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# Specifications Grading in a First Course in Abstract Algebra

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# Specifications Grading in a First Course in Abstract Algebra

## **Abstract**

Specifications grading offers an alternative to more traditional, points-based grading and assessment structures. In place of partial credit, students are assessed pass/fail on whether or not they have achieved the learning outcomes being assessed on a given piece of work according to certain specifications, with limited opportunities for revision of non-passing work. This talk will describe the learning outcomes and specifications grading system I used in my Fall 2016 abstract algebra course, as well as student responses.

## **Keywords**

abstract algebra, testing, learning, college students

## **Disciplines**

Algebra | Higher Education

## **Comments**

Presented at the 2017 Joint Mathematics Meetings in Atlanta, Georgia, on January 4, 2017.

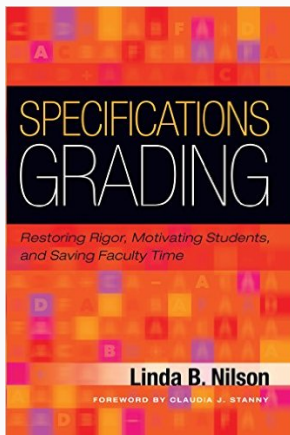
# SPECIFICATIONS GRADING IN A FIRST COURSE IN ABSTRACT ALGEBRA

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Mike Janssen  
Dordt College  
JMM 2017, Atlanta GA  
January 4, 2017

# INTRODUCTION

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## THE MAIN QUESTION

*What do you want students to learn, and how will you know when they've learned it?*

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*What do you want students to learn, and how will you know when they've learned it?*

Or:

*What are the (explicit) student learning targets, and what assessments will you use to gauge student progress toward mastering these learning targets?*

Grade your assessments Pass/No Pass according to set *specifications*, allowing sufficient opportunities for revision, according to whether students have met the learning targets.



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- Solutions to proofs and problems should be free of errors.
- If you wish to use a result we have not proved in class or you have not proved on an earlier homework problem, it should be stated as a lemma and proved independently.
- All solutions must be typeset using the free, open-source mathematical typesetting system,  $\text{\LaTeX}$ .

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The specifications are designed to encourage *self-regulation*: metacognition, strategic planning, and evaluating personal progress against a standard.

- Assign final grades by counting the amount/depth of work completed at a satisfactory level; more hurdles or higher hurdles (or both)?
- Students are encouraged to choose their grade goal and *only do the work they need to do in order to achieve that goal.*

## MY COURSE

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*The mathematical content on which I wanted students to demonstrate competency.*

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- **Example:** “R5 – I can determine whether a given subset of a ring is an ideal.”
- **Example:** “G2 – I can verify elementary properties of groups using basic definitions.”

## DEMONSTRATING CONTENT COMPETENCY

Each content objective assessed twice:

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1. First time: 1–3 problems on regular weekly homework assignments
  - Collaboration encouraged
  - Problems tagged with learning target (usually one target/problem)
  - Must earn passing designations on all problems tagged with a given learning target in order to earn credit
  - One free revision allowed on learning targets given good faith effort



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  - One free revision allowed on learning targets given good faith effort
2. Second time: 1 problem on take-home exam
  - No collaboration allowed
  - One free revision allowed on learning targets given good faith effort

## MATHEMATICAL PRACTICE TARGETS (5)

*The habits I want my students to develop.*

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*The habits I want my students to develop.*

- **Example:** “P3 – I worked on a homework problem outside of class with at least one other person on at least three different occasions.”

Demonstrated competency by noting it in their writeup.

## MATHEMATICAL PRACTICE TARGETS (5)

*The habits I want my students to develop.*

- **Example:** “P3 – I worked on a homework problem outside of class with at least one other person on at least three different occasions.”

Demonstrated competency by noting it in their writeup.

- **Example:** “P4 – I was stuck on a problem but got unstuck by reading the book on at least three different assignments.”

Demonstrated competency by writing a footnote explaining in 2–3 sentences what they had learned by reading the book.

- Copious feedback given on initial submissions – where it went wrong, and a nudge in the direction of a correct solution
- Revisions due one week after initial feedback, re-uploaded to LMS
- Students given tokens to use to extend deadlines, get a second (or third) revision, or revise non-GFE work

## FINAL GRADES (SIMPLIFIED)

Grade	Homework (43)	Exams (38)	Reflections
A	41	27	6
B	39	21	5
C	37	17	4
D	31	14	3

## PLANNING FOR THE FUTURE

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- Refine learning targets: clearer and more specific.
- Introduce higher-order tasks for A/B students
- Incorporate active/flipped learning work (GFE)



- Enforce the specifications early and often (and ruthlessly!); this is where the rigor lives.
- Teach the class once traditionally first and write learning targets as you go for next time (what do you *really* value?)
- Submit work electronically when possible to more easily manage the flow of student work in and out and back in
- Leave time for revision at the end of the semester (little/no new material or work the last week)

THANKS!

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