STANDARDS-BASED GRADING IN A DIFFERENTIAL EQUATIONS COURSE

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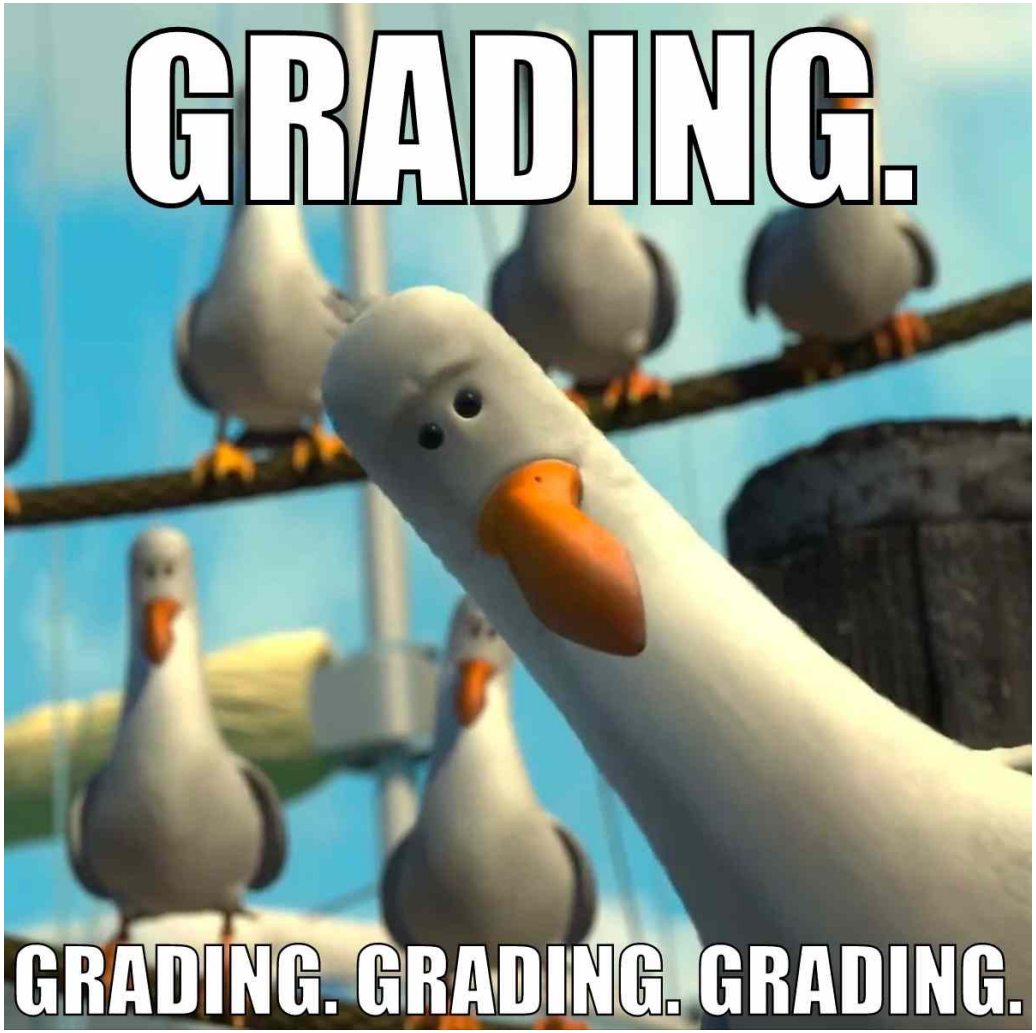

GRADING.
GRADING. GRADING. GRADING.

