**PROPOSAL SUMMARY AND ROUTING FORM**

Proposal Title: Quantitative Reasoning for Professionals (MATH 109 and MATH 114)

Initiating Individual: Victor Piercey  Initiating Department or Unit: Mathematics

Contact Person’s Name: Victor Piercey  Email: piercev1@ferris.edu  Phone: 231-591-2823

- [ ] Group I-A – New Degree, major, concentration, minor, or redirection of a current offering
- [ ] Group I-B – Deletion of a degree, major, concentration, or minor
- [x] Group II-A – New Course, modification of a course, deletion of a course
- [ ] Group II-B – Minor Curriculum Clean-up
- [ ] Group III – Certificate (☐ College Credit ☐ Non-credit ☐ New Certificate)
- [ ] Group IV – Other site location (☐ College Credit ☐ Non-credit)

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<thead>
<tr>
<th>Program Representative **</th>
<th>PLEASE PRINT AND SIGN YOUR NAME</th>
<th>DATE</th>
<th>VOTE/ACTION * Number Count</th>
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<tbody>
<tr>
<td>Victor Piercey</td>
<td>(Vote from Algebra, Core, Service, and Education Committees)</td>
<td>9/19/15</td>
<td>☑ Support</td>
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<th>Department/School/Faculty Representative Vote **</th>
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<th>Department/School Administrator</th>
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<tr>
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<th>University Curriculum Committee **</th>
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<td>Olukemi Fadayomi</td>
<td>11/11/16</td>
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<th>Senate **</th>
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<td>12/15/16</td>
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<th>Academic Affairs</th>
<th>DATE</th>
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<tr>
<td>Kirk Weller</td>
<td>12/15/16</td>
<td>☑ Support</td>
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* Support with Concerns or Not Support must include identification of specific concern with appropriate rationale.

** Number Count must be given for all members present and/or voting.

To be completed by Academic Affairs  Date of Implementation: Fall 2016

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VPAA  JAN 1 1 2016  PROVOST

President (Date Approved)  Board of Trustees (Date Approved)  Academic Officers of MI (Date Approved)
1. Proposal Summary: (Summary is generally less than one page. Briefly state what is proposed with a summary of rationale and highlights)

After piloting a two-semester sequence under the MATH 190 designation, we are adding two courses to the general education math curriculum: MATH 109 (Quantitative Reasoning for Professionals 1) and MATH 114 (Quantitative Reasoning for Professionals 2). These courses are alternatives to MATH 110 and MATH 115 (respectively). For details about these courses, who will take them, the transition plan, performance data from the pilot, relevant research literature on which the courses are based, and other logistical issues, see the discussion in Exhibit A at the end of this proposal.

In addition to creating the new courses, we are adding MATH 109 as a prerequisite to any MATH course for which MATH 110 is a prerequisite and we are adding MATH 114 as a prerequisite to any MATH course for which MATH 115 is a prerequisite. Minimum grade prerequisites for MATH 110 and MATH 115 are preserved for MATH 109 and 114 (respectively). We are making the changes to prerequisites in order to accommodate students who change majors to programs requiring further MATH courses. Checksheets in the math department do not include these courses, hence we are not including any Form Ds.

As part of the consultation process, we asked departments that offer courses whose prerequisites include MATH 110 or MATH 115 to consider allowing MATH 109 or 114 (respectively) to change their prerequisites. We originally envisioned that this proposal would include the paperwork necessary to effect this change if the change was approved by faculty. Further discussions about this proposal have indicated that doing so would be problematic. As a consequence, departments who are willing to include MATH 109 or MATH 114 as prerequisites for their courses are encouraged to complete their own proposals.

Note that MATH 122 will be subsumed into MATH 114. We will delete MATH 122 at a future time. We will need this course for some students during the transition, and while we anticipate that a 2-year transition period will be sufficient, we reserve the option to extend the length of the transition if necessary.

2. Summary of Curricular Action (Check all that apply to this proposal)

- [ ] Degree
- [ ] Major
- [ ] Minor
- [ ] Concentration
- [ ] Certificate
- [ ] Course
- [ ] New
- [ ] Modification
- [ ] Deletion

Name of Degree, Major, etc.:

3. Summary of All Course Action Required:

A. Newly Created Courses to be Added to the Catalog

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Number</th>
<th>Title</th>
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<tbody>
<tr>
<td>MATH</td>
<td>109</td>
<td>Quantitative Reasoning for Professionals 1</td>
</tr>
<tr>
<td>MATH</td>
<td>114</td>
<td>Quantitative Reasoning for Professionals 2</td>
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B. Courses to be Deleted from FSU Catalog

<table>
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<tr>
<th>Prefix</th>
<th>Number</th>
<th>Title</th>
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C. Existing Courses to be Modified

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<thead>
<tr>
<th>Prefix</th>
<th>Number</th>
<th>Title</th>
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<tbody>
<tr>
<td>MATH</td>
<td>115</td>
<td>Intermediate Algebra</td>
</tr>
<tr>
<td>MATH</td>
<td>116</td>
<td>Intermediate Algebra-Num Trig</td>
</tr>
<tr>
<td>MATH</td>
<td>117</td>
<td>Contemporary Mathematics</td>
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<tr>
<td>MATH</td>
<td>120</td>
<td>Trigonometry</td>
</tr>
<tr>
<td>MATH</td>
<td>218</td>
<td>Math for Elementary Teachers 1</td>
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D. Addition of existing FSU courses to program

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<th>Prefix</th>
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<th>Title</th>
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4. Summary of All Consultations

<table>
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<tr>
<th>Form Sent (B or C)</th>
<th>Date Sent</th>
<th>Responding Department</th>
<th>Date Received &amp; By Whom</th>
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<tr>
<td>Form B</td>
<td>Aug. 31, 2015</td>
<td>Accounting, Finance, Information Systems</td>
<td>Sept. 11, 2015, Larry Bajor</td>
</tr>
<tr>
<td>Form B</td>
<td>Sept. 16, 2015</td>
<td>Construction Technology Management</td>
<td>Oct. 29, 2015, Suzanne Miller</td>
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<tr>
<td>Form B</td>
<td>Sept. 16, 2015</td>
<td>Dental Hygiene and Medical Imaging</td>
<td>Dec. 1, 2015, Theresa Raglin</td>
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<td>Form B</td>
<td>Sept. 16, 2015</td>
<td>Heavy Equipment</td>
<td>Nov. 11, 2015, Gary Maike</td>
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<tr>
<td>Form B</td>
<td>Aug. 31, 2015</td>
<td>Management</td>
<td>Sept. 15, 2015, Gayle Lopez</td>
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<td>Form B</td>
<td>Sept. 16, 2015</td>
<td>Manufacturing</td>
<td>Oct. 8, 2015, Richard Goosen</td>
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<td>Form B</td>
<td>Aug. 31, 2015</td>
<td>Marketing</td>
<td>Sept. 11, 2015, Jeff Ek</td>
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<td>Form B</td>
<td>Sept. 16, 2015</td>
<td>Mechanical Engineering Technology</td>
<td>Oct. 29, 2015, Randy Stein</td>
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<td>Form B</td>
<td>Sept. 16, 2015</td>
<td>Physical Sciences</td>
<td>Oct. 20, 2015, David Frank</td>
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<td>Plastics-Rubber</td>
<td>Nov. 12, 2015, Bob Speirs</td>
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<td>Form B</td>
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<td>Social Sciences</td>
<td>Sept. 16, 2015, Meral Topcu</td>
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<tr>
<td>Form B</td>
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<td>Social Work</td>
<td>Sept. 18, 2015, Wendy Samuels</td>
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<tr>
<td>Form C</td>
<td>Aug. 31, 2015</td>
<td>FLITE</td>
<td>Aug. 31, 2015, Ann Breitenwischer</td>
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</tbody>
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5. Will External Accreditation be sought? [For new programs or certificates only]
   ☐ Yes    ☒ No

   If yes, name the organization involved with accreditation for this program. Click here to enter text.

6. Is a PCAF required? ☐ Yes ☒ No Is the PCAF approved? ☐ Yes ☐ No [If yes, supply link on Academic Affairs website where PCAF is posted]

7. Program Checksheets affected by this proposal (Check all that apply to this proposal)
   ☐ Add Course   ☐ Delete Course   ☐ Modify Course   ☐ Change Prerequisite   ☐ Move from required to elective
   ☐ Move from elective to required   ☐ Change Outcomes and Assessment Plan   ☐ Change Credit hours

8. List all Checksheets affected by this proposal: None

   College Department Program
To be completed by each department affected by the proposed change, addition, or deletion. Potential duplication of coursework is reason for consultation.

1. This completed form must be forwarded with the proposal to the administrator of the department to be consulted.

2. The department must respond within 10 business days of receipt of this form to insure inclusion in the final proposal. The completed original is returned to the Academic Senate Office to be inserted into the proposal and a copy is returned to the initiator.

   The department must acknowledge receipt of this form and the proposal in writing to the initiator.

   **Failure to respond by 10 business days of receipt of this form is interpreted as support for the proposal.**

3. The Proposing Department must address any concerns raised by the consulted department. This response must be in writing and will be included in the proposal following the original consultation form.

RE: Proposal Title **Quantitative Reasoning for Professionals (MATH 109 and MATH 114)**

Initiator(s): **Victor I. Piercey**

Proposal Contact: Victor I. Piercey  Date Sent: **Aug. 31, 2015**

Department: Mathematics  Campus Address: **ASC 2036**

(Please type)

Responding Department: Accounting, Finance, and Information Systems

Administrator: Larry Bajor  : 9/11/15 Date Returned: 9/15/15

Based upon department faculty review on 9/15/15 (Date) we:

☑ Support the above proposal.

☐ Support the above proposal with the modifications and concerns listed below.

☐ Do not support the proposal for the reasons listed below.

Comment regarding the impact this proposal has on current curriculum including prerequisites, scheduling, room assignments, and/or faculty load for your department. Use additional pages, if necessary. We understand that the specific curriculum changes, including prerequisites, will be decided at the program level.
To be completed by each department affected by the proposed change, addition, or deletion. Potential duplication of coursework is reason for consultation.

1. This completed form must be forwarded with the proposal to the administrator of the department to be consulted.

2. The department must respond within 10 business days of receipt of this form to insure inclusion in the final proposal. The completed original is returned to the Academic Senate Office to be inserted into the proposal and a copy is returned to the initiator.

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3. The Proposing Department must address any concerns raised by the consulted department. This response must be in writing and will be included in the proposal following the original consultation form.

**RE: Proposal Title Quantitative Reasoning for Professionals (MATH 109 and MATH 114)**

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<tr>
<td>Proposal Contact: Victor Piercey Date Sent: Sept. 16, 2015</td>
</tr>
<tr>
<td>Department: Mathematics Campus Address: ASC 2036</td>
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</tbody>
</table>

**Responding Department: Construction Technology Management**

| Administrator: Suzanne K. Miller Date Received: Date Returned: 10.29.15 |

Based upon department faculty review on 10/29/15 Date we:

- Support the above proposal.
- Support the above proposal with the modifications and concerns listed below.
- Do not support the proposal for the reasons listed below.

Comment regarding the impact this proposal has on current curriculum including prerequisites, scheduling, room assignments, and/or faculty load for your department. Use additional pages, if necessary.

We will not change our check sheets, but will address it on a case-by-case basis for the few students that may transfer to our program.
Hi Suzanne,

Thank you for allowing me to speak to your faculty regarding the proposal for MATH 109 and 114. I realized that I have not yet sent you the required response to the concerns expressed on the Form B.

Given the small anticipated volume of students in your program who will have taken MATH 109 and 114, a case-by-case approach makes sense. I will pull the Form F from the proposal.

Thanks again!

Victor
To be completed by each department affected by the proposed change, addition, or deletion. Potential duplication of coursework is reason for consultation.

1. This completed form must be forwarded with the proposal to the administrator of the department to be consulted.

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3. The Proposing Department must address any concerns raised by the consulted department. This response must be in writing and will be included in the proposal following the original consultation form.

RE: Proposal Title **Quantitative Reasoning for Professionals (MATH 109 and MATH 114)**

**Initiator(s): Victor Piercey**

**Proposal Contact:** Victor Piercey  **Date Sent:** Sept. 16, 2015

**Department:** Mathematics  **Campus Address:** ASC 2036

(Please type)

**Responding Department:** Dental Hygiene and Medical Imaging

**Administrator:** Theresa Raglin  **Date Received:**  **Date Returned:** December 1, 2015

Based upon department faculty review on November 30, 2015 (Date) we:

☐ Support the above proposal.

☐ Support the above proposal with the modifications and concerns listed below.

☐ Do not support the proposal for the reasons listed below.

Comment regarding the impact this proposal has on current curriculum including prerequisites, scheduling, room assignments, and/or faculty load for your department. Use additional pages, if necessary.
To be completed by each department affected by the proposed change, addition, or deletion. Potential duplication of coursework is reason for consultation.

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2. The department must respond within 10 business days of receipt of this form to insure inclusion in the final proposal. The completed original is returned to the Academic Senate Office to be inserted into the proposal and a copy is returned to the initiator.

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**RE: Proposal Title Quantitative Reasoning for Professionals (MATH 109 and MATH 114)**

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<tr>
<td>Department: Mathematics  Campus Address: ASC 2036</td>
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<th>Responding Department: Heavy Equipment</th>
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<td>Administrator: Gary Malke  Date Received: 11/11/15  Date Returned: 11/11/15</td>
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Based upon department faculty review on 11/11/15 (Date) we:

- [ ] Support the above proposal.
- [ ] Support the above proposal with the modifications and concerns listed below.
- [ ] Do not support the proposal for the reasons listed below.

Comment regarding the impact this proposal has on current curriculum including prerequisites, scheduling, room assignments, and/or faculty load for your department. Use additional pages, if necessary.

When considering this, we considered our current MATH progression which is MATH 110, MATH 115, MATH 120. These work well for us because of the widespread availability of classes.

We switched from MATH 116, MATH 126 because of the difficulty transfer students have aligning MATH 109, MATH 114 may have the same issues.

The vote was 4-0
Hi Gary,

Thanks for the Form B! As required by our processes, I am writing to respond to the concerns.

Regarding the prerequisites, given the small anticipated volume of students in your program who will have taken the new sequence of courses, I think a case-by-case approach makes sense. I will remove the Form F for your courses from the proposal.

You also raised an important point about transferability. Under the new Michigan Transfer Agreement, MATH 114 will qualify as a transferable general education math courses under the “Quantitative Reasoning” pathway.

Thanks a lot!

Victor
CURRICULUM CONSULTATION FORM

To be completed by each department affected by the proposed change, addition, or deletion. Potential duplication of coursework is reason for consultation.

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2. The department must respond within 10 business days of receipt of this form to insure inclusion in the final proposal. The completed original is returned to the Academic Senate Office to be inserted into the proposal and a copy is returned to the initiator.

   The department must acknowledge receipt of this form and the proposal in writing to the initiator.

   Failure to respond by 10 business days of receipt of this form is interpreted as support for the proposal.

3. The Proposing Department must address any concerns raised by the consulted department. This response must be in writing and will be included in the proposal following the original consultation form.

RE: Proposal Title Quantitative Reasoning for Professionals (MATH 109 and MATH 114)

Initiator(s): Victor I. Piercey

Proposal Contact: Victor I. Piercey  Date Sent: Aug. 31, 2015

Department: Mathematics  Campus Address: ASC 2036
(Please type)

Responding Department: Management

Administrator: Gayle Lopez  Date Received: Click here to enter text  Date Returned: Click here to enter text.

