March 2016

To: All BSE Mathematics Majors and Post-Baccalaureate Certification students enrolled in MATH 310/311
From: Drs. Blum and White
Re: Completing Portfolio Submissions

As you may already know, you will be compiling a Mathematics Content Portfolio to fulfill your requirements for department certification. This semester you will begin (or continue) the process by submitting a sample of work from ALL MATH courses (excluding MATH 301, MATH 405) in which you are CURRENTLY enrolled beginning with MATH 310 and/or MATH 311.

By Friday, May 6, 2016 please submit the following to the Math Office, Wickersham Hall 208.

Each Submission contains 3 parts: stapled together (no folders please)

- **ONE** sample of your “best work” from this semester (be carefully selective)
- **FOR EACH COURSE:** a separate completed cover page (see p. 5).
- A short reflection essay should be included for each submission(s) and/or course(s). This essay should indicate why the submitted work for this course meets the requirement(s) indicated in the table as well as address at least one of the following topics:
  - problem solving strategies used in the college course that are similar to those that you may have used in secondary school or that you may have seen being used during a block experience.
  - Potential overlap that may exist in the mathematical content at the college level and the secondary level.
  - Extensions of secondary mathematics within the mathematical content.
  - How the sample demonstrates the development of higher order thinking (or deeper understanding) more than other evidence that could have been selected.
  - How the sample demonstrates creativity in approach, presentation or techniques.
  - How the sample provided indicates growth in the course relative to course content and objectives.
  - Any other relevant observations

See additional pages or department website for more information.

IMPORTANT NOTE: when the work is returned to you during the next semester, it is your responsibility to keep it. The portfolio will be utilized as a required component in MATH 405.
**Purposes of the Content Portfolio:**

1. To have teacher candidates collect evidence of their mathematical growth and understanding in their required mathematics content.
2. To have teacher candidates reflect on their mathematical preparation as it relates to their future teaching throughout their program.

**Overall Organization of the Process:**

1. Student Selection of “best work” from each 300-400 level mathematics content course taken at Millersville University (required and elective). (Note: this does not include Math301.)

2. Evaluation by Portfolio committee (Blum/White) following a specific checklist and rubric (pp. 3-4).

3. **Possible sources of best work** include anything that has been submitted for a grade or evaluation. It MUST be clear that this work has been graded. All work must be that of the student completing the portfolio. Examples may include, but are not limited to, the following:
   a. quizzes, or quiz questions
   b. tests, or test questions
   c. problem sets
   d. proofs
   e. homework problems
   f. projects
   g. papers
   h. extra credit problems

4. By completion of their program, in addition to having specific content work from each of their 300-400 level mathematics courses, teacher candidates in the BSE in Mathematics major will have evidence provided in their portfolio of each of the following standards of the National Council of Teachers of Mathematics. Please look carefully at the included rubric for clear expectations of such evidence.
   a. **Effective use of Technology:** Candidates embrace technology as an essential tool for teaching and learning mathematics. (This does NOT include the typing of mathematical symbols in word processing.)
   b. **Problem Solving:** Candidates know, understand and apply the process of mathematical problem solving.
   c. **Mathematical Communication:** Candidates communicate their mathematical thinking orally and in writing to peers, faculty and others.
   d. **Mathematical Representation:** Candidates use varied representations of mathematical ideas to support and deepen students’ mathematical understanding.
   e. **Mathematical Connections:** Candidates recognize, use, and make connections between and among mathematical ideas and in contexts outside mathematics to build mathematical understanding.
   f. **Discrete Mathematics:** Candidates apply the fundamental ideas of discrete mathematics in the formulation and solution of problems.
5. A **short reflective essay** about the course will accompany the evidence from each specific course that is to be included in the portfolio. When possible, the reflections should connect the evidence to the candidates’ future careers in education. For example, although not required for each, reflections may also contain discussion of
   a. Similar problem solving strategies that may be used in secondary schools (may have been witnessed in their own backgrounds or in their block experiences).
   b. Potential overlap that may exist in the mathematical content and secondary mathematics.
   c. Extensions of secondary mathematics within the mathematical content.
   d. How the sample demonstrates the development of higher order thinking (or deeper understanding) more than other evidence that could have been selected.
   e. How particular evidence demonstrates creativity in approach, presentation or techniques.
   f. How work provided indicates growth in the course relative to course content and objectives.

6. Any questions or concerns, please contact Dr. Dorothee Blum (871-7303, Dorothee.Blum@millersville.edu) or Dr. Janet White (871-7320, Janet.White@millersville.edu)

7. This Assessment is a required component of the BSE in Mathematics degree. Failure to complete any part will result in the following:
   - Notification from and/or Consultation with Drs. Blum and/or White
   - Notification of and/or Consultation with Advisor
   - Consultation with Dr. Schultz, Mathematics Department Chair
   - Recommendations for completing requirements or changing major

**NOTE:** It is the responsibility of the student to keep his or her work in the development of a comprehensive portfolio. At this time, the committee will only look at elements separately and keep a record of the progress of each student.