THE HISTORY OF GRADING

- Harvard (1646): Required exit exams to earn degree
- Yale (1785): Optimi, second Optimi, Inferiores, and Perjores
- Horace Mann (1846): Written examinations and report cards
- Mount Holyoke (1884): A, B, C, D, E

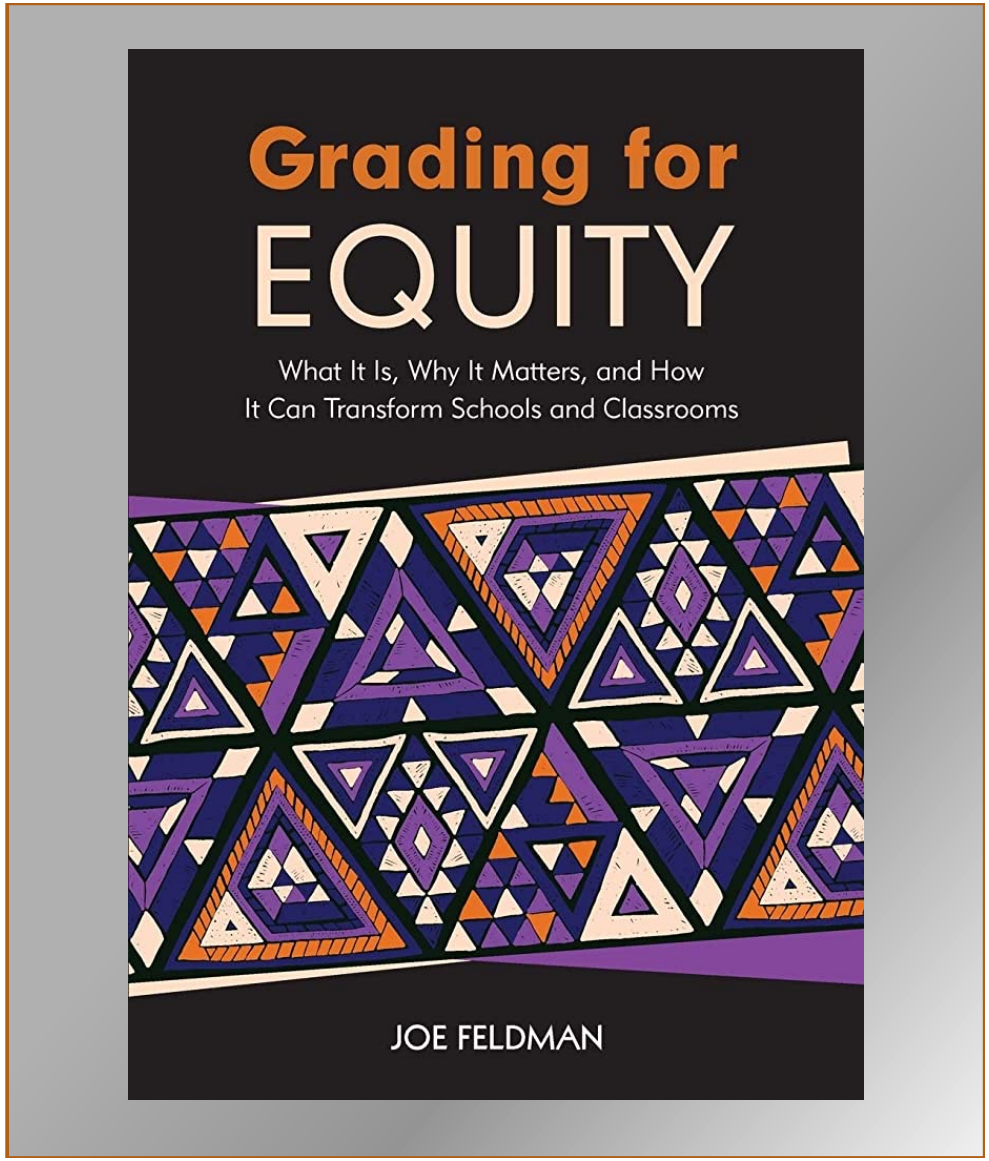
WHAT DO WE MEASURE WITH GRADES?