Based upon department faculty review on 9/15/2015 (Date) we:

☐ Support the above proposal.
☒ Support the above proposal with the modifications and concerns listed below.
☐ Do not support the proposal for the reasons listed below.

Comment regarding the impact this proposal has on current curriculum including prerequisites, scheduling, room assignments, and/or faculty load for your department. Use additional pages, if necessary. Click here to enter text.

Faculty fully support the Math 109 and Math 114 proposal. There are faculty concerns over Math 114 as a 4 credit course to replace Math 115 a 3 credit course.
Hi Gayle,

Thank you for returning the complete Form B. I wanted to respond to the concerns that were expressed.

As you are probably aware, there is a COB committee working on revising the business core. Part of that work involves fitting MATH 114 into the curriculum, and room for the 4th credit will be identified as part of that process. I understand that there may be room in the directed electives or general education electives. That will be a separate proposal that will come out of your departments and your college and I will participate in that conversation as it relates to the math.

The other point I want to address here is that the extra credit isn't merely MATH 122 stuff dropped on top of MATH 115 stuff. Rather, the extra credit is used to carefully develop systems of equations and other applications of linearity. Systems of equations would be important in ECON 222, for example. In addition, we introduce students to linear and nonlinear regression, which helps with STQM and deepens understanding of the meaning of linearity as well as logarithms. (This may not be clear from the proposal itself).

Thanks again, and I look forward to continuing this conversation!

Victor
To be completed by each department affected by the proposed change, addition, or deletion. Potential duplication of coursework is reason for consultation.

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3. The Proposing Department must address any concerns raised by the consulted department. This response must be in writing and will be included in the proposal following the original consultation form.

RE: Proposal Title Quantitative Reasoning for Professionals (MATH 109 and MATH 114)

Initiator(s): Victor Piercey

Proposal Contact: Victor Piercey  Date Sent: Sept. 16, 2015

Department: Mathematics  Campus Address: ASC 2036
(Please type)

Responding Department: Manufacturing

Administrator: Richard Goosen  Date Received:  Date Returned: 10/18/2015

Based upon department faculty review on (Date) we:

☐ Support the above proposal.
☒ Support the above proposal with the modifications and concerns listed below.
☐ Do not support the proposal for the reasons listed below.

Comment regarding the impact this proposal has on current curriculum including prerequisites, scheduling, room assignments, and/or faculty load for your department. Use additional pages, if necessary.

The new courses are OK but the program faculty do not wish to change the MATH prerequisites at this time.

R. Goosen
Hi Rich,

Thank you for your response and for the Form B. I will pull the Form F for your proposal.

As this is unlikely to impact many students (and may not impact any), any student who comes into your programs with MATH 109 or MATH 114 can be handled on a case-by-case basis. If there are any questions at any time, please do not hesitate to contact me (or have your faculty contact me).

Thanks a lot!

Victor

Victor,

Attached is the form B. The new MATH 109 & 114 are fine but the faculty do not wish to change the pre-req for MFGE 353 at this time. Therefore I will not be returning the Form F-M.

Please call me at x2635 if you have any questions.

R. Goosen
Director
To be completed by each department affected by the proposed change, addition, or deletion. Potential duplication of coursework is reason for consultation.

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RE: Proposal Title Quantitative Reasoning for Professionals (MATH 109 and MATH 114)

Initiator(s): Victor I. Piercey

Proposal Contact: Victor I. Piercey  Date Sent: Aug. 31, 2015

Department: Mathematics  Campus Address: ASC 2036
(Please type)

Responding Department: Marketing  9/18/15

Administrator: Jeff Ek  Date Received: September 11, 2015 Date Returned: September 18, 2015

Based upon department faculty review on September 15, 2015 (Date) we: Marketing Department

☐ Support the above proposal.
☒ Support the above proposal with the modifications and concerns listed below.
☐ Do not support the proposal for the reasons listed below.

Comment regarding the impact this proposal has on current curriculum including prerequisites, scheduling, room assignments, and/or faculty load for your department. Use additional pages, if necessary.

Faculty expressed concern that 114 appears to place less emphasis on student development and manipulation of algebraic expressions and functions than 115 thus diminishing student confidence and facility with basic expressions and functions needed for statistics, data analytics, and quantitative oriented undergraduate curriculum or graduate level entry elsewhere. There is also concern with this course being accepted at other universities for math credit. This is an opportunity to demonstrate our sensitivity and commitment to the issue of student debt and educational cost.
Hi Jeff,

Thank you for sending over the completed Form B and the concerns expressed by Marketing faculty. Following UCC guidelines, I am writing to respond to the concerns. I have identified two concerns. The first is the level and extent of the algebra and functions involved in the course, the second is about transfer out to other institutions.

1. Regarding the level of development and manipulation of algebraic expressions, this is one of the main objectives for MATH 109 (not 114). This is covered by focusing on meaning and depth. Students learn how to codify mathematical "processes" into algebraic formulas, and these are then programmed into Excel to perform calculations. We have a detailed discussion of order of operations and how that informs the way algebraic expressions are written, and students turn all of this around to "read" complicated algebraic expressions as a list of computational directions containing variables on operations.

From this point, we proceed to formula manipulation. There are two types of algebraic actions involved in manipulations: solving actions and simplification actions. The former involves applying inverse operations in the reverse of the order of operations. In many cases, this requires the student to "chunk" parts of a formula and work with those components as a whole — which is a cognitively more sophisticated approach than most students are exposed to in MATH 110 or MATH 115. Simplification actions involve substitutions and identities. Often these go hand-in-hand. Along the way, students do some factoring and work with the quadratic equation, but the emphasis is on meaning and purpose in addition to calculation.

By the conclusion of this course, students are able so solve problems such as:

\[ \tau_e = \frac{D_1}{P_0 (1-F)} + g \text{ for } F. \]

\[ \text{Solve } N = \frac{C_u - C_d}{P_u - P_d} \text{ for } P_d. \]

\[ \text{Solve } EOQ = \sqrt{\frac{2(D)(S)}{H}} \text{ for } H. \]

This is more sophisticated and difficult than any algebraic work required of a student in MATH 110 or MATH 115.

In addition, we have some data suggesting that students in these courses outperform MATH 115 students in algebraic manipulations. This data was presented in the proposal narrative that was distributed.

MATH 114 is itself a study of functions, modeling, and prediction. The focus is on linear and exponential functions, with some other types of functions as well. This includes using these functions for analysis, including setting up and solving systems of linear equations and using logarithms to solve problems involving exponential functions. We study the features of these functions such as slope, rates of change, the constant rate of percentage change of an exponential function, etc. Students learn how to identify and calculate these features using algebraic as well as verbal, graphical, an numerical representations.
One of the things students do is derive — from scratch — the formula for the payoff time of a fixed loan balance. This involves (a) deriving the basic compound interest formula, (b) deriving the geometric series formula, (c) using these two to derive formulas for the future value and present value of an annuity, (d) using annuities to model the balance of the loan over time, and (e) setting the balance equal to zero and solving for the unknown exponent. The last step, of course, requires logarithms. In addition, students learn to use all three logarithm properties to linearize a nonlinear function such as an exponential function or a power function. For example, near the end of the class, students use a log transform to perform multiple linear regression with a two-input Cobb Douglas production function and estimate productivity parameters.

In general, the intensity of the algebra is even stronger than MATH 115, and it is deeper and tied to material they will see in their other courses. Our data also suggests that this approach is effective in reducing math anxiety as well as countering unhealthy beliefs about math.

If there are specific algebraic or functional content areas that your faculty believe should be included but are omitted, please have them contact me to discuss. I would be happy to include this content and contextualize it with the help of their content knowledge. The outcomes for the courses themselves are sufficiently broad to enable this process without altering the curriculum proposal.

2. As for transfer to other institutions, this course qualifies under the new Michigan Transfer Agreement. We will be working directly with the Michigan Transfer Network to enable other institutions to understand what it is we are doing and establish transfer equivalencies. Kirk Weller being in the Provost’s office will help in this endeavor.

If you have any other questions or concerns, please don’t hesitate to contact me. If any member of your faculty have questions or concerns, please feel free to direct them to contact me as well!

Thanks!

Victor
CURRICULUM CONSULTATION FORM

To be completed by each department affected by the proposed change, addition, or deletion. Potential duplication of coursework is reason for consultation.

1. This completed form must be forwarded with the proposal to the administrator of the department to be consulted.

2. The department must respond within 10 business days of receipt of this form to insure inclusion in the final proposal. The completed original is returned to the Academic Senate Office to be inserted into the proposal and a copy is returned to the initiator.

The department must acknowledge receipt of this form and the proposal in writing to the initiator.

**Failure to respond by 10 business days of receipt of this form is interpreted as support for the proposal.**

3. The Proposing Department must address any concerns raised by the consulted department. This response must be in writing and will be included in the proposal following the original consultation form.

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**RE: Proposal Title** Quantitative Reasoning for Professionals (MATH 109 and MATH 114)

**Initiator(s): Victor Piercey**

Proposal Contact: Victor Piercey  Date Sent: Sept. 16, 2015

Department: Mathematics  Campus Address: ASC 2036

(Please type)

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**Responding Department: Mechanical Engineering Technology**

Administrator: Chuck Drake  Date Received:  Date Returned:

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Based upon department faculty review on  (Date) we: 29 OCT 15

**Support the above proposal.**

Support the above proposal with the modifications and concerns listed below.

Do not support the proposal for the reasons listed below.

Comment regarding the impact this proposal has on current curriculum including prerequisites, scheduling, room assignments, and/or faculty load for your department. Use additional pages, if necessary.

**THIS PROPOSAL AFFECTS ONLY MECH 250, WHICH IS NOT A CHECKSHEET COURSE FOR MECH. ENG. STUDENTS, THIS IS A SERVICE COURSE FOR OTHER PROGRAMS. MECH 250 CONTENT WILL NOT BE AFFECTED BY WHETHER STUDENTS TAKE THE CURRENT MATH 116 PREALG OR THE PROPOSED MATH SEQUENCE.**

RJ Stem 29 OCT 15

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CURRICULUM CONSULTATION FORM

FORM B
Revised June 2015

To be completed by each department affected by the proposed change, addition, or deletion. Potential duplication of coursework is reason for consultation.

1. This completed form must be forwarded with the proposal to the administrator of the department to be consulted.

2. The department must respond within 10 business days of receipt of this form to insure inclusion in the final proposal. The completed original is returned to the Academic Senate Office to be inserted into the proposal and a copy is returned to the initiator.

   The department must acknowledge receipt of this form and the proposal in writing to the initiator.

   Failure to respond by 10 business days of receipt of this form is interpreted as support for the proposal.

3. The Proposing Department must address any concerns raised by the consulted department. This response must be in writing and will be included in the proposal following the original consultation form.

RE: Proposal Title Quantitative Reasoning for Professionals (MATH 109 and MATH 114)

Initiator(s): Victor Piercey
Proposal Contact: Victor Piercey  Date Sent: Sept. 16, 2015
Department: Mathematics  Campus Address: ASC 2036
(Please type)

Responding Department: Physical Sciences
Administrator: David Frank  Date Received:  Date Returned:

Based upon department faculty review on 10/6/15 (Date) we:

☐ Support the above proposal.
☐ Support the above proposal with the modifications and concerns listed below.
☐ Do not support the proposal for the reasons listed below.

Comment regarding the impact this proposal has on current curriculum including prerequisites, scheduling, room assignments, and/or faculty load for your department. Use additional pages, if necessary.

Comments received with regard to MATH 109:
• Students taking CHEM 114 will perform better with a more traditional math course (MATH 110).
• We don’t have a problem if the Math Department wants to offer a different course (MATH 109), but I think that MATH 110 is a more acceptable prerequisite for PHYS 130.

Comments received with regard to MATH 114:
• None
Hi Dave,

Thanks for the Form B! I enjoyed discussing the course with your curriculum committee and your department faculty. They asked great questions!

As required by the UCC, I am writing to respond to the expressed concerns from the “No” voters. Their concern was that the traditional math sequence would be better for PHYS 130 and CHEM 114. As part of our ongoing assessment, we are going to monitor student grades in critical courses that require MATH 109 and MATH 114. At present, we are looking at the business core. If majors that require CHEM 114 adopt the new math courses, CHEM 114 will also be part of our assessment. Since PHYS 130 is a gen ed course, it was not part of our plan. If desired, we could add that to the list. Additionally, if your faculty find that students coming out of the new math courses are having additional difficulty in any of your courses, please have them connect with me so we can make necessary adjustments. I guess I am saying that this is only the beginning of a process that will include regular assessment and revision.

I would also like to note that following the department meeting, one of your FNTFO faculty members expressed an interest in a linked MATH 114/CHEM 114 course for health professions students. This is an exciting opportunity and would provide a nice vehicle to assess any concerns those faculty have.

Thanks again!

Victor

From: David V Frank
Sent: Thursday, October 29, 2015 3:59 PM
To: Victor I Piercey
Subject: Form B Math 109/114 consultation form

Victor,

Our consultation form is attached. Let me know if you have any questions.

Thanks,

Dave

PS: Good luck with the new courses. My feeling is that as many sections as you and your colleagues can offer can only make things better. I am impressed with the number of times where you direct students to reflect on what they’re doing and why they’re doing it. You have a great sense for what it takes to help students learn.

David Frank
Physical Sciences Department Head
820 Campus Drive ASC 3021
CURRICULUM CONSULTATION FORM

To be completed by each department affected by the proposed change, addition, or deletion. Potential duplication of coursework is reason for consultation.

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2. The department must respond within 10 business days of receipt of this form to insure inclusion in the final proposal. The completed original is returned to the Academic Senate Office to be inserted into the proposal and a copy is returned to the initiator.

   The department must acknowledge receipt of this form and the proposal in writing to the initiator.

   **Failure to respond by 10 business days of receipt of this form is interpreted as support for the proposal.**

3. The Proposing Department must address any concerns raised by the consulted department. This response must be in writing and will be included in the proposal following the original consultation form.

RE: Proposal Title Quantitative Reasoning for Professionals (MATH 109 and MATH 114)

**Initiator(s): Victor Piercey**

Proposal Contact: Victor Piercey Date Sent: Sept. 16, 2015

Department: Mathematics Campus Address: ASC 2036
(Please type)

**Responding Department: Plastics and Rubber**

Administrator: Bob Speirs Date Received: Date Returned: 12/1/15

Based upon department faculty review on (Date) we:

☐ Support the above proposal.

☐ Support the above proposal with the modifications and concerns listed below.

☐ Do not support the proposal for the reasons listed below.

Comment regarding the impact this proposal has on current curriculum including prerequisites, scheduling, room assignments, and/or faculty load for your department. Use additional pages, if necessary.

[Signature]

Bob Speirs
CURRICULUM CONSULTATION FORM

FORM B
Revised June 2015

To be completed by each department affected by the proposed change, addition, or deletion. Potential duplication of coursework is reason for consultation.

1. This completed form must be forwarded with the proposal to the administrator of the department to be consulted.

2. The department must respond within 10 business days of receipt of this form to insure inclusion in the final proposal. The completed original is returned to the Academic Senate Office to be inserted into the proposal and a copy is returned to the initiator.

The department must acknowledge receipt of this form and the proposal in writing to the initiator.

Failure to respond by 10 business days of receipt of this form is interpreted as support for the proposal.

3. The Proposing Department must address any concerns raised by the consulted department. This response must be in writing and will be included in the proposal following the original consultation form.

