

Capstone Prerequisite Portfolio Description

Salve Regina University
Department of Mathematical Sciences
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The capstone course is a graduation requirement for all math majors and is offered in the fall of the senior year. The prerequisite for entry into this course is the completion of a portfolio demonstrating proficiency in each of the four identified learning outcomes of the math major (attached to this document). Students should begin working on this portfolio in freshman year. They will continue to add to their portfolios during sophomore and junior years. Portfolios will be periodically reviewed by the math faculty and a final assessment will occur during the summer prior to the senior year. Portfolios will include three sections, each targeting one of the first three outcomes. The fourth outcome (communicating mathematics) is also assessed in each of the three sections. Portfolios should demonstrate depth and breadth of mathematical knowledge as well as personal growth over the undergraduate career.

Outcome 1 (& Outcome 4)

Students provide evidence of proficiency by communicating their solutions to “standard problems”.

The **seven** courses listed below are designated as relevant courses:

- Calculus I, II, III, & IV
- Linear Algebra
- Differential Equations
- Scientific Programming

The instructors of these seven courses will designate certain problems on homework assignments and exams that are considered “standard problems” in the undergraduate curriculum.

From each of the **seven*** courses, choose **two** standard problems to include in your portfolio. The fourteen problems chosen for your portfolio should:

- demonstrate a wide variety of mathematical content knowledge
- demonstrate intellectual growth throughout each course and your undergraduate education
- reflect your unique academic work written in your own words, in accordance with the university academic honor code. You should use only official course materials and your instructor as reference, unless otherwise directed by your instructor. No part of your solution should be copied from other sources.

For each of your **fourteen** problems, your portfolio should include:

- completed cover sheet
- first draft
- instructor feedback: either formal (a marked copy of an exam or homework) or informal (notes from office hours or an email exchange)
- final draft which is complete, correct, and demonstrates proficiency according the accompanying rubric

*Students need only submit standard problems from courses taken while enrolled at Salve Regina. For example, if a student entered the program with AP Credit for Calculus I, they should submit examples from the remaining six courses.

Standard Problem Cover Sheet

Course: _____

Instructor: _____

Semester: _____ Year: _____

Original Problem Statement:

What strategy did you apply and why did you choose this method?

How did you check the validity of your solution?

What does this problem demonstrate about your growth/achievement as a math major?

Rubric for Standard Problem Solving

Characteristic	Proficient	Developing	Missing/Incorrect
Understanding the Problem	Complete understanding of the problem; can solve the problem.	Some understanding; can solve part of the problem.	No understanding; cannot start the solution
Using Information	Uses all, and only, the appropriate information correctly.	Uses some information correctly; uses no information incorrectly.	Fails to use appropriate information.
Using Appropriate Techniques	Applies all, and only, appropriate techniques.	Apply some appropriate (may apply some inappropriate) techniques.	Applies in appropriate techniques.
Using Illustrations	Uses an illustration that clearly represents the problem.	Uses an illustration to provide understanding of the problem.	Uses an illustration to provide little or no understanding of the problem.
Answering the Problem	Correctly solves the problem and clearly indicates final answer with a written statement.	Partially solves the problem but has, for example, copying or computational errors or incorrect statement of the solution.	No solution or incorrect solution.

Outcome 2 (& Outcome 4)

Students provide evidence of proficiency by communicating their solutions to “complex problems”.

The **six** courses listed below are designated as relevant courses:

- Calculus III *or* IV
- Linear Algebra
- Differential Equations
- Abstract Algebra
- Geometry
- Scientific Programming

The instructors of these courses will designate certain problems that are considered “complex problems” in the undergraduate curriculum. These may include mini-projects or SRYou Day presentations that require problem-solving skills and application of course content to new and interesting situations.

Choose **two** courses from the list. From each course, choose **one** complex problem to include in your portfolio. The two problems chosen for your portfolio should:

- demonstrate a variety of mathematical content knowledge
- demonstrate intellectual growth throughout each course and your undergraduate education
- demonstrate ability to extend content knowledge beyond the scope of the regular course content
- reflect your unique academic work written in your own words, in accordance with the university academic honor code. You should use only official course materials and your instructor as reference. No part of your solution should be copied from other sources.

For each of your **two** complex problems, your portfolio should include:

- completed cover sheet
- first draft
- instructor feedback: either formal (a graded copy) or informal (notes from office hours or an email exchange)
- final draft which is complete, correct, and demonstrates proficiency according the accompanying rubric

Complex Problem Cover Sheet

Course: _____

Instructor: _____

Semester: _____ Year: _____

Original Problem Statement:

What strategy did you apply and why did you choose this method?

How did you check the validity of your solution?

What does this problem demonstrate about your growth/achievement as a math major?

