Standards and outcomes and grades, oh my!

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Homework

Alice: 10 10 10   0   0

Bob: 6   6   6   6   6

Standards Based Grading (SBG)

SBG in a nutshell:

- Define learning objectives (**standards**)
- Explicitly test standards on each assessment
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My SBG goals: Students will. . .
- Clearly demonstrate progress/knowledge
- Take ownership of grades and progress
- Receive meaningful participation and writing assessment.

Math 5251: Error Correcting Codes & Finite Fields

- Advanced undergraduate / beginning graduate
- Prereqs: 2 semesters of sophomore level math
- Not a prereq for *anything*

The class

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Existing class setup:

- Semi-flipped (Pre-class readings and responses)
- Active, problem-based
- Homework, quizzes, exams

Standards structure the course

5 Standards:

- Mathematical Tools — *Non-coding-specific background*
- Noiseless Coding — *Information theory*
- Noisy Coding — *Error detection and correction*

- Communicating Math — *Justification, organization, proof style*
- Student Success — *Attendance, homework, office hours*

Master all 5 standards to pass

Standards have *topics*

Topic $\approx$ one section of material

[MT] Mathematical Tools:

[MT-N] Numbers & Counting
[MT-P] Probability
[MT-O] Polynomials
[MT-A] Algebraic structures
[MT-F] Fields
[MT-L] Linear Algebra

Assessments

Every question assesses *topics*:

> **1.** [MT-O] [MT-F] Is $x^2 + 4x + 2$ irreducible over $\mathbb{F}_5$?

Mastery is all-or-nothing ($\checkmark$ or $\times$)

Basic topics: Computations, calculations *Quizzes, in-class exams*

Advanced topics: Concepts, proofs *Homework, take-home exams*

> **2.** [MT-O+] Prove: Let $p(x) \in \mathbb{F}[x]$ be a polynomial.
> Then $p(a) = 0$ if and only if $(x - a) \mid p(x)$.

Grades

Mastering a *standard* requires:

- 3 ✓ in every topic
- . . . at least one on an exam

Earn grades by *leveling up:*

Grades

Mastering a *standard* requires:
- 3 ✓ in every topic
- . . . at least one on an exam

Earn grades **through mastery:**

D: 3+ basic standards

C: 5 basic standards

B: . . . plus 2+ advanced standards

A: . . . plus 4+ advanced standards

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- Student conversations   *"I seem to be having trouble with the fundamentals"*

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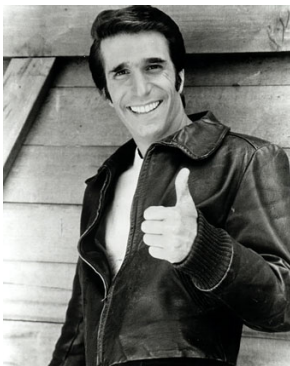**?** Meaningful participation and writing assessment

Other advice and reflections

- Propagandize, evangelize, personalize!

- Complexity and the Magic Gradebook

- Make sure your standards match your goals. . .
  . . . because your students will focus on them!

Happy Sonya Kovalevsky Day!

Born January 15, 1850

Happy "Happy Days" Day, eh?

Premiered January 15, 1974

First	Quiz Week 8											
	MT-A	MT-A	MT-A+	NY-L	MT-L	MT-A	CM-J	CM-O	CM-C	CM-M+	CM-S+	CM-E+
Alice				x	x	x						
Bill												
Charlene	x	x	x	x	x	x						
David Jr.			x		x	x				x		
Elanore	x	x	x	x	x	x						
Frank		x	x		x	x						
Geraldine				x	x	x						
Hans	x	x	x	x	x	x						
Ingrid	x	x	x	x	x	x	x	x	x			
Jerry												
Katie	x	x	x	x	x	x						
Larry				x	x	x						
Melissa		x		x	x	x						
Nick		x		x		x						
Olivia		x	x					x				

The Magic Gradebook

	MT Basic												MT Advanced												MT
	MT-N	ex	MT-P	ex	MT-A	ex	MT-F	ex	MT-O	ex	MT-L	ex	MT-N+	ex	MT-P+	ex	MT-A+	ex	MT-F+	ex	MT-O+	ex	MT-L+	ex	**MT**
Opportunities	13	4	12	6	12	3	18	8	16	8	12	5	11	4	9	4	10	2	12	7	12	6	9	4	
Alice	12	X	7	X	8	X	10	X	8	X	9	X	8	X	5	X	3	X	6	X	6	X	7	X	ADV
Bob	7	X	7	X	7	X	10	X	7	X	7	X	9	X	5	X	3	X	6	X	3	X	6	X	ADV
Charlene	8	X	7	X	9	X	9	X	9	X	9	X	9	X	5	X	6	X	6	X	7	X	6	X	ADV
David Jr.	10	X	7	X	9	X	8	X	9	X	6	X	9	X	7	X	6	X	5	X	6	X	5	X	ADV
Elanore	11	X	7	X	10	X	13	X	9	X	7	X	8	X	4	X	6	X	8	X	4	X	4	X	ADV
Frank	5	X	3	X	9	X	8	X	5	X	7	X	4	X	3	X	3	X	5	X	5	X	6	X	ADV
Geraldine	5	X	5	X	7	X	11	X	10	X	6	X	8	X	5	X	4	X	5	X	5	X	6	X	ADV
Hans	12	X	8	X	12	X	14	X	10	X	9	X	9	X	8	X	9	X	8	X	8	X	7	X	ADV
Ingrid	5	X	3	X	10	X	7	X	4	X	8	X	3	X	4	X	8	X	4	X	3	-	5	X	BAS
Jerry	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	-
Katie	10	X	8	X	9	X	12	X	10	X	10	X	10	X	7	X	9	X	6	X	8	X	7	X	ADV
Larry	5	X	7	X	5	X	7	X	5	X	5	X	5	X	3	X	3	X	1	-	2	X	2	X	BAS
Melissa	8	X	6	X	8	X	9	X	8	X	6	X	5	X	4	X	3	X	3	X	2	X	6	X	BAS
Nick	9	X	7	X	9	X	8	X	8	X	6	X	6	X	7	X	3	X	3	X	4	X	6	X	ADV
Olivia	4	X	5	X	4	X	1	X	2	X	2	X	3	X	3	X	2	-	0	-	0	-	2	-	-