WHAT DO WE MEASURE WITH GRADES?

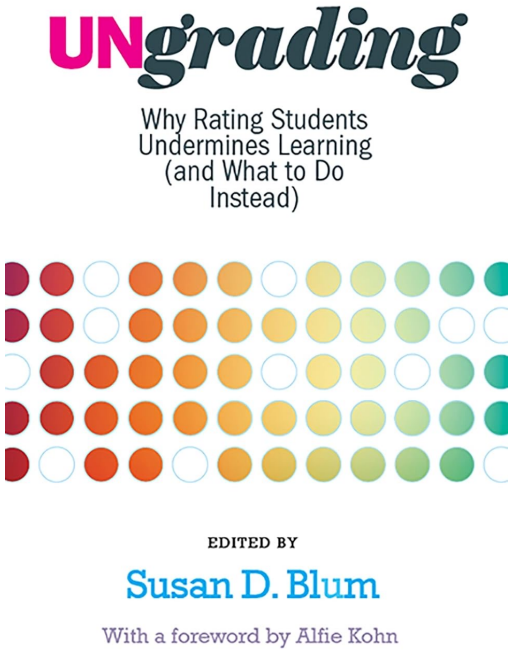
- Mastery of course content
- Ability to apply knowledge or transfer to a different domain
- Retention of knowledge
- Engagement in class, attendance and participation
- Effort
- Submitting work in a timely manner
- Written and oral communication skills

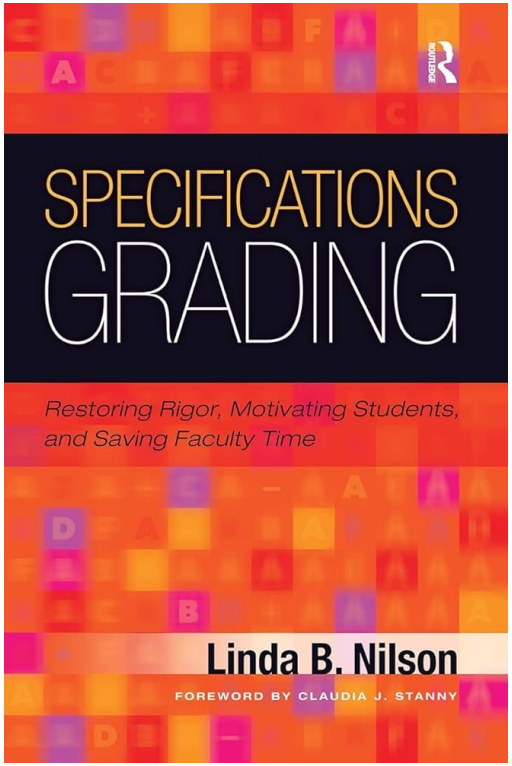
EQUITABLE GRADING

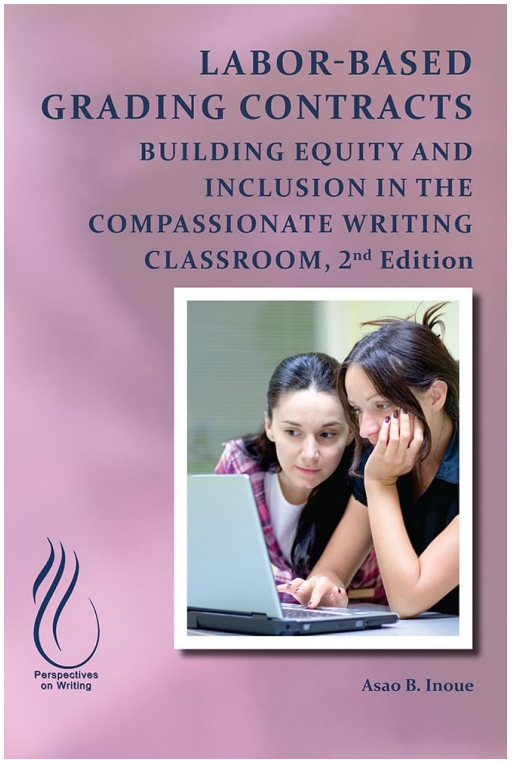
- Accuracy
- Bias-Resistance
- Intrinsic Motivation