RE: Proposal Title Quantitative Reasoning for Professionals (MATH 109 and MATH 114)

Initiator(s): Victor Piercey
Proposal Contact: Victor Piercey  Date Sent: Sept. 16, 2015
Department: Mathematics  Campus Address: ASC 2036
(Please type)

Responding Department: Social Sciences
Administrator: Meral Topcu  Date Received: September 16, 2015  Date Returned: October 20, 2015

Based upon department faculty review on (Date) October 20, 2015

we:

☑ Support the above proposal.
☐ Support the above proposal with the modifications and concerns listed below.
☐ Do not support the proposal for the reasons listed below.

Comment regarding the impact this proposal has on current curriculum including prerequisites, scheduling, room assignments, and/or faculty load for your department. Use additional pages, if necessary.
To be completed by each department affected by the proposed change, addition, or deletion. Potential duplication of coursework is reason for consultation.

1. This completed form must be forwarded with the proposal to the administrator of the department to be consulted.

2. The department must respond within 10 business days of receipt of this form to insure inclusion in the final proposal. The completed original is returned to the Academic Senate Office to be inserted into the proposal and a copy is returned to the initiator.

   The department must acknowledge receipt of this form and the proposal in writing to the initiator.

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3. The Proposing Department must address any concerns raised by the consulted department. This response must be in writing and will be included in the proposal following the original consultation form.

RE: Proposal Title **Quantitative Reasoning for Professionals (MATH 109 and MATH 114)**

Initiator(s): **Victor Piercey**

Proposal Contact: Victor Piercey  Date Sent: Sept. 16, 2015

Department: Mathematics  Campus Address: ASC 2036
(Please type)

Responding Department: Social Work

Administrator: Wendy Samuels  Date Received:  Date Returned: 9/18/15

Based upon department faculty review on (Date) we:

☒ Support the above proposal.
☐ Support the above proposal with the modifications and concerns listed below.
☐ Do not support the proposal for the reasons listed below.

Comment regarding the impact this proposal has on current curriculum including prerequisites, scheduling, room assignments, and/or faculty load for your department. Use additional pages, if necessary.
To be completed by each department affected by the proposed change, addition, or deletion. Potential duplication of coursework is reason for consultation.

1. This completed form must be forwarded with the proposal to the administrator of the department to be consulted.

2. The department must respond within 10 business days of receipt of this form to insure inclusion in the final proposal. The completed original is returned to the Academic Senate Office to be inserted into the proposal and a copy is returned to the initiator.

   The department must acknowledge receipt of this form and the proposal in writing to the initiator.

   **Failure to respond by 10 business days of receipt of this form is interpreted as support for the proposal.**

3. The Proposing Department must address any concerns raised by the consulted department. This response must be in writing and will be included in the proposal following the original consultation form.

RE: Proposal Title **Quantitative Reasoning for Professionals (MATH 109 and MATH 114)**

Initiator(s): Victor L. Piercey

Proposal Contact: Victor L. Piercey  Date Sent: Aug. 31, 2015

Department: Mathematics  Campus Address: ASC 2036
(Please type)

Responding Department: Sports, Entertainment, and Hospitality Management

Administrator: Lianne Briggs  Date Received: September 14, 2105  Date Returned: September 15, 2015

Based upon department faculty review on September 15, 2015 we:

☑ Support the above proposal.

☐ Support the above proposal with the modifications and concerns listed below.

☐ Do not support the proposal for the reasons listed below.

Comment regarding the impact this proposal has on current curriculum including prerequisites, scheduling, room assignments, and/or faculty load for your department. Use additional pages, if necessary. Click here to enter text.
Hi all,

This e-mail is to update you on the status of the MATH 109/114 proposal that we have discussed. Thank you for submitting the consultation forms. Originally we envisioned that we would attach the paperwork to process prerequisite updates for those departments who were willing to make those changes. With at least one department, there was unintentional miscommunication concerning this idea (for which I take responsibility). Moreover, this approach proved problematic with several faculty in departments and on curriculum committees.

As a consequence, we no longer intend to include this paperwork. We encourage you to complete your own proposals as you see fit. The proposal that we will submit maintains the prerequisite updates for courses in MATH.

Thank you for all of the conversations this term! I have learned a lot.

If you have any questions about these courses, or about what is or is not in this proposal, please do not hesitate to contact me! This e-mail will be included in the proposal for clarity.

Thanks!

Victor
FLITE SERVICES CONSULTATION FORM

To be completed by the liaison librarian and approved by the Dean of FLITE. FLITE must return the original form to the Academic Senate office to be inserted in the proposal and a copy to the initiator. FLITE must respond within 10 business days of receipt of this form to insure that the form is included in the final proposal.

Failure to respond by 10 business days of receipt of this form is interpreted as support for the proposal.

RE: Proposal Title: Quantitative Reasoning for Professionals (MATH 109 and MATH 114)

Projected number of students per year affected by proposed change: 450

Initiator(s): Victor Piercey
Proposal Contact: Victor Piercey Date Sent: Aug. 31, 2015
Department: Mathematics Campus Address: ASC 2036
(Please type)

Liaison Librarian Signature: Date Received: 08/31/2015. Returning 09/14/2015
Dean of FLITE Signature: Date Returned: 9/14/15

Based upon our review on (date), FLITE concludes that:

Approval information is found in the attached Narrative

☐ Library resources to support the proposed curriculum change are currently available.

☒ Additional Library resources are needed but can be obtained from current funds.

☐ Support, but significant additional Library funds/resources are required in the amount of $.

☐ Does not support the proposal for reasons listed below.

Comment regarding the impact this proposal will have on library resources, collection development, or other FLITE programs. Use additional pages if necessary.
In keeping with Ferris State University and the Ferris Library (FLITE)’s missions, FLITE in its longstanding role as the information resource center on campus offers access to information in varying formats from a multitude of sources onsite and online located anywhere in the world. These resources are available in a learner-centered environment. Graduating from the University with a knowledge of how to locate and evaluate information to solve problems is critical to becoming a successful and contributing professional in the workplace and a citizen in a continuously changing global, pluralistic and technological society.

Analysis of information resource needs –

Since receiving the proposal to establish Math 109 and 114 Quantitative Reasoning 1 and 2 (QR), a brief needs assessment was developed and sent to the course proposer, Prof. Victor Piercey. This questionnaire was based upon Form E which gives the course description and learning outcomes, and Form C which stated that 450 students are expected annually. Prof. Piercey has supplied additional information through this questionnaire including the intent that the courses will be offered beginning Fall 2016. This will be ample time for any clarification as well as acquisition of any additional materials.

Meanwhile, as FLITE’s Mathematics Liaison, I have been working to determine more specifically the strengths and weaknesses (if any) of the existing information resources. The resulting work in simplest terms indicates that it will take a combination of journals, books, government information resources, media and appropriate websites for the QR initiative depending upon the instructor’s requirements.

Journals – FLITE provides access to a rich collection of subscription and open access journals. Both types should be considered. No new journal titles are requested.

Books – Some appropriate book titles have been identified as available (physical or electronic format). Others are not, and should be acquired particularly if these courses will serve as a building block to the student’s future studies. It is anticipated that book allocations can be redirected.

Government information resources – Although not expected in the courses under consideration, students may need to utilize existing statistical data in the future for QR. If the case, government publications are one source of easily downloadable information. Additionally, FLITE offers online access to recognized statistical publications such as Statistical Abstract of the United States.

A non-governmental database, e.g., Demographics Now will have data from the government, associations and other organizations.

Media and Websites – Media and websites present information resources unattainable any other way. Web and media accessibility such as captioned images is an essential component in the use of existing resources or the creation of new ones.

Analysis of student needs –

It should be noted that there may be students especially in their first-year who may not have much experience in searching for supporting information resources if it is part of the course work, and will need help in locating desired information. Student needs are easily accommodated through “Get Help” (in-person, chat, email, phone and text messaging-SMS) found on FLITE’s homepage.

In sum, adoption of the proposed courses will provide yet another opportunity to expand student’s knowledge. From the FLITE perspective, the courses should be approved. It will be assumed that funding will be adequate to keep FLITE information resources, technologies and access up-to-date.
COURSE INFORMATION FORM

Complete all items below (New or Current)

Check all boxes where modifications are being made.

Course Identification

☐Prefix (current)  ☐Number (current)  
Lecture ☐Lab ☐Seminar ☐  

Contact Hours (current):  
[Enter contact hours per week in blank above.]

☐Prefix (proposed) MATH  ☐Number (proposed) 109  
Lecture ☐Lab ☐Seminar ☐  

Contact Hours (proposed): 4  
[Enter contact hours per week in blank above.]

☐Title (current):  
☐Title (proposed): Quantitative Reasoning for Professionals 1

☐Credit Hours (current):  
☐Credit Hours (proposed): 4  
(proposed):  

☐Prerequisites (current):  
☐Prerequisites (proposed): 1. MATH 010 with grade of C- or better,  
☐Co-requisites (current):  
☐Co-requisites (proposed): or 15 or better on ACT (Math), or 350 or  
better on SAT (Math); AND  
2. ENGL 074, or 14 or better on ACT (Verbal), or  
370 or better on SAT (Verbal).

☐Course Description (current) 125 words maximum:

☐Course Description (proposed) 125 words maximum:

An introductory course in college mathematics in professional contexts. Topics include proportional reasoning, data-based decision making, constructing and interpreting algebraic formulas, and manipulating algebraic formulas including those involving linear expressions, expressions with exponents, rational expressions, and expression with radicals. Additional mathematical topics may include polynomials and factoring. Prerequisites: MATH 010 with a grade of C- or  
better or 15 or better on ACT (Math) or 350 or better on SAT (Math); and ENGL 074 or 14 or better on ACT (Verbal) or 370 or better on SAT (Verbal). Typically  
offered Fall, Spring.

☐Course Outcomes and Assessment Plan (current):

☐Course Outcomes and Assessment Plan (proposed):

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Students will be able to apply prior knowledge and mathematical concepts to solve novel problems.</td>
<td>Classroom activities and homework assignments</td>
</tr>
<tr>
<td>2. Students will be able to use proportional reasoning to solve problems.</td>
<td>Classroom activities, homework assignments, and exams.</td>
</tr>
<tr>
<td>3. Students will use data to make and defend professional decisions.</td>
<td>Classroom activities, homework assignments, and exams.</td>
</tr>
<tr>
<td>4. Students will be able to construct algebraic formulas to model real-world quantitative relationships.</td>
<td>Classroom activities, homework assignments, and exams.</td>
</tr>
<tr>
<td>5. Students will be able to manipulate formulas involving diverse mathematical operations.</td>
<td>Classroom activities, homework assignments, and exams.</td>
</tr>
</tbody>
</table>

☐Course Outline including Time Allocation (current):
Express time allocation in one of the following formats for a 3 credit hour course; adjust accordingly: Weeks (15 weeks), Hours (45 hours, assuming 3 contact hours per week, Percentages (100 percent)

Course Outline including Time Allocation (proposed):

Express time allocation in one of the following formats for a 3 credit hour course; adjust accordingly: Weeks (15 weeks), Hours (45 hours, assuming 3 contact hours per week, Percentages (100 percent)

The first outcome will be addressed throughout the course through in-class activities and homework assignments. The other outcomes will fit into the following outline:

4 Weeks (16 class sessions): Solve problems using proportional reasoning
4 Weeks (16 class sessions): Use data to make and defend professional decisions
3 Weeks (12 class sessions): Construct algebraic formulas to model real-world algebraic relationships
4 Weeks (16 class sessions): Manipulate formulas involving diverse mathematical operations

Total: 15 weeks, 60 class sessions.
Complete all items below (New or Current)

Check all boxes where modifications are being made.

Course Identification

☐ Prefix (current)  ☐ Number (current)  Contact Hours (current): [Enter contact hours per week in blank above.]

☐ Prefix (proposed)  MATH  ☐ Number (proposed)  114  Contact Hours (proposed): 4

☐ Title (current):

☐ Title (proposed): Quantitative Reasoning for Professionals 2

☐ Credit Hours (current):

☐ Credit Hours (proposed): 4

☐ Prerequisites (current):

☐ Prerequisites (proposed): 1. MATH 109 with grade of C- or better, MATH 110 with grade of C- or better, or 19 or better on ACT (Math), or 460 or better on SAT (Math); AND

☐ Co-requisites:

2. ENGL 074, or 14 or better on ACT (Verbal), or 370 or better on SAT (Verbal).

☐ Course Description (current) 125 words maximum:

☐ Course Description (proposed) 125 words maximum:

A study of modeling and analyzing quantitative relationships in professional contexts. Focus on linear and exponential models, linear systems of equations and inequalities, linear programming, linear regression, solving equations with logarithms, and using logarithms to transform non-linear models into linear models. Additional topics may include quadratic functions, logistic functions, and periodic functions. Prerequisites: MATH 109 with a grade of C- or better, or MATH 110 with a grade of C- or better, or 19 on ACT (Math), or 460 on SAT (Math); and ENGL 074 or 14 or better on ACT (Verbal) or 370 or better on SAT (Verbal). Typically offered Fall, Spring.

☐ Course Outcomes and Assessment Plan (current):

☐ Course Outcomes and Assessment Plan (proposed):

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Students will be able to apply prior knowledge and mathematical concepts to solve complicated, novel problems in context.</td>
<td>Classroom activities and homework assignments</td>
</tr>
<tr>
<td>2. Students will be able to identify and create models of linear functions involving verbal, numerical, algebraic, and graphical representations.</td>
<td>Classroom activities, homework assignments, and exams.</td>
</tr>
<tr>
<td>3. Students will be able to identify and create models of exponential functions involving verbal, numerical, algebraic, and graphical representations.</td>
<td>Classroom activities, homework assignments, and exams.</td>
</tr>
<tr>
<td>4. Students will be able to solve problems requiring the use of logarithms.</td>
<td>Classroom activities, homework assignments, and exams.</td>
</tr>
<tr>
<td>5. Students will be able to use linear systems of equations and inequalities as well as linear programming to solve problems.</td>
<td>Classroom activities, homework assignments, and exams.</td>
</tr>
</tbody>
</table>

☐ Course Outline including Time Allocation (current):
Express time allocation in one of the following formats for a 3 credit hour course; adjust accordingly: Weeks (15 weeks), Hours (45 hours, assuming 3 contact hours per week, Percentages (100 percent)

Course Outline including Time Allocation (proposed):

Express time allocation in one of the following formats for a 3 credit hour course; adjust accordingly: Weeks (15 weeks), Hours (45 hours, assuming 3 contact hours per week, Percentages (100 percent)

The first outcome will be addressed throughout the course through in-class activities and homework assignments. The other outcomes will fit into the following outline:

4 Weeks (16 class sessions): Identify and create models of linear functions involving verbal, numerical, algebraic, and graphical representations.
3 Weeks (12 class sessions): Identify and create models of exponential functions involving verbal, numerical, algebraic, and graphical representations.
4 Weeks (16 class sessions): Solve problems requiring the use of logarithms.
4 Weeks (16 class sessions): Use linear systems of equations and inequalities as well as linear programming to solve problems.

Total: 15 weeks, 60 class sessions.

[Signature]
11/2/15
Complete all items below (New or Current)
Check all boxes where modifications are being made.

Course Identification

☐ Prefix (current) MATH ☐ Number (current) 115  Contact Hours (current): 3
Lecture ☒ Lab ☐ Seminar ☐ [Enter contact hours per week in blank above.]

☐ Prefix (proposed) ☐ Number (proposed)  Contact Hours (proposed):
Lecture ☐ Lab ☐ Seminar ☐ [Enter contact hours per week in blank above.]

