and/or 3.5 (geometrical interpretations).

**Geometry 1: 4.1–4.4, 4.7** (MWF: 7 classes, TR: 4 classes)

<b>Topic</b>	<b>Homework problems</b>
Pythagorean Theorem	4.1: 1–5, 6, 12, 15, <b>18</b>
Art Gallery Theorem	4.2: 1–5, 9, 11, <b>20</b>
Golden rectangle	4.3: 1–3, 9, 12, 13, <b>16</b>
symmetry and tilings	4.4: 6, 8, 10, 12, <b>16</b>
Platonic solids	4.5: 1–8
fourth dimension (optional)	4.7: 1–5, 7, 12, 14, <b>16, 18</b>

Optional: To spend more time on this topic cover 4.6 (non-Euclidean geometry).

**Geometry 2: 5.1–5.2, 4.5, 5.3** (MWF: 6 classes, TR: 4 classes)

<b>Topic</b>	<b>Homework problems</b>
rubber sheet geometry	5.1: 3, 4, 6, 9–12, <b>31, 38</b>
nonorientable surfaces	5.2: 1–4, 8, 9, 14, 25, <b>33, 36</b>
Euler characteristic, proof that there are only five Platonic solids	5.3: 1–5, 7, 9, 13, <b>26, 40</b>

**Decision Making: 8.2, 8.3** (MWF 6 classes, TR: 4 classes)

<b>Topic</b>	<b>Homework problems</b>
risk	8.2: 1–5, 6, 10, 11, 13, 15, <b>17, 20, 21, 22</b>
financial math	8.3: 1–3, 8, 9, 11, 12, 15, <b>16, 19</b>

Optional: To spend more time on this topic cover 8.4 (voting)