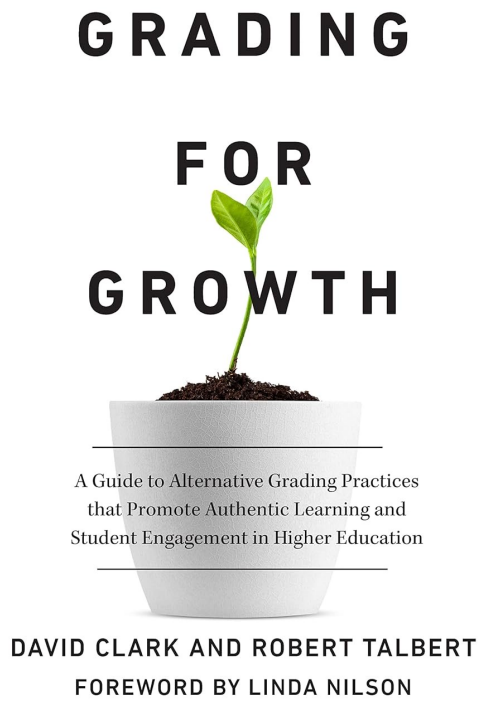


ALTERNATIVE FORMS OF GRADING









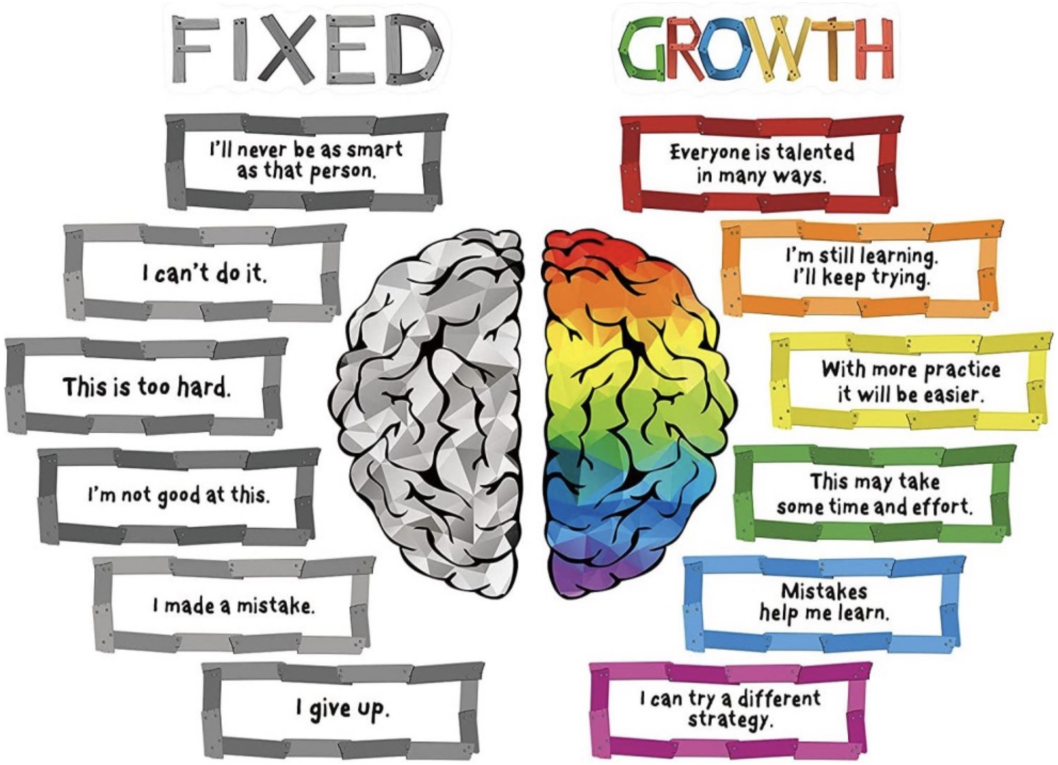
Forms of Alternative Grading

- Ungrading
- Specifications Grading
- Contract Grading
- Standards-Based Grading