□ Title (current): Intermediate Algebra
□ Title (proposed):

□ Credit Hours (current): 3 ☐ Prerequisites (current): MATH 110 with grade of C- or better, or 19 on ACT or 460 on SAT. ☐ Co-requisites (current):
□ Credit Hours (proposed):

☐ Prerequisites (proposed): MATH 109 with grade of C- or better, or MATH 110 with grade of C- or better, or 19 on ACT or 460 on SAT

□ Co-requisites (proposed):

☐ Course Description (current) 125 words maximum:
A study of complex fractions, first and second degree equations and inequalities, exponents, radicals, and introduction to complex numbers, logarithms, and systems of equations. Pre-Requisites: MATH 110 with a grade of C- or better, or 19 on ACT or 460 on SAT. Typically Offered Fall, Spring, Summer.

☐ Course Description (proposed) 125 words maximum:
A study of complex fractions, first and second degree equations and inequalities, exponents, radicals, and introduction to complex numbers, logarithms, and systems of equations. Pre-Requisites: MATH 109 with a grade of C- or better, or MATH 110 with a grade of C- or better, or 19 on ACT or 460 on SAT. Typically Offered Fall, Spring, Summer.

□ Course Outcomes and Assessment Plan (current):
Students successfully completing the course will be able to ...

1) Solve a variety of equations and inequalities (e.g. linear equations and inequalities with and without absolute values, quadratic equations, logarithmic equations, exponential equations, and linear systems in 2 or 3 variables.)

2) Construct graphs of functions (linear, exponential, and logarithmic) and determine and apply characteristics of linear graphs (e.g. calculate slope and intercepts, determine if lines are parallel/perpendicular, and write equations of lines).

3) Manipulate algebraic expressions (e.g. simplify and factor polynomial and rational expressions, simplify radical expressions, simplify expressions involving complex numbers, simplify and expand logarithmic expressions.)

4) Solve application problems using algebraic models and graphical representations.

Assessment will involve exams, homework, and quizzes.

□ Course Outcomes and Assessment Plan (proposed):
___Course Outline including Time Allocation (current):___

Express time allocation in one of the following formats for a 3 credit hour course; adjust accordingly: Weeks (15 weeks), Hours (45 hours, assuming 3 contact hours per week, Percentages (100 percent)

Class will meet 3 hours per week for 15 weeks for a total of 45 class hours.

___Course Outline including Time Allocation (proposed):___

Express time allocation in one of the following formats for a 3 credit hour course; adjust accordingly: Weeks (15 weeks), Hours (45 hours, assuming 3 contact hours per week, Percentages (100 percent)
COURSE INFORMATION FORM

Complete all items below (New or Current)

Check all boxes where modifications are being made.

Course Identification

☐ Prefix (current) MATH 116
☐ Number (current) 116
Contact Hours (current): 4
[Enter contact hours per week in blank above.]

☐ Prefix (proposed)
☐ Number (proposed)
Contact Hours (proposed):
[Enter contact hours per week in blank above.]

☐ Title (current): Intermediate Algebra – Num Trig

☐ Title (proposed):

☐ Credit Hours (current): 4 ☐ Prerequisites (current): MATH 110 with grade of C- or better, or 19 on ACT or 460 on SAT. ☐ Co-requisites (current):

☐ Credit Hours (proposed):

☐ Prerequisites (proposed): MATH 109 with grade of C- or better, or MATH 110 with grade of C- or better, or 19 on ACT or 460 on SAT

☐ Co-requisites (proposed):

☐ Course Description (current) 125 words maximum:

Special factoring forms, exponents, roots and radicals, scientific notation, fractions, first and second degree equations and inequalities, functions and graphs, logarithms, and solutions of logarithmic and exponential equations, systems of equations up to 3x3 and Cramer’s Rule, numerical trigonometry including vectors, Law of Sines and Cosines, and graphs of trigonometric functions. Pre-Requisites: MATH 110 with a grade of C- or better, or 19 on ACT or 460 on SAT. Typically Offered Fall, Spring, Summer.

☐ Course Description (proposed) 125 words maximum:

Special factoring forms, exponents, roots and radicals, scientific notation, fractions, first and second degree equations and inequalities, functions and graphs, logarithms, and solutions of logarithmic and exponential equations, systems of equations up to 3x3 and Cramer’s Rule, numerical trigonometry including vectors, Law of Sines and Cosines, and graphs of trigonometric functions. Pre-Requisites: MATH 109 with a grade of C- or better, or MATH 110 with a grade of C- or better, or 19 on ACT or 460 on SAT. Typically Offered Fall, Spring, Summer.

☐ Course Outcomes and Assessment Plan (current):

1. Performing Basic Operations: Students will be able to perform basic operations (e.g. addition, subtraction, multiplication, and division) on quantities that result from taking measurements and determine their accuracy and precision in the context of both algebra and trigonometry.
2. Knowledge & Application of Trigonometric Ratios: Students will be able to demonstrate a knowledge of the trigonometric ratios and apply them to solving right triangles in the context of both real world and trigonometric problems.
3. Graphing: Students will be able to graph linear and quadratic functions.
4. Parallel & Perpendicular Lines: Students will be able to determine whether given lines are parallel or perpendicular by using the slopes.
5. Distance & Midpoint: Students will be able to find the distance between two points and the midpoint of the segment joining two points.
6. Factoring: Students will be able to apply factoring techniques to simplify algebraic expressions and solve a variety of equations (e.g. linear, quadratic, rational, radical, absolute value, and a system of linear equations).
7. Modeling Quadratic Problems: Students will be able to model real world quadratic problems and solve them.
8. Exponentials & Radicals: Students will be able to perform operations with exponential and radical expressions, and solve equations involving radicals.
9. Computing Values of Trigonometric Functions: Students will be able to compute the values of trigonometric functions of any angle in degree and radian mode.
10. Solving Oblique Triangles: Students will be able to solve oblique triangles using the Law of Sines and the Law of Cosines.
Assessment will involve exams, homework, and quizzes.

☐ Course Outcomes and Assessment Plan (proposed):

☐ Course Outline including Time Allocation (current):

Express time allocation in one of the following formats for a 3 credit hour course; adjust accordingly: Weeks (15 weeks), Hours (45 hours, assuming 3 contact hours per week, Percentages (100 percent)

Class will meet 4 hours per week for 15 weeks for a total of 60 class hours.

☐ Course Outline including Time Allocation (proposed):

Express time allocation in one of the following formats for a 3 credit hour course; adjust accordingly: Weeks (15 weeks), Hours (45 hours, assuming 3 contact hours per week, Percentages (100 percent)
Complete all items below (New or Current)
Check all boxes where modifications are being made.

Course Identification

☐ Prefix (current) MATH
☐ Number (current) 117
Contact Hours (current): 4
[Enter contact hours per week in blank above.]

☐ Prefix (proposed)
☐ Number (proposed)
Contact Hours (proposed):
[Enter contact hours per week in blank above.]

☐ Title (current): Contemporary Mathematics
☐ Title (proposed):

☐ Credit Hours (current): 4 ☒ Prerequisites (current): MATH 110 with grade of C- or better, or 19 on ACT or 460 on SAT.
☐ Co-requisites (current):

☐ Credit Hours (proposed):

☒ Prerequisites (proposed): MATH 109 with grade of C- or better, or MATH 110 with grade of C- or better, or 19 on ACT or 460 on SAT

☐ Co-requisites (proposed):

☒ Course Description (current) 125 words maximum:
A terminal course in mathematics satisfying the General Education quantitative skills requirement. Exposes students to a wide variety of mathematical concepts and their applications. Topics include algebraic applications, geometry, statistics, probability and mathematics of finance. Note: Math 117 cannot be used as a prerequisite for courses requiring Math 115 as a prerequisite. Should a student change his or her academic program to one that requires Math 115 as a prerequisite for subsequent courses the student will be required to complete Math 115. Pre-Requisites: MATH 110 with a grade of C- or better, or 19 on ACT or 460 on SAT. Typically Offered Fall, Spring, Summer.

☒ Course Description (proposed) 125 words maximum:
A terminal course in mathematics satisfying the General Education quantitative skills requirement. Exposes students to a wide variety of mathematical concepts and their applications. Topics include algebraic applications, geometry, statistics, probability and mathematics of finance. Note: Math 117 cannot be used as a prerequisite for courses requiring Math 115 as a prerequisite. Should a student change his or her academic program to one that requires Math 115 as a prerequisite for subsequent courses the student will be required to complete Math 115. Pre-Requisites: MATH 109 with a grade of C- or better, or MATH 110 with a grade of C- or better, or 19 on ACT or 460 on SAT. Typically Offered Fall, Spring, Summer.

☐ Course Outcomes and Assessment Plan (current):
Students successfully completing the course will be able to ...

1) Solve a variety of equations and inequalities (e.g. linear equations and inequalities, quadratic equations, exponential equations, and linear systems of equations and inequalities in 2 variables.)

2) Construct graphs of functions and determine and apply characteristics of graphs (e.g. calculate slope, calculate intercepts, graph lines, graph exponential functions, graph logarithmic functions, graph quadratic functions, determine the vertex of a parabola, use graphical procedures to solve linear programming applications.)

3) Choose and apply appropriate formulas to solve financial applications (e.g. simple and compound interest, effective annual yield, income tax, investment, short and long term loans.)
4) Choose and apply appropriate formulas to solve geometric applications (e.g. convert measurements, calculate perimeters, areas, volumes.)

5) Choose and apply appropriate counting techniques to solve counting and probability applications (e.g. permutations, combinations, multiplicative rule, classic probability.)

6) Perform basic statistical tasks with data (e.g. organize data with graphical displays, interpret and answer questions using graphical displays, calculate descriptive statistics, apply the normal distribution table.)

Assessment will involve exams, homework, and quizzes.

☐ Course Outcomes and Assessment Plan (proposed):

☐ Course Outline including Time Allocation (current):

Express time allocation in one of the following formats for a 3 credit hour course; adjust accordingly: Weeks (15 weeks), Hours (45 hours, assuming 3 contact hours per week, Percentages (100 percent)

Class will meet 4 hours per week for 15 weeks for a total of 60 class hours.

☐ Course Outline including Time Allocation (proposed):

Express time allocation in one of the following formats for a 3 credit hour course; adjust accordingly: Weeks (15 weeks), Hours (45 hours, assuming 3 contact hours per week, Percentages (100 percent)

1/12/15
COURSE INFORMATION FORM

FORM E
Revised July 2015

Complete all items below (New or Current)
Check all boxes where modifications are being made.

Course Identification

☐ Prefix (current) MATH
☐ Number (current) 120
Contact Hours (current): 3
[Enter contact hours per week in blank above.]

☐ Prefix (proposed)
☐ Number (proposed)
Contact Hours (proposed):
[Enter contact hours per week in blank above.]

☐ Title (current): Trigonometry
☐ Title (proposed):

☐ Credit Hours (current): 3
☐ Prerequisites (current): MATH 115 with grade of C- or better, or 24 on ACT or 560 on SAT.
☐ Corequisites (current):

☐ Credit Hours (proposed):
☐ Prerequisites (proposed): MATH 114 with grade of C- or better, or MATH 115 with grade of C- or better, or 24 on ACT or 560 on SAT.
☐ Corequisites (proposed):

☑ Course Description (current) 125 words maximum:
An elementary course in plane trigonometry. Includes the trigonometric functions, their properties, solution of right and oblique triangles, radian measure, graphs, identities, trigonometry equations, vectors, and applications. Related topics in Geometry included. Calculators with trigonometric functions required. Pre-Requisites: MATH 115 with a grade of C- or better, or 24 on ACT or 560 on SAT. Typically Offered Fall, Spring, Summer.

☑ Course Description (proposed) 125 words maximum:
An elementary course in plane trigonometry. Includes the trigonometric functions, their properties, solution of right and oblique triangles, radian measure, graphs, identities, trigonometry equations, vectors, and applications. Related topics in Geometry included. Calculators with trigonometric functions required. Pre-Requisites: MATH 114 with a grade of C- or better, or MATH 115 with a grade of C- or better, or 24 on ACT or 560 on SAT. Typically Offered Fall, Spring, Summer.

☐ Course Outcomes and Assessment Plan (current):
Students who have completed MATH 120 are expected to be able to:

1. Solve abstract and practical problems that involve angle measures, angle relationships, right and oblique triangles, trigonometric functions, trigonometric equations, and vectors.
2. Solve abstract and practical problems that involve arc length, the area of a sector, linear velocity and angular velocity.
3. Sketch and interpret the graphs of trigonometric functions.
4. Verify trigonometric identities and use them to solve problems and manipulate expressions.

Assessment will involve exams, homework, and quizzes.

☐ Course Outcomes and Assessment Plan (proposed):
☐ Course Outline including Time Allocation (current):

Express time allocation in one of the following formats for a 3 credit hour course; adjust accordingly: Weeks (15 weeks), Hours (45 hours, assuming 3 contact hours per week, Percentages (100 percent)

Class will meet 3 hours per week for 15 weeks for a total of 45 class hours.

☐ Course Outline including Time Allocation (proposed):

Express time allocation in one of the following formats for a 3 credit hour course; adjust accordingly: Weeks (15 weeks), Hours (45 hours, assuming 3 contact hours per week, Percentages (100 percent)

[Handwritten signature and date]
Complete all items below (New or Current)

Check all boxes where modifications are being made.

Course Identification

☐ Prefix (current) MATH
☐ Number (current) 218
Contact Hours (current): 3
[Enter contact hours per week in blank above.]

☐ Prefix (proposed)
☐ Number (proposed)
Contact Hours (proposed):
[Enter contact hours per week in blank above.]

☐ Title (current): Math for Elementary Teachers 1
☐ Title (proposed):

☐ Credit Hours (current): 3

☐ Prerequisites (current): Elementary Education students only. MATH 115 with grade of C- or better, or 24 on ACT or 560 on SAT.

☐ Co-requisites (current):

☐ Credit Hours (proposed):

☐ Prerequisites (proposed): Elementary Education students only. MATH 114 with grade of C- or better, or MATH 115 with grade of C- or better, or 24 on ACT or 560 on SAT

☐ Co-requisites (proposed):

☐ Course Description (current) 125 words maximum:

The first in a two course sequence designed to develop pre-service elementary teachers’ conceptual understanding of mathematics. Topics include problem solving, set theory, number theory, rational and real numbers, and algebraic concepts. Emphasis is placed on learning through problem solving. Open only to prospective elementary teachers. Pre-Requisites: MATH 115 with a grade of C- or better, or 24 on ACT or 560 on SAT.

☐ Course Description (proposed) 125 words maximum:

The first in a two course sequence designed to develop pre-service elementary teachers’ conceptual understanding of mathematics. Topics include problem solving, set theory, number theory, rational and real numbers, and algebraic concepts. Emphasis is placed on learning through problem solving. Open only to prospective elementary teachers. Pre-Requisites: MATH 114 with a grade of C- or better, or MATH 115 with a grade of C- or better, or 24 on ACT or 560 on SAT.

☐ Course Outcomes and Assessment Plan (current):

- Application: Students will use manipulatives and activity-based learning to solve and demonstrate conceptual understanding of the mathematics underlying and included in the Elementary School curriculum in Number Theory, Operations, and Algebraic Thinking.
- Communication: Students will be able to communicate effectively about the underlying mathematics behind mathematical procedures and concepts; reflect on a variety of processes of mathematical problem solving; and relate these underlying mathematics and processes to how mathematics should be taught in the elementary classroom.
- Analysis: Students will be able to relate class activities to the elementary classroom in writing.
- Evaluation: Students will connect course concepts to the Common Core State Standards for Mathematical Content and for Mathematical Practice (CCSSM) for grades K-8.

