

Reforming an Introduction to
Modern Algebra

(Preliminary Report)

Jeffrey L. Hirst

Appalachian State University

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The Course

MAT 3110 Introduction to Modern Algebra (3 credits)

Text: *Elements of Modern Algebra*, Gilbert and Gilbert

Topics: Number theory, modular arithmetic, groups, homomorphisms, isomorphisms, normal subgroups, quotient groups, rings, fields.

Population: 25 students; 12 mathematics education majors, 7 mathematics majors, 5 math double majors (e.g. math and CS)

Prerequisites: Calculus and Linear Algebra

Common difficulty: Limited prior experience with proof writing.

Distribution of time and points

Time:

150 minutes per week

60 minutes lecture

15 minutes quiz

75 minutes problem session

Points:

29% Homework (12 homework sets)

29% Two stage quizzes (12 quizzes)

14% Midterm exam (75 minute exam)

21% Final exam (2.5 hour exam)

7% Portfolio problems (10 problems)

Synergy

Two stage quizzes

Help students locate and correct gaps in understanding.

Improve homework performance.

Prepare students for “short answer” questions on exams.

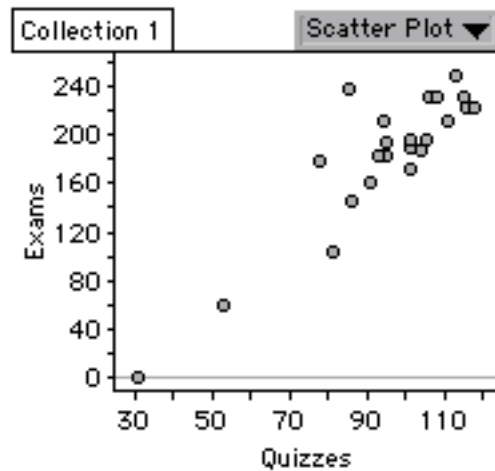
Portfolio problems

Emphasize techniques of proofs.

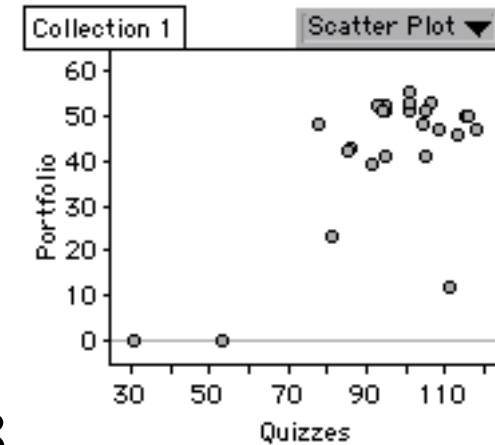
Provide a natural list of important concepts on exams.

Correlations

r squared	Homework	Quizzes	Portfolio	Exams
Homework	1	0.74	0.84	0.75
Quizzes		1	0.48	0.8
Portfolio			1	0.55
Exams				1



$r^2=0.80$



$r^2=0.48$

Student evaluations

Written comments

	Negative	No Comment	Positive
Problem sessions	0	3	19
2-stage Quizzes	2	6	14
Portfolio	1	14	7

Problem sessions gave a degree of concrete, immediate feedback unusual in a proofs course, and greatly assisted my rapid mastery of the the concepts and techniques required in this course. Two-stage quizzes served a similar function.

[The problem sessions] gave me a chance to work problems out for myself, but I also had the teacher / other students there if needed.

I would have been lost months ago if it weren't for the problem sessions.

Two-stage quizzes helped a lot because you learn from your mistakes and this made me realize where I had messed up and what I needed to know better. [The] portfolio gave examples to study and made the proofs stick in my memory.

[This] format really allows for great interaction between students and between [the] students and [the] teacher. You get both a presentation and [a] kinesthetic learning environment...

The problem sessions were immensely helpful and valuable by providing opportunities for us to apply concepts immediately in class with the synergy of having our peers and instructor close by to help each other past road blocks and increase the number of aha! moments.

Although I initially was turned off by the two-stage quizzes, I grew to like them because they kept me up-to-date with coursework and forced me to stay current weekly on the material.

...the proof portfolio seemed like a burdensome chore at first, but learning how to use LaTeX was helpful and not something that I would likely have done on my own. Having a personal portfolio of high quality, formal proofs representing a variety of styles is not only useful to me professionally, but also a project that I am proud of. Thanks!

The problem sessions were very helpful. They allowed for a more interactive teaching-learning environment.