AFTER THE EXAM…

FOUR PILLARS OF GRADING FOR GROWTH

Clark, David & Talbert, Robert (2023). *Grading for Growth*. Routledge.



UPDATED EDITION

CAROL S. DWECK, Ph.D.

mindset

THE NEW PSYCHOLOGY OF SUCCESS

HOW WE CAN LEARN TO FULFILL OUR POTENTIAL

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- *business*
- *school*
- *relationships*

"Through clever research studies and engaging writing, Dweck illuminates how our beliefs about our capabilities exert tremendous influence on how we learn and which paths we take in life."
—Bill Gates, *GatesNotes*

STANDARDS FOR DIFFERENTIAL EQUATIONS

1. I can find the general solution to a homogeneous second order constant ODE with constant coefficients.
2. I can model the populations of two interacting populations with a system of ODEs.
3. I can use the Laplace transform to solve IVPs that involve discontinuous functions.
4. I can sketch and interpret a bifurcation diagram.

Differential Equations Standards

Module C: How can we solve and apply linear constant coefficient ODEs?

☐ ☐ **C1. Constant coefficient first order.** I can find the general solution to a first order constant coefficient ODE.

☐ ☐ **C2. Modeling motion in viscous fluids.** I can model the motion of a falling object with linear drag

☐ ☐ **C3. Homogeneous constant coefficient second order.** I can find the general solution to a homogeneous second order constant coefficient ODE.

☐ ☐ **C4. IVPs.** I can solve initial value problems for constant coefficient ODEs

☐ ☐ **C5. Non-homogenous constant coefficient second order.** I can find the general solution to a non-homogeneous second order constant coefficient ODE

☐ ☐ **C6. Modeling oscillators.** I can model (free or forced, damped or undamped) mechanical oscillators with a second order ODE

Module F: How can we solve and apply first order ODEs?

☐ ☐ **F1. Sketching trajectories.** I can given a slope field, sketch a trajectory of a solution to a first order ODE

☐ ☐ **F2. Separable ODEs.** I can find the general solution to a separable first order ODE

☐ ☐ **F3. Modeling motion.** I can model the motion of an object with quadratic drag

☐ ☐ **F4. Autonomous ODEs.** I can find and classify the equillibria of an autonomous first order ODE, and describe the long term behavior of solutions

☐ ☐ **F5. First order linear ODEs.** I can find the general solution to a first order linear ODE

☐ ☐ **F6. Exact ODES.** I can find the general solution to an exact first order ODE

Module S: How can we solve and apply systems of linear ODEs?

☐ ☐ **S1. Solving systems.** I can solve systems of constant coefficient ODEs

☐ ☐ **S2. Modeling interacting populations.** I can model the populations of two interacting populations with a system of ODEs

☐ ☐ **S3. Modeling coupled oscillators.** I can model systems of coupled mechanical oscillators using a system of ODEs

Module N: How can we use numerical approximation methods to apply and solve unsolvable ODEs?

☐ ☐ **N1. First Order Existence and Uniqueness.** I can determine when a unique solution exists for a first order ODE

☐ ☐ **N2. Second Order Linear Existence and Uniqueness.** I can determine when a unique solution exists for a second order linear ODE

☐ ☐ **N3. Systems Existence and Uniqueness.** I can determine when a unique solution exists for a system of first order ODEs

☐ ☐ **N4. Euler's method for first order ODES.** I can use Euler's method to find approximate solution to first order ODEs

☐ ☐ **N5. Euler's method for systems.** I can use Euler's method to find approximate solutions to systems of first order ODEs

Module D: How can we solve and apply ODEs involving functions that are not continuous?