Assessment will involve exams, homework, and quizzes.
Course Outcomes and Assessment Plan (proposed):

Course Outline including Time Allocation (current):

Express time allocation in one of the following formats for a 3 credit hour course; adjust accordingly: Weeks (15 weeks), Hours (45 hours, assuming 3 contact hours per week, Percentages (100 percent)

Class will meet 3 hours per week for 15 weeks for a total of 45 class hours.

Course Outline including Time Allocation (proposed):

Express time allocation in one of the following formats for a 3 credit hour course; adjust accordingly: Weeks (15 weeks), Hours (45 hours, assuming 3 contact hours per week, Percentages (100 percent)

1/2/15
CREATE NEW COURSE – Course Data Entry Form

COMPLETE ALL SECTIONS BELOW. If this course is to be used as a prerequisite for other university courses, FORM F's that reflect the prerequisite change must be submitted for all those courses as well. See Appendix E for Completing Forms.

I. ACTION TO BE TAKEN: CREATE A NEW COURSE

Desired Term Effective (6 digit code): 201808 Examples: 201601 (Spring), 201605 (Summer) NOTE: The first four digits indicate year, the next two digits indicate month in which term.

II. NEW COURSE ATTRIBUTES:

A. Course Prefix: MATH  B. Number: 109  
C. Contact Hours: 4  Lecture ☑ Lab ☐ Seminar ☐ [Enter contact hours per week in blank. See formula for contact hours to credit hours in Appendix E.]
D. Practicum ☐ Independent Study ☐ [Check Box as appropriate. See Definitions in Appendix E]
E. Course Title: Quantitative Reasoning for Professionals 1 [Limit to 30 characters including punctuation and spaces]
F. College Code: AS  G. Department Code: MATH  H. Credit Hours: Variable ☐ Fixed ☑
I. Minimum Credit Hours: 4  J. Maximum Credit Hours: 4 [Enter number is space.]
K. Hours May be Repeated for Extra Credit: Yes ☐ No ☑ If yes, max times  Or max credits awarded.
L. Levels: Undergraduate ☑ Graduate ☐ Professional ☐
M. Grade Method: Normal Grading ☑ Credit/No Credit (Pass/Fail) ☐
N. Does proposed new course replace an equivalent course? Yes ☐ No ☑
O. Equivalent Course: Prefix:  Number:
P. Catalog Description: Limit to 125 words – PLEASE BE CONCISE.

An introductory course in college mathematics in professional contexts. Topics include proportional reasoning, data-based decision making, constructing and interpreting algebraic formulas, and manipulating algebraic formulas including those involving linear expressions, expressions with exponents, rational expressions, and expression with radicals. Additional mathematical topics may include polynomials and factoring. Prerequisites: MATH 010 with a grade of C- or better or 15 or better on ACT (Math) or 350 or better on SAT (Math) and ENGL 074 or 14 or better on ACT (Verbal) or 370 or better on SAT (Verbal). Typically offered Fall, Spring.

Q. Term Offered: Fall, Spring  R. Max Section Enrollment: 25  Lecture:  Lab:
S. Prerequisites or Restrictions: If none, leave blank. MATH 010 with C- or better or 15 or better on ACT (Math) or 350 or better on SAT (Math); and ENGL 074 or 14 or better on ACT (Verbal) or 370 or better on SAT (Verbal)
T. Co-requisites: Courses must be taken concurrently. If none, leave blank. Limit to 100 characters including punctuation and spaces.

To be completed by Academic Affairs Office: Standards & Measures Coding and General Education Code

Basic Skill (BS) ☐ General Education ☐ Occupational Education ☐ G E Codes:

UCC Chair Signature/Date

Academic Affairs Approval Signature/Date

OFFICE OF THE REGISTRAR USE ONLY

Date Rec’d:  Date Completed:  Entered: SCACRSE ☐ SCADETL ☐ SCARRRES ☐ SCAPREQ ☐
CREATE NEW COURSE – Course Data Entry Form

COMPLETE ALL SECTIONS BELOW. If this course is to be used as a prerequisite for other university courses, FORM F’s that reflect the prerequisite change must be submitted for all those courses as well. See Appendix E for Completing Forms.

I. ACTION TO BE TAKEN: CREATE A NEW COURSE

Desired Term Effective (6 digit code): 201608 Examples: 201601 (Spring), 201605 (Summer) NOTE: The first four digits indicate year, the next two digits indicate month in which term.

II. NEW COURSE ATTRIBUTES:

A. Course Prefix: MATH  B. Number: 114
C. Contact Hours: 4  Lecture [ ] Lab [ ] Seminar [ ] [Enter contact hours per week in blank. See formula for contact hours to credit hours in Appendix E.]
D. Practicum [ ] Independent Study [ ] [Check Box as appropriate. See Definitions in Appendix E]
E. Course Title: Quantitative Reasoning for Professionals 2 [Limit to 30 characters including punctuation and spaces]
F. College Code: AS  G. Department Code: MATH  H. Credit Hours: Variable [ ] Fixed [ ]
I. Minimum Credit Hours: 4  J. Maximum Credit Hours: 4 [Enter number is space.]
K. Hours May be Repeated for Extra Credit: Yes [ ] No [x]  If yes, max times Or max credits awarded.
L. Levels: Undergraduate [ ] Graduate [ ] Professional [ ]
M. Grade Method: Normal Grading [ ] Credit/No Credit (Pass/Fail) [ ]
N. Does proposed new course replace an equivalent course? Yes [ ] No [x]
O. Equivalent Course: Prefix:  Number:
P. Catalog Description: Limit to 125 words – PLEASE BE CONCISE.

A study of modeling and analyzing quantitative relationships in professional contexts. Focus on linear and exponential models, linear systems of equations and inequalities, linear programming, linear regression, solving equations with logarithms, and using logarithms to transform non-linear models into linear models. Additional topics may include quadratic functions, logistic functions, and periodic functions. Prerequisites: MATH 109 with a grade of C- or better, or MATH 110 with a grade of C- or better, or 19 on ACT (Math), or 460 on SAT (Math); and ENGL 074 or 14 or better on ACT (Verbal) or 370 or better on SAT (Verbal). Typically offered Fall, Spring.

Q. Term Offered: Fall, Spring  R. Max Section Enrollment: 25  Lecture: [ ] Lab:
S. Prerequisites or Restrictions: If none, leave blank. MATH 109 with C- or better or MATH 110 with C- or better or 19 on ACT (Math) or 460 on SAT (Math); and ENGL 074 or 14 or better on ACT (Verbal) or 370 or better on SAT (Verbal)
T. Co-requisites: Courses must be taken concurrently. If none, leave blank. Limit to 100 characters including punctuation and spaces.

To be completed by Academic Affairs Office: Standards & Measures Coding and General Education Code

Basic Skill (BS) [ ] General Education [ ] Occupational Education [ ] G E Codes: [ ]

UCC Chair Signature/Date

Academic Affairs Approval Signature/Date

OFFICE OF THE REGISTRAR USE ONLY

Date Rec’d:  Date Completed:  Entered: SCACRSE [ ] SCADETL [ ] SCARRES [ ] SCAPREQ [ ]
MODIFY A COURSE – Course Data Entry Form

I. ACTION TO BE TAKEN: MODIFY A COURSE

Desired Term Effective (6 digit code): 201608  Examples: 201601 (Spring), 201605 (Summer) NOTE: The first four digits indicate year, the next two digits indicate month in which term.

II. COURSE TO BE MODIFIED:

A. Course Prefix: MATH  B. Number: 115
C. Course Title: Intermediate Algebra

LIST THE LETTER(S) OF ALL CHANGES FROM SECTION III BELOW: P, S  See Appendix E Instructions for Completing Forms.

III. MODIFICATIONS

A. Course Prefix:  B. Number:
B. Contact Hours:  Lecture □ Lab □ Seminar □ [Enter contact hours per week in blank. See formula for contact hours to credit hours in Appendix E.]
C. Practicum □ Independent Study □ [Check Box as appropriate. See Definitions in Appendix E]
D. Course Title:  [Limit to 30 characters including punctuation and spaces]
E. College Code:  G. Department Code:  H. Credit Hours: Variable □ Fixed □
I. Minimum Credit Hours:  J. Maximum Credit Hours:  [Enter number as space.]
K. Hours May be Repeated for Extra Credit: Yes □ No □ If yes, max times Or max credits awarded.
L. Levels: Undergraduate □ Graduate □ Professional □
M. Grade Method: Normal Grading □ Credit/No Credit (Pass/Fail) □
N. Does proposed new course replace an equivalent course? Yes □ No □
O. Equivalent Course: Prefix:  Number:
P. Catalog Description: Limit to 125 words – PLEASE BE CONCISE.

A study of complex fractions, first and second degree equations and inequalities, exponents, radicals, and introduction to complex numbers, logarithms, and systems of equations. Pre-Requisites: MATH 109 with a grade of C- or better, or MATH 110 with a grade of C- or better, or 19 on ACT or 460 on SAT. Typically Offered Fall, Spring, Summer.

Q. Term Offered:  R. Max Section Enrollment:
S. Prerequisites or Restrictions: If none, leave blank. MATH 109 with C- or better or MATH 110 with C- or better or 19 on ACT or 460 on SAT
T. Co-requisites: Courses must be taken concurrently. If none, leave blank. Limit to 100 characters including punctuation and spaces.

To be completed by Academic Affairs Office: Standards & Measures Coding and General Education Code
Basic Skill (BS) □  General Education □  Occupational Education □  G E Codes:

UCC Chair Signature/Date  Academic Affairs Approval Signature/Date

OFFICE OF THE REGISTRAR USE ONLY

Date Rec’d:  Date Completed:  Entered: SCACRSE □ SCADETL □ SCARRRES □ SCAPREQ □
MODIFY A COURSE – Course Data Entry Form

FORM F-M
Revised July 2015

I. ACTION TO BE TAKEN: MODIFY A COURSE

Desired Term Effective (6 digit code): 201608  Examples: 201601 (Spring), 201605 (Summer) NOTE: The first four digits indicate year, the next two digits indicate month in which term.

II. COURSE TO BE MODIFIED:

A. Course Prefix: MATH  B. Number: 116
C. Course Title: Intermediate Algebra – Num Trig

LIST THE LETTER(S) OF ALL CHANGES FROM SECTION III BELOW: P, S  See Appendix E Instructions for Completing Forms.

III. MODIFICATIONS

A. Course Prefix:  B. Number:
B. Contact Hours: Lecture □ Lab □ Seminar □ [Enter contact hours per week in blank. See formula for contact hours to credit hours in Appendix E.]
C. Practicum □ Independent Study □ [Check Box as appropriate. See Definitions in Appendix E]
D. Course Title: [Limit to 30 characters including punctuation and spaces]
E. College Code:  G. Department Code:  H. Credit Hours: Variable □ Fixed □
I. Minimum Credit Hours:  J. Maximum Credit Hours: [Enter number is space.]
K. Hours May be Repeated for Extra Credit: Yes □ No □ If yes, max times Or max credits awarded.
L. Levels: Undergraduate □ Graduate □ Professional □
M. Grade Method: Normal Grading □ Credit/No Credit (Pass/Fail) □
N. Does proposed new course replace an equivalent course? Yes □ No □
O. Equivalent Course: Prefix: Number:
P. Catalog Description: Limit to 125 words – PLEASE BE CONCISE.

Special factoring forms, exponents, roots and radicals, scientific notation, fractions, first and second degree equations and inequalities, functions and graphs, logarithms, and solutions of logarithmic and exponential equations, systems of equations up to 3x3 and Cramer’s Rule, numerical trigonometry including vectors, Law of Sines and Cosines, and graphs of trigonometric functions. Pre-Requisites: MATH 109 with a grade of C- or better, or MATH 110 with a grade of C- or better, or 19 on ACT or 460 on SAT. Typically Offered Fall, Spring, Summer.

Q. Term Offered:  R. Max Section Enrollment: Lecture:  Lab:
S. Prerequisites or Restrictions: If none, leave blank. MATH 109 with C- or better or MATH 110 with C- or better or 19 on ACT or 460 on SAT
T. Co-requisites: Courses must be taken concurrently. If none, leave blank. Limit to 100 characters including punctuation and spaces.

To be completed by Academic Affairs Office: Standards & Measures Coding and General Education Code

Basic Skill (BS) □ General Education □ Occupational Education □  G E Codes:

UCC Chair Signature/Date  Academic Affairs Approval Signature/Date

OFFICE OF THE REGISTRAR USE ONLY

Date Rec’d:  Date Completed:  Entered: SCACRSE □ SCADETL □ SCARRES □ SCAPREQ □
MODIFY A COURSE – Course Data Entry Form

FORM F-M
Revised July 2015

I. ACTION TO BE TAKEN: MODIFY A COURSE

Desired Term Effective (6 digit code): 201608  Examples: 201601 (Spring), 201605 (Summer) NOTE: The first four digits indicate year, the next two digits indicate month in which term.

II. COURSE TO BE MODIFIED:

A. Course Prefix: MATH  B. Number: 117  
C. Course Title: Contemporary Mathematics

LIST THE LETTER(S) OF ALL CHANGES FROM SECTION III BELOW: P, S  See Appendix E Instructions for Completing Forms.

III. MODIFICATIONS

A. Course Prefix:  B. Number:  
B. Contact Hours:  Lecture ☐ Lab ☐ Seminar ☐ [Enter contact hours per week in blank. See formula for contact hours to credit hours in Appendix E.]  
C. Practicum ☐  Independent Study ☐ [Check Box as appropriate. See Definitions in Appendix E]  
D. Course Title:  [Limit to 30 characters including punctuation and spaces]  
E. College Code:  G. Department Code:  H. Credit Hours: Variable ☐ Fixed ☐  
I. Minimum Credit Hours:  J. Maximum Credit Hours:  [Enter number is space.]  
K. Hours May be Repeated for Extra Credit: Yes ☐  No ☐  If yes, max times Or max credits awarded.  
L. Levels: Undergraduate ☐  Graduate ☐  Professional ☐  
M. Grade Method: Normal Grading ☐  Credit/No Credit (Pass/Fail) ☐  
N. Does proposed new course replace an equivalent course? Yes ☐  No ☐  
O. Equivalent Course: Prefix:  Number:  
P. Catalog Description: Limit to 125 words – PLEASE BE CONCISE.

A terminal course in mathematics satisfying the General Education quantitative skills requirement. Exposes students to a wide variety of mathematical concepts and their applications. Topics include algebraic applications, geometry, statistics, probability and mathematics of finance. Note: Math 117 cannot be used as a prerequisite for courses requiring Math 115 as a prerequisite. Should a student change his or her academic program to one that requires Math 115 as a prerequisite for subsequent courses the student will be required to complete Math 115. Pre-Requisites: MATH 109 with a grade of C- or better, or MATH 110 with a grade of C- or better, or 19 on ACT or 460 on SAT. Typically Offered Fall, Spring, Summer.

Q. Term Offered:  R. Max Section Enrollment:  Lecture:  Lab:  
S. Prerequisites or Restrictions: If none, leave blank. MATH 109 with C- or better or MATH 110 with C- or better or 19 on ACT or 460 on SAT  
T. Co-requisites: Courses must be taken concurrently. If none, leave blank. Limit to 100 characters including punctuation and spaces.