**Rubric for Scoring of Process Standards:**

**Knowledge of Technology:** Expectations measured by addressing one or more of the following: using knowledge of mathematics to select and use appropriate technology such as: spreadsheets, dynamic graphing tools, computer algebraic systems, dynamic statistical packages, graphing calculators, data-collection devices, and presentation software.

- **2:** Meets Expectations – Candidate’s work adequately demonstrates the effective use of technologies in the classroom as an essential for teaching and learning mathematics.
- **1:** Does Not Meet Expectations – Candidate’s work does not demonstrate the effective use of technologies in the classroom as an essential for teaching and learning mathematics.

*Examples of courses which may address this component are MATH 311, 312, 333, 353/355, or 357.*

**Knowledge of Problem Solving:** Expectations measured by addressing one or more of the following: applying and adapting a variety of strategies; solving problems arising in mathematics or involving mathematics in other contexts; building new mathematical knowledge through problem solving; and reflection of the problem solving process.

- **2:** Meets Expectations – Candidate’s work adequately demonstrates a knowledge, understanding or application of mathematical problem solving.
- **1:** Does Not Meet Expectations – Candidate’s work does not demonstrate a knowledge, understanding or application of mathematical problem solving.

*Examples of courses which may address this component are MATH 311, 319, 322, 333, 353/355, 365, 375, 395, 467, or 471.*
**Knowledge of Mathematical Communication:** Expectations measured by addressing one or more of the following: effective communicating in writing mathematical thinking; precisely expressing ideas using mathematical language; communicating organized mathematical thinking; and analyzing and evaluating mathematical thinking and strategies.

- **2:** Meets Expectations – Candidate’s work adequately demonstrates mathematical thinking in writing.
- **1:** Does Not Meet Expectations – Candidate’s work does not demonstrate mathematical thinking in writing.

*Examples of courses which may address this component are MATH 310, 322, 345, 353/355, or 464.*

**Knowledge of Mathematical Representation:** Expectations measured by addressing one or more of the following: modeling or interpreting physical, social or mathematical phenomena using representations; creating or using representations to organize, record or communicate mathematical ideas; and selecting, applying or translating among mathematical representations to solve problems.

- **2:** Meets Expectations – Candidate’s work adequately demonstrates varied representations of mathematical ideas to support and deepen mathematical understanding.
- **1:** Does Not Meet Expectations – Candidate’s work does not demonstrate varied representations of mathematical ideas to support and deepen mathematical understanding.

*Examples of courses which may address this component are MATH 322, 333, 365, 375, 395, or 471.*

**Knowledge of Mathematical Connections:** Expectations measured by addressing one or more of the following: recognizing or using connections among mathematical ideas; recognizing or applying mathematics in contexts outside of mathematics; and demonstrating the interconnections of mathematical ideas to build a coherent whole.

- **2:** Meets Expectations – Candidate’s work adequately demonstrates connections among mathematical ideas and in contexts outside mathematics to build mathematical understanding.
- **1:** Does Not Meet Expectations – Candidate’s work does not demonstrate connections among mathematical ideas and in contexts outside mathematics to build mathematical understanding.

*Examples of courses which may address this component are MATH 333, 345, 353/355, 393, or 464.*

**Knowledge of Discrete Mathematics:** Expectations measured by addressing one or more of the following: demonstrating knowledge of discrete mathematics with graph theory, recurrence relations, finite difference approaches, linear programming, or combinatorics; applying fundamental ideas of discrete mathematics in the formulation and solution of real-world problems; and using technology to solve problems involving discrete structures and the application of algorithms.

- **2:** Meets Expectations – Candidate’s work adequately demonstrates the fundamental ideas of discrete mathematics.
- **1:** Does Not Meet Expectations – Candidate’s work does not demonstrate the fundamental ideas of discrete mathematics.

*Examples of courses which may address this component are MATH 310, 370, 393, or 395.*

**Evaluation of the Reflection Statement:**

- **2:** Meets Expectations – Candidate’s reflection adequately addresses at least one connection between the mathematical content and process standards and their future teaching.
- **1:** Does Not Meet Expectations – Candidate’s reflection does not address at least one connection between the mathematical content and process standards and their future teaching.
Please indicate in the table if the work submitted for this course meets the specific requirement (see rubric for specifics).

In addition to the guidelines for the short reflective essay you MUST ALSO use the reflective essay to indicate in what way each selected component is met.

<table>
<thead>
<tr>
<th>Evidence of...</th>
<th>(please ✓)</th>
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<tbody>
<tr>
<td>Effective use of Technology in Teaching and Learning</td>
<td>MATH 322</td>
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<tr>
<td>Problem Solving</td>
<td>MATH 333</td>
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<tr>
<td>Mathematical Communication</td>
<td>MATH 345</td>
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<tr>
<td>Mathematical Representation</td>
<td>MATH 353/355</td>
</tr>
<tr>
<td>Discrete Mathematics</td>
<td>MATH 464</td>
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MATH Electives (not MATH 301)

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<td>MATH</td>
<td>MATH</td>
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Scoring:  

_____ Submission (1-2*)  

_____ Reflection Statement (1-2*)  

Components (1-2*, see above)

*Overall scoring: 2 = Meets Expectations; 1 = Does Not Meet Expectations