☐ ☐ **D1. Laplace Transform.** I can compute the Laplace transform of a function

☐ ☐ **D2. Discontinuous ODEs.** I can solve initial value problems for ODEs with discontinuous coefficients

☐ ☐ **D3. Modeling non-smooth motion.** I can model the motion of an object undergoing discontinuous acceleration

☐ ☐ **D4. Modeling non-smooth oscillators.** I can model mechanical oscillators undergoing discontinuous acceleration

Taken from Drew Lewis, University of South Alabama

GRADE BOOK WITH STANDARDS

		C1	C2	C3	C4	C5	C6	F1	F2	F3	F4	F5	F6	S1	S2	S3	N1	N2	N3	N4	N5	D1	D2	D3	D4
Blackwell	David																								
Cartwright	Mary																								
du Châtelet	Émilie																								
Euler	Leonhard																								
Germain	Sophie																								
Jingrun	Chen																								
Lovelace	Ada																								
Ramanujan	Srinivasa																								

GRADE BOOK WITH STANDARDS

		Exam 1																						
		C1	C2	C3	C4	C5	C6	F1	F2	F3	F4	F5	F6	S1	S2	S3	N1	N2	N3	N4	N5	D1	D2	D3	D4
Blackwell	David																								
Cartwright	Mary																								
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Euler	Leonhard																								
Germain	Sophie																								
Jingrun	Chen																								
Lovelace	Ada																								
Ramanujan	Srinivasa																								

MARK EACH PROBLEM WITH A “P” OR AN “N”

GRADE BOOK WITH STANDARDS

		Exam 1																						
		C1	C2	C3	C4	C5	C6	F1	F2	F3	F4	F5	F6	S1	S2	S3	N1	N2	N3	N4	N5	D1	D2	D3	D4
Blackwell	David	N	P	P	P																				
Cartwright	Mary	P	P	N	P																				
du Châtelet	Émilie	P	P	P	P																				
Euler	Leonhard	P	N	P	P																				
Germain	Sophie	P	P	P	P																				
Jingrun	Chen	N	P	P	P																				
Lovelace	Ada	P	P	N	P																				
Ramanujan	Srinivasa	P	N	P	P																				

Ada Lovelace's Progress

Exam 1. Passed: **C1**, **C2**, **C4** Not Yet: **C3**

Exam 2. Passed: **C3**, **C5**, **C6**, **F1** Not Yet: **F2**

Exam 3. Passed: **F3**, **F4**, **F5**, **F6** Not Yet: **F2**, **S1**

GRADE BOOK WITH STANDARDS

						Exam 2																			
		C1	C2	C3	C4	C5	C6	F1	F2	F3	F4	F5	F6	S1	S2	S3	N1	N2	N3	N4	N5	D1	D2	D3	D4
Blackwell	David	N	P	P	P																				
Cartwright	Mary	P	P	N	P																				
du Châtelet	Émilie	P	P	P	P																				
Euler	Leonhard	P	N	P	P																				
Germain	Sophie	P	P	P	P																				
Jingrun	Chen	N	P	P	P																				
Lovelace	Ada	P	P	N	P																				
Ramanujan	Srinivasa	P	N	P	P																				

Ada Lovelace's Progress

Exam 1.	Passed: C1, C2, C4	Not Yet: C3
Exam 2.	Passed: C3, C5, C6, F1	Not Yet: F2
Exam 3.	Passed: F3, F4, F5, F6	Not Yet: F2, S1