To be completed by Academic Affairs Office: Standards & Measures Coding and General Education Code

Basic Skill (BS) ☐  General Education ☐  Occupational Education ☐  G E Codes:  

UCC Chair Signature/Date  Academic Affairs Approval Signature/Date

OFFICE OF THE REGISTRAR USE ONLY

Date Rec’d:  Date Completed:  Entered: SCACRSE ☐  SCADETL ☐  SCARRES ☐  SCAPREQ ☐
MODIFY A COURSE – Course Data Entry Form

FORM F-M
Revised July 2015

I. ACTION TO BE TAKEN: MODIFY A COURSE

Desired Term Effective (6 digit code): 201608  Examples: 201601 (Spring), 201605 (Summer)  NOTE: The first four digits indicate year, the next two digits indicate month in which term.

II. COURSE TO BE MODIFIED:

A. Course Prefix: MATH  B. Number: 120
C. Course Title: Trigonometry

LIST THE LETTER(S) OF ALL CHANGES FROM SECTION III BELOW: P, S  See Appendix E Instructions for Completing Forms.

III. MODIFICATIONS

A. Course Prefix:  B. Number:
B. Contact Hours: Lecture □ Lab □ Seminar □ [Enter contact hours per week in blank. See formula for contact hours to credit hours in Appendix E.]
C. Practicum □ Independent Study □ [Check Box as appropriate. See Definitions in Appendix E]
D. Course Title: [Limit to 30 characters including punctuation and spaces]
E. College Code:  G. Department Code:  H. Credit Hours: Variable □ Fixed □
I. Minimum Credit Hours:  J. Maximum Credit Hours: [Enter number is space.]
K. Hours May be Repeated for Extra Credit: Yes □ No □ If yes, max times Or max credits awarded.
L. Levels: Undergraduate □ Graduate □ Professional □
M. Grade Method: Normal Grading □ Credit/No Credit (Pass/Fail) □
N. Does proposed new course replace an equivalent course? Yes □ No □
O. Equivalent Course: Prefix:  Number:
P. Catalog Description: Limit to 125 words – PLEASE BE Concise.

An elementary course in plane trigonometry. Includes the trigonometric functions, their properties, solution of right and oblique triangles, radian measure, graphs, identities, trigonometry equations, vectors, and applications. Related topics in Geometry included. Calculators with trigonometric functions required. Pre-Requisites: MATH 114 with a grade of C- or better, or MATH 115 with a grade of C- or better, or 24 on ACT or 560 on SAT. Typically offered Fall, Spring, Summer.

Q. Term Offered:  R. Max Section Enrollment:  Lecture:  Lab:
S. Prerequisites or Restrictions: If none, leave blank. MATH 114 with C- or better or MATH 115 with C- or better or 24 on ACT or 560 on SAT
T. Co-requisites: Courses must be taken concurrently. If none, leave blank. Limit to 100 characters including punctuation and spaces.

To be completed by Academic Affairs Office: Standards & Measures Coding and General Education Code
Basic Skill (BS) □ General Education □ Occupational Education □ G E Codes:

UCC Chair Signature/Date  Academic Affairs Approval Signature/Date

OFFICE OF THE REGISTRAR USE ONLY
Date Rec’d:  Date Completed:  Entered: SCACRSE □ SCADTL □ SCARRES □ SCAPREQ □
MODIFY A COURSE – Course Data Entry Form

I. ACTION TO BE TAKEN: MODIFY A COURSE

Desired Term Effective (6 digit code): 201608  Examples: 201601 (Spring), 201605 (Summer) NOTE: The first four digits indicate year, the next two digits indicate month in which term.

II. COURSE TO BE MODIFIED:

A. Course Prefix: MATH  B. Number: 218
C. Course Title: Math for Elementary Teachers 1

LIST THE LETTER(S) OF ALL CHANGES FROM SECTION III BELOW: P, S  See Appendix E Instructions for Completing Forms.

III. MODIFICATIONS

A. Course Prefix:  B. Number:
B. Contact Hours: Lecture □ Lab □ Seminar □ [Enter contact hours per week in blank. See formula for contact hours to credit hours in Appendix E.]
C. Practicum □ Independent Study □ [Check Box as appropriate. See Definitions in Appendix E]
D. Course Title: [Limit to 30 characters including punctuation and spaces]
E. College Code:  G. Department Code:  H. Credit Hours: Variable □ Fixed □
I. Minimum Credit Hours:  J. Maximum Credit Hours: [Enter number is space.]
K. Hours May be Repeated for Extra Credit: Yes □ No □ if yes, max times or max credits awarded.
L. Levels: Undergraduate □ Graduate □ Professional □
M. Grade Method: Normal Grading □ Credit/No Credit (Pass/Fail) □
N. Does proposed new course replace an equivalent course? Yes □ No □
O. Equivalent Course: Prefix:  Number:
P. Catalog Description: Limit to 125 words – PLEASE BE CONCISE.

The first in a two course sequence designed to develop pre-service elementary teachers' conceptual understanding of mathematics. Topics include problem solving, set theory, number theory, rational and real numbers, and algebraic concepts. Emphasis is placed on learning through problem solving. Open only to prospective elementary teachers. Pre-Requisites: MATH 114 with a grade of C- or better, or MATH 115 with a grade of C- or better, or 24 on ACT or 560 on SAT.

Q. Term Offered:  R. Max Section Enrollment:  L. Lecture:  Lab:
S. Prerequisites or Restrictions: If none, leave blank. MATH 114 with C- or better or MATH 115 with C- or better or 24 on ACT or 560 on SAT
T. Co-requisites: Courses must be taken concurrently. If none, leave blank. Limit to 100 characters including punctuation and spaces.

To be completed by Academic Affairs Office: Standards & Measures Coding and General Education Code

Basic Skill (BS) □ General Education □ Occupational Education □ G E Codes:

UCC Chair Signature/Date

Academic Affairs Approval Signature/Date

OFFICE OF THE REGISTRAR USE ONLY

Date Rec’d:  Date Completed:  Entered: SCACRSE □ SCADTL □ SCARRES □ SCAPREQ □
GENERAL EDUCATION APPROVAL FORM

Form G plus justification of the General Education designation being sought must be sent to the General Education Coordinator (preferably electronically). The criteria for each designation can be found on the FSU General Education website:
http://www.ferris.edu/HTMLS/academics/gened/gened.html

Upon review, the form below will be completed by the University General Education Committee for the courses that will meet General Education requirements. The form must be included in the proposal packet.

Course Prefix: MATH Course Number: 114
Course Title: Quantitative Reasoning for Professionals 2   G. E. Codes Requested: Q

Initiator: Victor Piercey Date Sent: December 14, 2015
Proposal Contact: Victor Piercey Email: piercev1@ferris.edu
Department: MATH Campus Address: ASC 2036

Based upon University General Education Committee review on (date), we
☑ Support the request to designate the course listed above as a Q (insert Gen. Ed. Designation(s).)
☐ Do not support the request to designate the course listed above as a (insert Gen. Ed. Designation(s)) for reasons listed below.

Comments:

University General Education Committee: Approved December 14, 2015
Chair: Date Returned: 1/12/2016

VPAA
JAN 12 2016
PROVOST
Quantitative Literacy Course Criteria

All courses seeking General Education status are required to meet specific criteria approved by the Academic Senate. The criteria that a course must meet for the Quantitative Literacy designator are listed below. Course proposers must provide a justification for why their course should be given General Education status by explaining how her/his course will meet each criterion. Please include descriptions of assignments and assessments that will be used for each criterion.

The completed page(s) must be included with curriculum proposal forms A, E, F and G and then sent electronically to the Coordinator of General Education who will forward the proposal to the appropriate General Education outcome area committee for evaluation. Please contact the Coordinator of General Education for any questions about this process.

To be approved as a Quantitative Literacy course, proposers must:

A. describe how students will be prepared to:
   1. explain information presented in mathematical forms;
      Throughout the course, students will be asked to work through and discuss "explorations" of mathematical ideas. This requires students to review, reflect upon, and explain their mathematical reasoning and interpretation of mathematical results in writing. In addition, there will be certain "extension assignments" that will extend these requirements deeper and make connections. Finally, as part of classroom activities, students will have to explain their responses to questions in the explorations to their classmates, including delivering presentations, and respond to their peers' questions.
   2. convert relevant information into various mathematical forms;
      The emphasis in MATH 114 is on viewing mathematical models through the four key representations: verbal, numerical, symbolic, and graphical. Students will often be required to convert descriptions in one of these prer
   3. perform calculations by hand, with the calculator, and with the computer;
      Students are required to perform calculations throughout the course. Many of their calculations require manipulating formulas by hand or transforming functions from one form to another (for example, using a logarithm to make an exponential model into a linear model suitable for regression). Several class periods are spent on solving linear systems and linear programming problems by hand. In addition, students use calculators for numerical computations and graphing, including the use of the online graphing calculator Desmos which allows students to use sliders to analyze the relationship between function parameters and the graph of the function. Excel is used considerably throughout the course, sometimes simply to investigate data, but other times for more sophisticated functions including multiple linear regression, linear programming problems with three or more decision variables, and creating log and log-log plots to determine whether a power function or an exponential function fits a data set better.
   4. describe assumptions in estimation, modeling, and analysis of data;
      Early in the course students are asked to explore estimation and explain how they selected an estimation method. The "take-away" from this exploration is that how you estimate depends on context. In addition, students are asked to determine how to use the data itself to select a technique to analyze the data (for example, what sort of graphical display would be most appropriate to convince an audience of a decision). As part of modeling, students are asked to characterize what makes a linear model linear ("linearity") and what makes an exponential model exponential ("exponentiality"). Given data or verbal descriptions, students are asked whether assumptions of linearity or exponentiality are appropriate. This includes some consideration of the consequences of faulty assumptions. Finally, students use regular plots, log plots and log-log plots to determine whether an assumption that data should be analyzed using a linear model, an exponential model, or a power function model would be best prior to running a regression.
   5. use quantitative data together with other information to draw plausible conclusions.
      Students are often asked to make professional decisions in scenarios involving data and then asked to justify their decisions based on the data. Students will occasionally have to weigh decisions and justify their selection based on mathematical analysis (for example, using future value formulas modeled by exponential functions to select the best investment, or using logarithms to decide the smallest ethically appropriate minimum payment to charge a credit card customer).
B. demonstrate that the course will spend a preponderance (approximately 75%) of course activities and assessment addressing the above outcome criteria.

Every outcome in the courses is dedicated to one or more of the criteria above, as is every assessment method.

Here is a specific list:

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify and create models of linear functions involving verbal, numerical, algebraic, and graphical representations.</td>
<td>1, 2, 3, 4, and 5</td>
</tr>
<tr>
<td>Identify and create models of exponential functions involving verbal, numerical, algebraic, and graphical representations.</td>
<td>1, 2, and 3</td>
</tr>
<tr>
<td>Solve problems requiring the use of logarithms.</td>
<td>1, 2, 3, 4, and 5</td>
</tr>
<tr>
<td>Use linear systems of equations and inequalities as well as linear programming to solve problems.</td>
<td>1, 3, and 5</td>
</tr>
<tr>
<td>Apply mathematical concepts to solve complicated, novel problems in context.</td>
<td>1 and 4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explorations</td>
<td>1, 2, 3, 4, and 5</td>
</tr>
<tr>
<td>Extended assignments/take-home exams</td>
<td>1, 2, 3, 4, and 5</td>
</tr>
<tr>
<td>Checkpoint HW</td>
<td>2, 3, and 4</td>
</tr>
<tr>
<td>In-Class Exams</td>
<td>2, 3, and 4</td>
</tr>
<tr>
<td>Quizzes</td>
<td>2, 3, and 4</td>
</tr>
<tr>
<td>Class discussion</td>
<td>1</td>
</tr>
<tr>
<td>Project</td>
<td>1, 2, 3, 4, and 5</td>
</tr>
</tbody>
</table>

C. demonstrate that the course will be taught by faculty with academic credentials appropriate to the course.

This course will be designed and initially taught by Victor Piercey, who has a Ph.D in Mathematics and a J.D. along with experience working with business clients as an attorney. Other faculty within the Mathematics Department will be trained through a team-teaching and mentoring program. This will involve team-teaching the course once with an instructor who has taught the course and will serve as a mentor, teaching the course once on one’s own, and then serving as a team-teaching mentor for new instructors for the course.

D. demonstrate that the course should be transferrable as a comparable course to other institutions.

The final recommendations for mathematics in the latest “Michigan Transfer Agreement” include three pathways: a College Algebra pathway, a Statistics pathway, and a Quantitative Reasoning pathway. Any one of these pathways will satisfy the MTA requirements for general education.

This course follows the Quantitative Reasoning pathway. The recommended content for this pathway is as follows:

- Mathematical modeling and the use of reasoning to choose between competing models
- Numeric, symbolic, and graphical methods to handle a variety of applications
- Topics could include but are not limited to number sense and estimation, linear and non-linear models, financial models, symbolic logic, networks, networks and graphs, probability and counting, statistical reasoning, voting theory, geometric models, similarity and scaling, and game theory. (emphasis added)

Note that the list of topics is suggestive and NOT prescriptive.

The content of the proposed course (as described above) aligns with this recommendation.
Finally, note that the proposers for this course have plans to eventually partner with Michigan community colleges and other Michigan institutions to widen implementation. Faculty at Davenport have already begun working on this process. The long term goal is to make this course a nationwide standard course that may be adopted by other institutions if appropriate.
Exhibit A: Additional Details and Exposition Concerning MATH 109 and MATH 114
Quantitative Reasoning for Professionals: MATH 109 and MATH 114

Executive Summary

For the past two years, the mathematics department has run an experimental course sequence called Quantitative Reasoning for Business (“QRB”). We propose to make this a permanent addition to the course catalog. While the courses will initially serve business students, we anticipate adapting the course materials for other programs with similar content needs. For that reason, the sequence is titled “Quantitative Reasoning for Professionals” (“QRP”) to emphasize that the same courses will be available for students in programs besides business. This proposal also includes adding the new courses as allowed prerequisites for courses that currently require MATH 110 or MATH 115.

Contents:

This proposal is presented with the following headings.

1. History (pg. 3) – the process that led to the creation of the new courses.
2. About the Courses (pg. 3) – a detailed description of the content of the courses, including the outcomes and recommended course materials.
3. National Context (pg. 6) – how this course fits into initiatives taking place across the country as well as changes at the state and local level.
4. Evidence of Success (pg. 7) – mostly qualitative data showing the promise of the new courses in terms of student learning, retention, and reduction of math anxiety and nonavailing beliefs.
5. Difference from 110/115: The Case for 109/114 as Prerequisites (pg. 11) - detailed explanation of the difference between the new courses and the original 110/115 sequence. We address why the new courses are appropriate prerequisites for courses currently requiring 110 or 115.
6. Fit Into the Business Curriculum (pg. 13) – the process by which these courses will be incorporated into the business curriculum.
7. Transition Plan (pg. 13) – the plan to address the development of resources for these courses, including the faculty to teach the course, a placement test, and academic support services.
8. Credit Load (pg. 15) – a comparison of the current math sequence for business students with the proposed sequence, including a discussion of how the changed credit load will impact students.
9. Prerequisites and Course Caps (pg. 16) - a rationale for the proposed prerequisites and course caps.
10. Other Logistical Matters (pg. 16) – a plan for addressing advising, major changes, and transfers among institutions.
11. About this Proposal (pg. 17) – a description of the curricular mechanisms involved in the proposal.
12. Conclusion (pg. 17) – a concluding summary.
13. References (pg. 18) – citations for works cited.
14. Table 1 (pg. 21) – A list of programs in the College of Business.
15. Table 2 (pg. 22) – A list of all courses requiring either MATH 110 or MATH 115 as a prerequisite, including (where appropriate) enrollment figures for students who had formerly been business majors.
History

During the 2012-2013 academic year, a committee consisting of faculty from the College of Business and the Department of Mathematics met regularly in response to a request from business faculty to improve mathematical outcomes for their students. What emerged was an alternate course for business students that would replace MATH 115. The content areas that students were demonstrating difficulty with were (a) proportional reasoning, especially ratios and percentages, and (b) handling and manipulating formulas. In addition, linear functions and exponential functions needed to be part of the course, along with tools to study linear and exponential models (including systems and logarithms). Throughout these meetings, a common theme was that the students needed to be stronger and more confident problem solvers. We are making this an explicit outcome for both courses.

