



## Course Information



# Course Syllabus

## GENERAL INFORMATION

### Instructor Information

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### Course Description:

As a participant in this course you will solve interesting middle school and high school algebra, geometry, and probability problems and investigate the implementation of an explicit problem solving strand in the core curriculum. We will discuss how to support students developing high levels of competence and sophistication with a wide range of mathematical approaches from "guess and check" to "simpler problem" to "analysis of cases."

In the context of this work, and with the aid of research and instructional articles, we will consider some essential questions about problem solving in the K-12 mathematics curriculum.

- What is mathematical problem solving?
- What benefits and concerns arise in making it an explicit strand of the core curriculum?
- What are the core mathematical problem solving strategies that should be at the heart of such a curriculum?
- What does it look like to develop a deep and mathematical understanding of strategies such as: understanding the problem, guess and check, tables and patterns, changing the representation, simpler problem, cases, logic, and working backwards?
- What are the challenges that students face and what developmental trajectories might students follow in learning each of these strategies?
- What kind of teaching and learning environment best supports process and strategy-oriented instruction?
- What's the relationship between the development of mathematical communication and problem solving competence?
- How might technology support or enhance the problem solving process or the learning of strategies?

### Required Texts and Materials:

*You do not need to purchase any texts for this course.* All readings will be available for download except for the NCTM Standards. If you are not an NCTM member and do not have access to the print form of this document, you can sign up for 120-day free access to the full *Principles and Standards* online at <http://standards.nctm.org/> .

We do recommend Polya's *How to Solve It* and NCTM's *Focus in High School Mathematics: Reasoning and Sense Making* as good resources for thinking about mathematical problem solving and related instructional approaches.

## COURSE SPECIFICS

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### Typical Unit:

\*\*\* NOTE: The next week's material will be made available by each **Wednesday @ Noon** \*\*\*

- **Problem Solving:** Most weeks will have a focal strategy to investigate and a set of problems from which to choose at least two that you will use to explore and practice the strategy. Problem solving will be done "privately" until Sunday, at which point you will be asked to reflect on the work of at least two colleagues. Note: the emphasis is on trying to use the featured method, not on getting an answer.
- **Readings:** Each week, there will be a document or two from the Math Forum's *Problem Solving and Mathematical Communication Activity Series*. There will also be a short article or two from a research or teaching journal, covering one or more of the essential questions.
- **Discussions:** On most weeks there will be two discussions, one focused on the featured problem solving strategy and the other relating the readings to one or more of the essential questions.
- **Project, etc.:** Beginning about the 5th week, there will be tasks associated with the final project (graduate credit students only). Other activities may arise out of course activity or suggestions you make.

### Weekly Task List

The first item in each week is a "Weekly Task List" that summarizes the key activities and due dates for the week. Please be sure to review this list at the beginning of each week.

*NOTE: There are usually two deadlines per week – Tuesday @ midnight and Saturday @ midnight. These days were selected to allow people to work in shorter "bursts" throughout the week or in more marathon sessions on one particular day and to engender effective online interactions.*

## GRADING

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### Weekly Participation: Discussions and Activities

**Discussion Boards & Blogs:** The primary way we will interact throughout this course is in discussion boards and blogs. Each week, you will receive a grade that is based on your problem solving, including the reflections and feedback on your colleagues' work, and on participation in the discussions. There will be 10 points for the problem solving and 10 points for the discussions. Points will be distributed evenly in the two areas:

1. **Completion and Timeliness:** Your work will be graded based on completing the appropriate problem solving, feedback, and discussion posts by the specified deadlines.
2. **Quality:** Your work will also be graded based on the quality of the submission.
  - clarity and thoroughness
  - responds directly to the stated topic (make sure the problem solving blogs focus on exploring the featured method for that week as presented in the strategy reading)
  - is substantive on points of mathematics, learning, or instruction
  - is supportive and constructive in feedback

Your post should meet *all* of these criteria.

## Final Project

Those taking the course for graduate credit will have a final paper/project of 8-10 pages, developing and exploring one or more of the essential questions (additional questions can be proposed for the list).

## Calculating your Grade

The weekly problem solving and discussion participation (in terms of completeness and quality) count for **80%** of the grade and the final project counts for **20%**.

## Grading Scale

A+ > 97	B+ 87-89	C+ 77-79	D+ 67-69
A 93-96	B 83-86	C 73-76	D 63-66
A- 90-92	B- 80-82	C- 70-72	D- 60-62
			F <60

## Weekly topics:

(Each week will feature a problem solving strategy and discuss some aspect of the essential questions around teaching problem solving. What follows is a partial listing. Changes in strategy focus and discussion topic are possible and suggestions are welcome.)

### Week 1

Strategy: Understanding the Problem

Teaching topic: Goals in teaching problem solving

### Week 2

Strategy: Guess and Check

Teaching topic: Mathematical communication: writing and accountable talk

### Week 3

Strategy: Tables and Patterns

Teaching topic: A look at story, context and math dialogue in the problem solving classroom

### Week 4

Strategy: Simpler Problem

Teaching topic: Teachers' beliefs. Implementing a problem solving approach.

### Week 5

Strategy: Change the Representation

Teaching topic: The use of multiple representations in problem solving instruction

### Week 6

Strategy: Using Cases

Teaching topic: Teaching problem solving and low performing students

### Week 7

Strategy: Logic

Teaching topic: A critique of teaching of general problem solving. Teaching students concrete language for solving problems together.

### Week 8

Strategy: Working Backwards