GRADE BOOK WITH STANDARDS

		Exam 2																						
		C1	C2	C3	C4	C5	C6	F1	F2	F3	F4	F5	F6	S1	S2	S3	N1	N2	N3	N4	N5	D1	D2	D3	D4
Blackwell	David	N	P	P	P	P	P	P	N																
Cartwright	Mary	P	P	P	P	N	P	P	N																
du Châtelet	Émilie	P	P	P	P	P	N	P	P																
Euler	Leonhard	P	P	P	P	P	P	N	P																
Germain	Sophie	P	P	P	P	P	P	P	P																
Jingrun	Chen	N	P	P	P	P	P	P	P																
Lovelace	Ada	P	P	P	P	P	P	P	N																
Ramanujan	Srinivasa	P	N	P	P	P	N	P	N																

Ada Lovelace's Progress

Exam 1.	Passed: C1, C2, C4	Not Yet: C3
Exam 2.	Passed: C3, C5, C6, F1	Not Yet: F2
Exam 3.	Passed: F3, F4, F5, F6	Not Yet: F2, S1

GRADE BOOK WITH STANDARDS

										Exam 3															
		C1	C2	C3	C4	C5	C6	F1	F2	F3	F4	F5	F6	S1	S2	S3	N1	N2	N3	N4	N5	D1	D2	D3	D4
Blackwell	David	N	P	P	P	P	P	P	N																
Cartwright	Mary	P	P	P	P	N	P	P	N																
du Châtelet	Émilie	P	P	P	P	P	N	P	P																
Euler	Leonhard	P	P	P	P	P	P	N	P																
Germain	Sophie	P	P	P	P	P	P	P	P																
Jingrun	Chen	N	P	P	P	P	P	P	P																
Lovelace	Ada	P	P	P	P	P	P	P	N																
Ramanujan	Srinivasa	P	N	P	P	P	N	P	N																

Ada Lovelace's Progress

Exam 1.	Passed: C1, C2, C4	Not Yet: C3
Exam 2.	Passed: C3, C5, C6, F1	Not Yet: F2
Exam 3.	Passed: F3, F4, F5, F6	Not Yet: F2, S1

GRADE BOOK WITH STANDARDS

										Exam 3																
		C1	C2	C3	C4	C5	C6	F1	F2	F3	F4	F5	F6	S1	S2	S3	N1	N2	N3	N4	N5	D1	D2	D3	D4
Blackwell	David	P	P	P	P	P	P	P	N	P	N	P	P	P											
Cartwright	Mary	P	P	P	P	N	P	P	N	P	N	P	P	P											
du Châtelet	Émilie	P	P	P	P	P	P	P	P	P	P	N	P	P											
Euler	Leonhard	P	P	P	P	P	P	N	P	P	P	P	P	N											
Germain	Sophie	P	P	P	P	P	P	P	P	P	P	N	P	P											
Jingrun	Chen	P	P	P	P	P	P	P	P	P	N	P	P	P											
Lovelace	Ada	P	P	P	P	P	P	P	N	P	P	P	P	N											
Ramanujan	Srinivasa	P	N	P	P	P	N	P	N	P	P	P	N	N											

Ada Lovelace's Progress

Exam 1.	Passed: C1, C2, C4	Not Yet: C3
Exam 2.	Passed: C3, C5, C6, F1	Not Yet: F2
Exam 3.	Passed: F3, F4, F5, F6	Not Yet: F2, S1