During the academic year 2013-2014, an experimental course called Quantitative Reasoning for Business was run under the designation MATH 190, with a MATH 110 prerequisite (or placement into MATH 115). It became apparent during this process that a great deal of time was spent working through material at the MATH 110 level. As a consequence, during the academic year 2014-2015 we ran a sequence of two experimental courses under the designation MATH 190: Quantitative Reasoning for Business 1 and Quantitative Reasoning for Business 2. The prerequisite for the first course was placement into MATH 110. The prerequisite for the second course was placement into MATH 115. In addition to replacing MATH 110 and MATH 115, this sequence also replaces MATH 122 (Math Analysis for Business) which is required for certain business majors. These two new courses are what we seek to add to the catalog permanently.

Other units (such as Health Care Systems and Administration) have expressed interest in a similar sequence for their students. As a consequence we are designing the new courses (MATH 109 and MATH 114) in a way that will facilitate adaptation to other programs beyond business without having to reengage the curriculum process to create or modify courses. For this reason, the title has changed from “Quantitative Reasoning for Business” (“QRB”) to “Quantitative Reasoning for Professionals” (“QRP”). The reason for such a title rather than simply “Quantitative Reasoning” is that students in certain professional programs, such as business or nursing, have certain (common) quantitative needs that include some algebra. At the same time, the traditional algebra sequence designed to prepare students for Calculus may not appropriate for this population. Through this sequence, we strive to strike the optimal balance between professional content requirements and a deeper mathematical reasoning that supports problem solving and critical thinking. Since the students who will benefit from MATH 109 and 114 are in career-oriented programs, these courses will make a meaningful contribution to the mission of the university.

About the Proposed Courses

All but one of the proposed course outcomes address content. These content-based outcomes are the result of the discussion with business faculty. In addition, we have added to both courses a “problem solving outcome” in order to address faculty concerns about students’ overall problem-solving habits. The course materials that have been developed encourage faculty to use inquiry-based learning, which is an approach that supports these dispositions (Hodara, 2013; Kohen and Laursen, 2014).

The content of the two courses are organized around different themes.
MATH 109

The first course is about using and processing data. This is the “developmental” course in the sequence. The outcomes for MATH 109 are as follows:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Students will be able to apply prior knowledge and mathematical concepts to solve novel problems.</td>
</tr>
<tr>
<td>2.</td>
<td>Students will be able to use proportional reasoning to solve problems.</td>
</tr>
<tr>
<td>3.</td>
<td>Students will use data to make and defend professional decisions.</td>
</tr>
<tr>
<td>4.</td>
<td>Students will be able to construct algebraic formulas to model real-world quantitative relationships.</td>
</tr>
<tr>
<td>5.</td>
<td>Students will be able to manipulate formulas involving diverse mathematical operations.</td>
</tr>
</tbody>
</table>

The first outcome is the “problem-solving” outcome and is addressed through inquiry-based materials and homework. This outcome will be primarily assessed through specific homework assignments which require students to solve new problems or complete mathematical tasks that they are unlikely to have encountered. For example, one such assignment requires programming Excel to adjust the minimum wage for inflation.

The other outcomes describe the content of the course, which is organized into four units, one for each outcome.

- **Unit 1:** A great deal of data comes in the form of ratios, proportions, and percentages. As a result, the first unit lays a foundation in proportional reasoning that is necessary to interpret and process data.
- **Unit 2:** The second unit explicitly addresses the use of data, including activities in which students have to make and justify decisions when the data is ambiguous. Two major themes in this unit are using spreadsheets and handling complications.

The third and fourth units involve the use of algebraic formulas. Formulas are necessary to process raw data into communicable formats. Algebraic representations of formulas are useful because they can be programmed into spreadsheets to complete any number of calculations simultaneously. In addition, sometimes a formula must be manipulated (solved for another variable) in order to obtain the data desired.

- **Unit 3:** In the third unit, students develop formulas to process data in order to provide a desired result. Students also break down specific, given formulas in order to make sense of how they work. Students learn to view algebraic formulas as “recipes” telling one the quantities (“ingredients”) involved and the steps (“operations”) used to process those quantities. Particular attention is paid to order of operations.
- **Unit 4:** The fourth unit is focused on manipulating formulas, mostly for the purpose of solving for a specified variable or using identities to simplify an expression.

Study skills explorations are embedded throughout MATH 109 to help students find their way through the college experience. By Unit 2, these explorations direct students to formulate their own academic goals, collect data to evaluate their progress toward those goals, and periodically assess the quality of
their data collection plan. As such, the study skills materials fit into the theme of the course. Research shows that study skills can be learned and that embedding these lessons into developmental courses is a “best practice.” (See, e.g., McKeachie et al. 1985).

In addition, beginning in Unit 2, students use Excel throughout the course. Excel is the mathematical software that professional students are most likely to encounter in their careers, and is also extremely useful for personal financial planning.

MATH 114

The second course is a “college-level” course. The theme of MATH 114 is modeling, with a focus on using models to “predict the future.” The units are organized around linear and exponential models and the analytic tools necessary to use those models to solve problems (such as systems of equations and logarithms). Students are briefly exposed to other types of mathematical models, including quadratic, logistic, and periodic models as well as a rudimentary stochastic model (using coin flips to simulate stock prices).

The outcomes of MATH 114 are as follows:

| 1. Students will be able to apply prior knowledge and mathematical concepts to solve complicated, novel problems in context. |
| 2. Students will be able to identify and create models of linear functions involving verbal, numerical, algebraic, and graphical representations. |
| 3. Students will be able to identify and create models of exponential functions involving verbal, numerical, algebraic, and graphical representations. |
| 4. Students will be able to solve problems requiring the use of logarithms. |
| 5. Students will be able to use linear systems of equations and inequalities as well as linear programming to solve problems. |

The “problem solving” outcome is more sophisticated than that of MATH 109. The modeling outcomes emphasize the four representations of functions. Implicit in the outcomes is that students learn to identify an appropriate model by examining how a function changes. Technology is utilized throughout the course, including Desmos as a graphing calculator that allows students to explore the impact of parameters using sliders. Excel also utilized often, including using features to solve linear programming problems with more than two decision variables as well as multiple linear regression. Students also use Excel to create log plots and log-log plots in order to determine whether an exponential or power function is likely to be the best fit to model data and use logarithms to transform nonlinear models into linear models for regression.

As with MATH 109, the content based outcomes are organized into units, picking up where MATH 109 leaves off.

- **Unit 5:** The most common mathematical models are linear and exponential models. The fifth unit involves an understanding of the practical meaning and implications of linearity, detecting linearity in data as well as verbal descriptions, algebraic representations, and graphs. In addition, we emphasize switching between representations. Students are required to write equations given data (usually two points or the slope and a point), write equations from graphs,
generate graphs from equations, and write practical interpretations of features such as the slope and the intercept.

- **Unit 6**: In the sixth unit, we study exponential functions. We identify exponential functions given data, graphs, and verbal descriptions, determine whether a given exponential function represents growth or decay, and simplify and manipulate algebraic representations using the laws of exponents.

- **Unit 7**: While units 5 and 6 focus on modeling, Units 7 and 8 are about using the models for analysis. The seventh unit introduces logarithms. In this unit, we primarily use logarithms to solve for an unknown exponent and to solve equations. A motivation is provided by the credit card problem: how long does it take to pay off a fixed loan with fixed monthly payments?

- **Unit 8**: The last unit is about analysis using linear functions. This includes solving systems of linear equations using a variety of approaches, linear programming, and using logarithms to linearize nonlinear functions (exponential and power functions).

**Adaptation to Other Programs**

When the course is adapted to other programs, the mathematics will not change. Rather, the contexts in which students explore the mathematics will change. For example, explorations in Unit 2 about the consumer price index may be changed to explorations about the body-mass index. Both deal with index numbers, but one context is economic while the other is health. Even though graduates of business programs are unlikely to encounter the body-mass index professionally, the context of such an exploration will benefit that students’ general education, specifically regarding health. Similarly, explorations that deal with the time it takes to pay off a loan will benefit non-business students by improving their financial literacy. By addressing common content in different contexts, students will also see one of the great values of mathematics, namely that the same mathematical idea can be applied in multiple scenarios. As a result, adapting the course to other programs will enrich the student experience.

**The National Context**

This course sequence is in line with curriculum reforms taking place across the country and advocated by professional associations. Mathematics faculty from the Mathematics Association of America conducted studies with partner disciplines. They identified a need for authentic and discipline-based mathematics in an active learning environment (Barker, et. al. 2004; Ganter & Barker, 2004; Ganter & Haver, 2011). A report (2012) of the President’s Council of Advisors on Science and Technology stressed the need to improve student learning experiences in undergraduate mathematics courses, especially at the lower level, by incorporating active learning strategies and collaborating with partner disciplines to create contextualized, rich mathematical experiences. This call was repeated in a publication (2013) of the National Research Council looking to the future of the mathematical sciences.

The sequence also aligns with specific reforms being adopted at institutions across the country. The structure of the sequence with one developmental course and one college-level course, the fact that this sequence will offer a professionally appropriate mathematics pathway for students, and the use of inquiry-based course materials all follow best practices that have been used by the New Mathways Project at the Dana Center and the Quantway/Statway project at the Carnegie Foundation (for some of the relevant supporting research, see Boylan, 2002; Goldstein, et. al., 2011). Quantway and Statway
have been adopted at a number of institutions, while the New Mathways Project is or will be adopted by the entire community college system of the state of Texas. Other institutions have made their own, homegrown courses for similar needs. For example, Augsburg College developed a course called “Just Enough Algebra” that shares similar features to MATH 109 and MATH 114. Their course is designed for a variety of students, including students who are going to take statistics and students who are going to take College Algebra or Precalculus.

The new sequence also fits changes taking place in Michigan and at Ferris. MATH 114 satisfies the new Ferris general education conditions for quantitative skills and the quantitative elements of the Michigan Transfer Agreement (Form G is included in this proposal).

Evidence of Success

Preliminary data shows the promise of this course sequence to improve retention and student learning.

Figure 1 shows DFW rates by semester compared to an appropriate “comparison course.” Since the initial pilot in Fall 2013 and Spring 2014 was intended as a replacement for MATH 115, the comparison course for both of those semesters is MATH 115. In the 2014-2015 academic year, the Fall 2014 course was a replacement for MATH 110 and the Spring 2015 course was a replacement for MATH 115. The comparison course in each case was selected accordingly. In all cases, the DFW rates for the comparison course come from data for the same semester as that for MATH 190. For example, for Fall 2013, we see the DFW rate for MATH 190 as well as the DFW rate across all sections of MATH 115 from the Fall 2013 semester.

The data in Figure 1 shows that during the first run of the course in Fall 2013 we had a higher DFW rate than MATH 115. By the second iteration in Spring 2014 following revisions the DFW rate was more in line with that for MATH 115. After significant revision during the summer of 2014, the Fall 2014 course had a significantly lower DFW rate than MATH 110. The Spring 2015 DFW rate for QRB was not only lower than the MATH 115 DFW rate that semester, it was lower than the DFW rate for every comparison course over the two year period.
Figures 2 and 3 show comparisons between performance on formula manipulation problems in QRB 1 and students in MATH 115. Figure 2 displays student performance on the following problem:

Solve for $M$: \[ T = n \sqrt[2]{\frac{M}{K}} - 1 \]

Figure 3 displays student performance on:

Solve for $K$: \[ T = n \sqrt[2]{\frac{M}{K}} - 1 \]

Each response was coded as "mastered" if the problem was solved perfectly, "approaching" if the problem was solved almost perfectly with minor errors, and "needs improvement" otherwise.
There were 45 QRB students who completed these problems, and 81 MATH 115 students. All students were asked to complete the problems anonymously on an index card.
The manipulation of formulas is one of the more important elements of procedural fluency needed by business and other professional students. The comparisons in Figures 2 and 3 show that students in QRB outperformed their MATH 115 counterparts.

Beyond the cognitive domain, students in this course have demonstrated affective gains over their peers in MATH 115 (for an overview of the affective domain in math education, see Schoenfeld, 1988). Using pre/post surveys, we measured the average change in (a) math anxiety (Suinn and Winston, 2003) and (b) nonavailing beliefs (Steiner, 2007). Math anxiety refers to the “feelings of tension and anxiety that interfere with the ... solving of mathematical problems in a wide variety of ordinary life and academic situations.” (Suinn and Richardson, 1972). Math anxiety is a significant barrier to effective problem solving (Tobias, 1991; Ashcraft and Kirk, 2001; Ashcraft, 2002). Nonavailing beliefs refers to beliefs that inhibits problem solving and learning (Muis, 2004; Yoshinobu and Jones, 2012). Examples of nonavailing beliefs are the belief that math problems should be solved quickly, or that math is all about memorizing the right formula.

Each survey is a Likert-type scale where the scores are added together. The higher the total, the higher the math anxiety and the more that nonavailing beliefs are held by the students. The results of our study show the following percentage changes between the pre and post surveys:

<table>
<thead>
<tr>
<th>Course</th>
<th>n</th>
<th>Change in Anxiety</th>
<th>Change in Beliefs</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 115</td>
<td>743</td>
<td>-2%</td>
<td>+2%</td>
</tr>
<tr>
<td>QRB</td>
<td>61</td>
<td>-10%</td>
<td>-5.5%</td>
</tr>
</tbody>
</table>

Students in the experimental MATH 190 QRB course had affective gains that were more significant than their counterparts in MATH 115. One-tailed t-tests show that differences between QRB and MATH 115 are statistically significant (for anxiety, $p \approx 0, t \approx -235.32$ while for nonavailing beliefs, $p \approx 0, t \approx -439.78$). This means that on average the level of math anxiety and beliefs about math held by QRB students showed greater improvement than MATH 115 students. Improved attitudes and dispositions toward problem solving will help with student success in any situation requiring systematic thinking.

Additionally, many students are picking up on the non-content based learning opportunities in this course. During the Fall 2014 semester, the final exam included a journal entry asking the students to write a paragraph describing 5 things they learned in the course. The bar graph below shows the relative frequencies for categories generated by the students:
While content and applications were listed in most of the responses, this data also shows that approximately 1/3 of the students cited something related to reasoning, about ¼ of the students cited something related to study skills and something related to using Excel, and about 1/5 mentioned something about teamwork and perseverance. Comments related to “reasoning” are comments that address using logic and reasoning to figure out how to solve novel problems without having to be given a template from an instructor.

We have begun a process to collect data concerning student performance in subsequent business courses. However, there has not been a sufficient amount of time to collect any meaningful data on this. We will collect this data and maintain a dialogue with the College of Business as part of the ongoing assessment of the course.