Rubric for Complex Problem Solving

Characteristic	Distinguished	Proficient	Developing	Missing/Incorrect
Understanding the Problem	Makes assumptions that can affect solution methodology.	Complete understanding of the problem; can solve the problem.	Some understanding; can solve part of the problem.	No understanding; cannot start the solution
Using Information	Explains why some information is critical to the solution and other information is not.	Uses all, and only, the appropriate information correctly.	Uses some information correctly; uses no information incorrectly.	Fails to use appropriate information.
Using Appropriate Techniques	Explains why techniques are appropriate for the problem.	Applies all, and only, appropriate techniques.	Apply some appropriate (may apply some inappropriate) techniques.	Applies in appropriate techniques.
Using Illustrations	Uses an accurate illustration that provides insight into the mathematical solution.	Uses an illustration that clearly represents the problem.	Uses an illustration to provide understanding of the problem.	Uses an illustration to provide little or no understanding of the problem.
Answering the Problem	Correctly solves and explains the solution to the problem and extends the solution to other problem situations.	Correctly solves the problem and clearly indicates final answer with a written statement.	Partially solves the problem but has, for example, copying or computational errors or incorrect statement of the solution.	No solution or incorrect solution.

Outcome 3 (& Outcome 4)

Students provide evidence of proficiency by communicating examples of their proof-writing.

The **five** subjects listed below are designated as relevant courses:

- Discrete Math
- Geometry
- Abstract Algebra
- Analysis
- Statistical Theory

The instructors of these courses will designate certain problems on homework assignments and exams that are considered “portfolio proofs” in the undergraduate curriculum.

Choose **three** subjects from the list. From each of the three subjects, choose **three** proofs to include in your portfolio. The **nine** proofs chosen for your portfolio should:

- demonstrate a wide variety of mathematical content knowledge and proof strategy
- demonstrate intellectual growth throughout each course and your undergraduate education
- reflect your unique academic work written in your own words, in accordance with the university academic honor code. You should use only official course materials and your instructor as reference. No part of your proof should be copied from other sources.

For each of your **nine** proofs, your portfolio should include:

- completed cover sheet
- first draft
- instructor feedback: either formal (eg: a marked copy of an exam or homework) or informal (eg: notes from office hours or an email exchange)
- final draft which is complete, correct, and demonstrates proficiency according the accompanying rubric

At least one of your nine proofs should be something you presented in class during the semester in which you took the relevant course. Include a presentation rubric for this proof as completed by your course instructor at the time of presentation. **(*DRAFT included at the end of this document.)***

Proof Cover Sheet

Course: _____

Instructor: _____

Semester: _____ Year: _____

Original Problem Statement:

What must be shown in order to prove this statement?

What proof strategy did you apply and why did you choose this method?

What does this proof demonstrate about your growth/achievement as a math major?

Rubric for Proof Writing

Characteristic	Proficient	Developing	Missing/Incorrect
Understanding the Problem	The problem statement is clearly understood.	The problem statement is partially understood.	The problem statement is completely misunderstood.
Proof Strategy	Identifies and implements an appropriate proof strategy.	Identifies an appropriate proof strategy, but fails to implement correctly.	Fails to identify an appropriate proof strategy.
Proof Structure	Proof structure is logically correct.	Proof structure is mostly correct, but missing key components.	Proof structure is illogical or entirely incorrect.
Application of Theorems & Computations	Correctly identifies and applies relevant theorems. Computations are accurate and detailed.	Chooses relevant theorems but fails to apply correctly or correctly (e.g.: fails to check assumptions). Computations contain mistakes or lack sufficient detail.	Neglects to apply relevant theorems or chooses a completely irrelevant theorem. Computations are missing or incorrect.
Readability	The proof is readable: typed, uses complete sentences and correct grammar, and correctly uses mathematical terms and symbols.	The proof is difficult to read: legible, but statements are poorly ordered or lacking connective sentences; some mathematical terms and symbols are misunderstood.	The proof is unreadable: illegible, sentences are incomplete or fail to convey desired meaning, mathematical terms and symbols are used incorrectly.

Rubric for Mathematical Presentation

Characteristic	Proficient	Developing	Missing/Incorrect
Mathematical Content	Presentation is mathematically correct, demonstrates complete understanding, completely and correctly explains mathematical procedures.	Presentation is mathematically correct, but lacks some understanding or provides minimal explanations for mathematical procedures.	Presentation is incorrect, lacks understanding, and omits or fails to explain mathematical procedures.
Organization	Very well organized presentation: builds from basic assumptions, explains choice of proof strategy, outlines each step, includes relevant theorems and computations; audience can clearly follow the presentation.	Good organization: fails to explain strategy, skips some steps, or excludes some relevant theorems and computations; audience can follow basic structure.	Poor organization: fails to give explanations, skips steps, audience cannot follow the presentation.
Preparation	Evidence of adequate preparation. Good pacing.	Evidence of some preparation. Satisfactory pacing.	Lack of preparation is evident throughout presentation.
Oral Communication	Clear voice, appropriate language, connects with and responds to audience.	Satisfactory voice and language, may lack connection with audience.	Inappropriate language, no connection with audience.
Written Communication	Utilizes whiteboard or slides to present well-written, well-organized content in a clear and legible format.	Written content is legible and correct.	Written content is unclear, illegible, or incorrect.
Mathematical Communication	Sophisticated usage of mathematical terminology and symbols.	Adequate usage of mathematical terminology and symbols.	Incorrect usage of mathematical terminology and symbols.
Representations (where applicable)	Utilizes appropriate diagrams, graphs, tables, equations, etc. to elucidate concepts for audience.	Utilizes diagrams, graphs, tables, equations, etc., but use fails to assist audience in understanding.	Fails to utilize appropriate diagrams, graphs, tables, equations, etc.