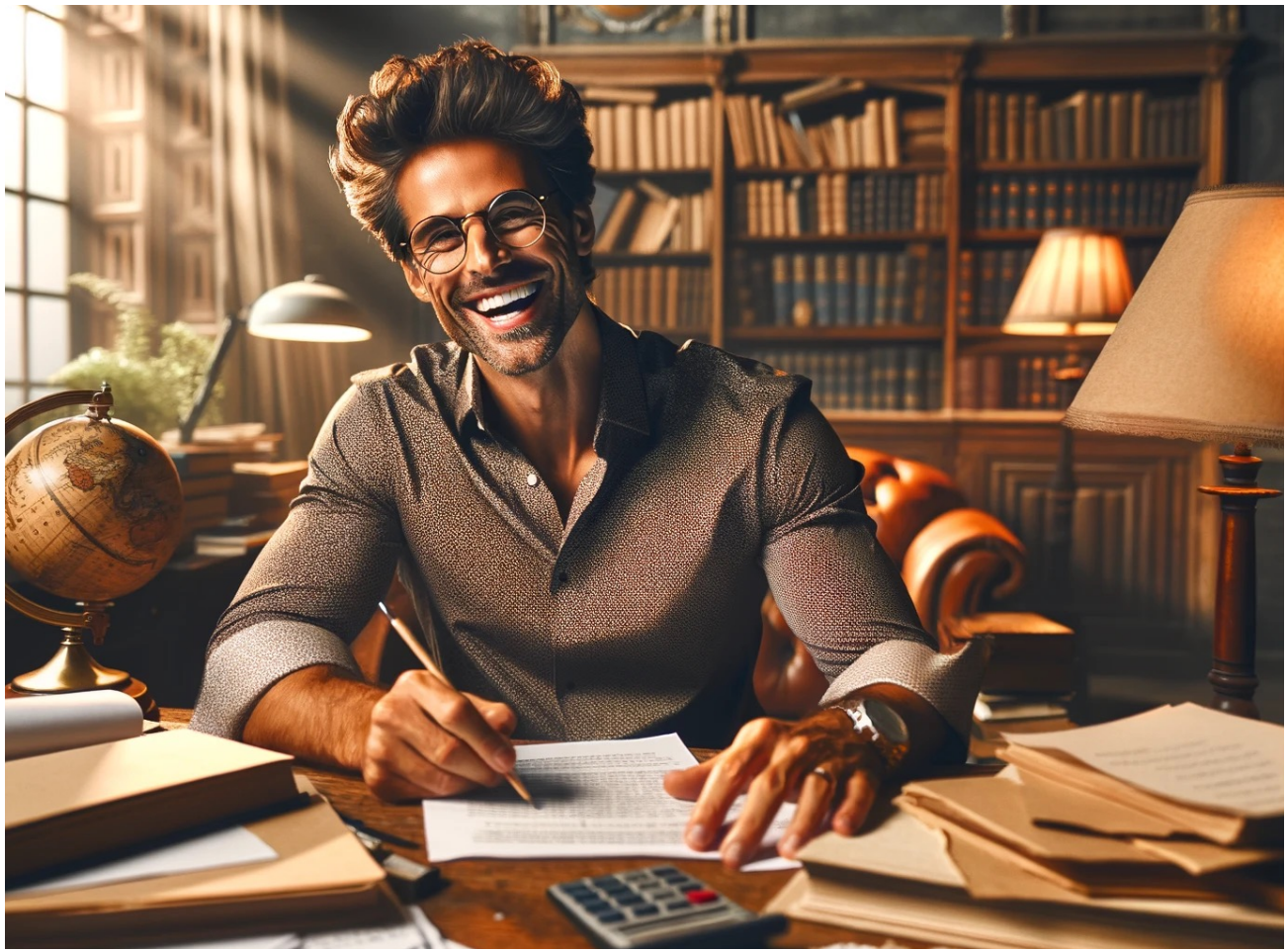
GRADING RUBRIC*

* This is overly simplified. Additional modes of assessment such as group projects are highly encouraged.

Grade	Standards (out of 24)
A	23
A-	22
B+	21
B	20
B-	19
C+	18
C	17
C-	16
D	15

How has this changed the class?


Nelson
Marlon



How has this changed the class?

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Registration is $50 for regular registration. Graduate students or others who need a reduced registration rate, please see the "Pay What You Can" option at the end of the registration form.

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FAQ | Resources

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