**How is QRP Different from MATH 110 and 115? The Case for 109 and 114 as Prerequisites.**

The primary difference between the 109/114 and 110/115 sequences is that novel problem solving is an explicit outcome in the new courses. In order to allow the students the space to grow as problem solvers, some content from 110 and 115 has been cut. The cuts were selected based on the professional needs of the students. The content cuts were (a) polynomial and quadratic functions, including factoring, and (b) rational functions. This does not mean that these topics are completely absent, as they come up as examples in MATH 109 when students are asked to manipulate formulas. For example, in MATH 109 there is a homework assignment in which students are asked to explain what factoring
means and why factoring can be used to solve equations. They are also asked to solve quadratic equations by factoring and by using the quadratic formula and to evaluate which they prefer and why. An additional homework assignment involves factoring out a greatest common factor as a necessary step in solving the formula

\[ G = \frac{\sqrt{at + bt}}{z} \]

for \( t \). Other problems involve rational expressions, such as the following:

"Solve \( N = \frac{C_u - C_d}{P_u - P_d} \) for \( P_d \)."

The primary difference is that we do not spend class time addressing “how” to perform procedures or processes with polynomial or rational expression. Rather, we build on what these expressions mean and why we manipulate them in certain ways.

Putting this another way, by focusing on meaning and diving deeper into algebraic representations, students develop a cognitive framework that facilitates understanding of the processes involved in dealing with polynomial or rational expressions as they come up. The framework we build is based on the following fundamental four ideas behind algebraic representations:

1. Algebraic representations encode quantities and operations, and these operations must be performed in a prescribed order unless grouping symbols direct otherwise (grouping symbols include radicals, absolute value bars, and fraction bars). I like to say “Algebra is codified arithmetic” and I have heard others say “Algebra is order and operation.”

2. When working on a step to manipulate an algebraic representation, it is important to consider whether or not the next planned step will make progress toward solving the problem or not as well as whether or not that step involves simplifying an expression or solving an equation.

3. Solving actions involve applying inverse operations in reverse order.

4. Simplifying actions involve using identities and substitution.

In high school, students have seen (and experienced varying degrees of success with) the processes and procedures from 110 and 115 that are not covered in 109 and 114. When students encounter these issues in context, their prior learning is activated within this cognitive framework and misconceptions are addressed. This helps them to make progress.

As another example, students are asked at one point in an exploratory in the second course to solve the following equations:

- \[ \frac{3}{x+3} - 4 = 12 \]
- \[ \frac{x}{x+2} - 4 = 12 \]
- \[ \sqrt{x - 2} = 3 \]
They are given no instruction nor direction on how to solve these problems. The students in MATH 190 had no trouble solving these equations.

In short, the cognitive framework that students build in 109 and 114 is sufficient for students to review and use prior knowledge to solve problems that come up in courses that require procedures not covered in this course. As is always the case, results will vary with individual students. But that is the case whether the student takes 109/114 or 110/115. Weaker students who take further mathematics or mathematically oriented courses beyond 114 should be advised to obtain a tutor from the tutoring center and sign up for SLA sections when offered.

Fit into the Business Curriculum

The College of Business is redesigning its core curriculum. The new math courses are included in their plans which will be submitted via a separate proposal.

Transition Plan

There are three matters that need to be addressed in a transition plan:

- Faculty to teach MATH 109 and MATH 114.
- Placement
- Academic support services, including tutoring and SLA.

Faculty

By Fall, 2016, the effective semester of this proposal, there will be four faculty in the Mathematics Department prepared to teach these courses. Over a 3-semester period (Fall 2013, Spring 2014, and Fall 2014), an average of 75 business students per term enrolled in MATH 110 and an average of 150 business students per term enrolled in MATH 115. This means we expect to have to offer 3 sections of QRP 1 and 6 sections of QRP 2 each term.

While this demand can be covered by four faculty, at least one will have to have a full load of QRP courses, which may not necessarily be desirable. If other programs include MATH 109 and MATH 114 in their requirements, we will need to offer even more sections. To provide professional development for faculty interested in teaching and developing materials for MATH 109 and MATH 114, the Provost’s Office will fully support a team-teaching and mentoring program. This program envisions that new instructors will team-teach the sequence with an experienced instructor before teaching the sequence on their own. Mentoring will take place throughout the life of the program. Once an instructor has experienced teaching the sequence on their own, they will become experienced team-teachers and mentors for new instructors. This program utilizes best practices in faculty development (see Ewell, 2012; Bickerstaff, Edgecombe, et. al. 2012). This hands-on training and mentoring program will help the course to become self-sustaining.

In order to manage the demand while preparing faculty to teach this course, we will initially offer MATH 109 only in the fall and MATH 114 only in the spring.
Placement

We will select, pilot, and revise a placement test to determine which students should take the full sequence, which students should take the second course only, and which students need not take either of the courses. The College of Business is also reviving a placement tool that they have used in the past for ISYS. The math placement test will be taken by incoming freshmen alongside the ISYS placement test. Students who place into MATH 114 may not want to delay taking math until spring, so we will offer several options as summarized in the table below.

The table lists options based on student placement. The first column gives the results of a placement test administered during the summer. The second column lists where the student was placed using the current FSU guidelines based on the ACT. The third column lists the options that student will have in meeting their math requirement during the transition period.

<table>
<thead>
<tr>
<th>Placement Test</th>
<th>FSU Placement (ACT)</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 109</td>
<td>All</td>
<td>1. MATH 109 in Fall, MATH 114 in Spring.</td>
</tr>
</tbody>
</table>
| MATH 114       | MATH 110 (or lower) | 1. MATH 109 in Fall, MATH 114 in Spring.  
|                |                     | 2. MATH 114 in Spring.  
|                |                     | 3. MATH 110 in Fall, MATH 114 in Spring.  
|                |                     | 4. MATH 110 in Fall, MATH 115 in Spring (followed by MATH 122 in Fall if necessary) |
| MATH 114       | MATH 115 (or higher)| 1. MATH 114 in Spring.  
|                |                     | 2. MATH 115 (or higher) in Fall |

We anticipate that some students may place lower than MATH 109 on the placement test, in which case they should be directed to take MATH 010 or otherwise follow their FSU placement through the standard sequence. We also anticipate that some students may place out of MATH 114, in which case they will not be required to take further mathematics courses so long as they remain a business major.

By comparing and correlating student performance on the placement test with their performance in the classes, we will be able to refine and perfect our placement.

During the transition period, continuing and transfer students will have the option to take the new courses based on their prior coursework (i.e., if they have MATH 110 credit they can take MATH 114) or continue in the standard sequence.

It should be noted that MATH 122 will eventually be deleted from the catalog. We will need to offer the course during the transition in order to make sure students who continue in the MATH 110/MATH 115 sequence will be able to take the course, including students who transfer with MATH 115 credit. The reason we are not filing the paperwork to delete the course with this proposal is because we want to leave the option to extend the transition period if necessary. Hence we cannot predict with absolute
certainty what the effective date of the deletion will be. Once we do delete the course, all students who have previously been required to take MATH 122 may be required to take MATH 114, even if they have MATH 115 credit.

Academic Support

Karen Royster-James has agreed to work with us to develop student support systems including tutoring and SLA for the new courses. We expect these systems will be in place by Fall 2018.

Concluding Remarks About the Transition

After the transition period, we will be able to offer enough sections of MATH 109 and 114 in both Fall and Spring semesters and will have a placement test that will determine who takes which of these two courses. Students who place into MATH 114 but nevertheless demonstrate some weaknesses with MATH 109 content will be directed to take SLA sections of MATH 114.

Credit Load

Currently, business students are required to take or otherwise satisfy the course outcomes for two or three courses (depending on major):

- **MATH 110**
  - 4 credits

- **MATH 115**
  - 3 credits

- **MATH 122**
  - 3 credits

This requires a total of 7 or 10 credits, depending on major.

Our proposal would replace this with the following sequence:

- **QRB 1**
  - 4 credits

- **QRB 2**
  - 4 credits

This results in a total of 8 credits. The reason that the second course is 4 credits is that we are incorporating material from the currently existing MATH 122 course. Another reason for the 4-credit load has to do with the content-based outcomes (see above, and see Form E for each course). Each course, QRP 1 and QRP 2, has four content outcomes. We devote between 12 and 16 class periods per outcome, which translates to roughly 1 credit per content-based outcome.

For students in some majors, the new credit load is a reduction of 2 credits. For others, there is a net addition of 1 credit. Programs that do not require MATH 122 that add these courses to their checksheet may find this additional credit in their directed elective or elective general education credits. In addition, the revision of the COB core curriculum will result in an overall reduction in general education...
credits required for COB students. Details will be found in the checksheets submitted in the COB core revision proposal.

For non-business programs, switching from MATH 110/115 to MATH 109/114 may result in an additional credit added to the total student load. These considerations will have to be weighed by departments on a case-by-case basis.

**Prerequisites and Course Caps**

The prerequisite for the first course is placement into MATH 110 and ENGL 150. The reason for the ENGL prerequisite is the course materials require a fair amount of reading and writing in connection with the inquiry-based pedagogy. The prerequisite for the second course is either the first course or placement into MATH 115, along with placement into ENGL 150.

In order to accomplish the problem solving outcomes, and in order to effectively employ inquiry-based learning, we have set the course caps for both courses at 25. Inquiry-based learning requires students to investigate mathematical phenomenon and draw their own conclusions. They work in small groups and instruction is differentiated to provide each student and each small group what they need to support their learning. With class sizes larger than 25, the students tend to distract each other and it is more difficult to visit each group. If we increase the size of the groups, they become too large to maintain individual accountability, and it is more difficult to individualize student support. In addition, the course requires students to do more writing than in most math courses. On a near-daily basis, students are asked to write explanations of mathematical concepts in prose and to engage in metacognition through journal writing, which makes grading more time consuming.

**Other Logistical Matters: Advising, Major Changes, and Transfers**

**Advising**

As a consequence of changing COB programs and course prerequisites, advisors will place their students into MATH 109 and MATH 114 as appropriate and not simply default to MATH 110 and MATH 115. We have gathered a team of faculty from the College of Business to champion these changes. This team includes at least one member of each department. These members are leading the COB core revision proposals through their respective departments. These departments will replace MATH 115 with MATH 114 as well as make MATH 114 a prerequisite for business core courses. A complete list of programs in the College of Business can be found in Table 1 at the end of the narrative.

**Major Changes**

We will make sure that advisors in other colleges understand what the new courses represent so that students who change majors and leave the College of Business will not have to take MATH 110 or MATH 115 (depending on how many of the QRP courses they have successfully completed).

To facilitate changes in majors, as part of the consultation process we have asked departments that host classes whose prerequisites include MATH 110 or MATH 115 to add MATH 109 or MATH 114 (respectively) as an alternate prerequisite. The list is attached in Table 2. In the MATH department, this includes MATH 115, MATH 116, MATH 117, MATH 120, and MATH 218. Allowing MATH 114 to serve as an alternate prerequisite for MATH 120 means that if a student moves to a major requiring more math than MATH 115, they will be able to rejoin the traditional path to Calculus. Note that students changing
majors to programs in the College of Engineering and Technology after completing MATH 114 should be advised to take the 120-130-220 sequence instead of the 116-126-216 sequence, due to the inclusion of some trigonometry in MATH 116.

Transfers

With the assistance of the Provost’s office, we will also work with the Michigan Transfer Network to arrange for course equivalencies for students who either transfer to another institution or simply want to take a summer course that requires a math prerequisite. To this end, we will also work the professional organizations, including the Michigan section of the Mathematics Association of America and the Michigan section of the American Mathematical Association of Two-Year Colleges.

Students who transfer into Ferris should be placed based on the courses that they bring with them. Students who transfer in with a MATH 110 equivalent only should only be placed into MATH 114, while students who transfer in with a MATH 115 equivalent should not be asked to take QRP at all, unless their program requires MATH 122, in which case they may be required to take MATH 114.

About this Proposal

This proposal includes the creation of the new courses as well as forms to update prerequisites for courses that currently require MATH 110 or MATH 115. We are including updated Form Es and Fs for MATH courses whose prerequisites will be modified. For the other prerequisites, we are using the consultation process by including a Form B for each department hosting such a course and a Form F to alter the prerequisite for each such course. The COB core revision proposal, which includes all of the checksheet changes as well as the changes to business course prerequisites, will be submitted separately.

Conclusion

The Quantitative Reasoning for Professionals sequence will contribute meaningfully to the mission of Ferris State University and provide valuable and relevant mathematical experiences for students in occupational programs. The course is based on best practices and research. The piloted sections of MATH 190 show promise in terms of student learning, retention, and reduction of anxiety and non-availing beliefs. We have the faculty who are capable of meeting current demand and have a plan in place to meet additional demand over time. We also have a plan to develop a placement test as well as provide academic support. In addition, we are taking care of logistical issues to address advising and internal and external transfers. With these logistical matters covered, MATH 109 and MATH 114 will be added seamlessly into the curriculum.
References


President’s Council of Advisors on Science and Technology (PCAST, 2012). Engage to Excel: Producing one million additional college graduates with degrees in science, technology, engineering, and mathematics. Report to the President of the United States, Washington, DC.


<table>
<thead>
<tr>
<th>Department</th>
<th>Degree Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFIS (Accounting, Finance, and Information Systems)</td>
<td>BS in Accountancy</td>
</tr>
<tr>
<td>AFIS</td>
<td>Dual BS in Accountancy and Computer Information Systems</td>
</tr>
<tr>
<td>AFIS</td>
<td>Dual BS in Accountancy and Finance</td>
</tr>
<tr>
<td>AFIS</td>
<td>BS in Computer Information Systems</td>
</tr>
<tr>
<td>AFIS</td>
<td>BS in Computer Information Technology</td>
</tr>
<tr>
<td>AFIS</td>
<td>BS in Finance</td>
</tr>
<tr>
<td>AFIS</td>
<td>BS in Information Security and Intelligence</td>
</tr>
<tr>
<td>AFIS</td>
<td>AAS in Accountancy</td>
</tr>
<tr>
<td>AFIS</td>
<td>AAS in Computer Information Systems</td>
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<td>BS in Advertising and Integrated Marketing</td>
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</tr>
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<td>Marketing</td>
<td>BS in Public Relations</td>
</tr>
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<td>BS in Business Administration</td>
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<td>Management</td>
<td>BS in Business Administration with Professional Tracks</td>
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<tr>
<td>Management</td>
<td>BS in Business Administration with AAS in Legal Studies</td>
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<td>BS in Business Data Analytics</td>
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<td>Management</td>
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<td>SEHM</td>
<td>AAS in Dietary and Food Service Management</td>
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<td>SEHM</td>
<td>AAS in Restaurant and Food Industry Management</td>
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</table>
Table 2: Courses with MATH 110 or MATH 115 as prerequisite

<table>
<thead>
<tr>
<th>MATH 110 is Prerequisite</th>
<th>MATH 115 is Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCT 201 (C-)</td>
<td>ACCT 201</td>
</tr>
<tr>
<td>CHEM 103 (C-), (54/625)</td>
<td>ACCT 221 (C-)</td>
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<tr>
<td>CHEM 114 (C-), (14/1350)</td>
<td>CETM 215 (C-), (0/44)</td>
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<tr>
<td>COHP 350 (0/399)</td>
<td>CHEM 121 (C-), (11/1564)</td>
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<tr>
<td>CONM 116 (C-), (0/166)</td>
<td>CONM 111 (C-), (0/141)</td>
</tr>
<tr>
<td>CONM 121 (C-), (0/175)</td>
<td>CONM 112 (C-)</td>
</tr>
<tr>
<td>ECON 221 (C-)</td>
<td>ECON 221</td>
</tr>
<tr>
<td>HEQT 282 (0/12)</td>
<td>FINC 300 (D-)</td>
</tr>
<tr>
<td>HSMG 215 (C-)</td>
<td>FINC 310 (D-)</td>
</tr>
<tr>
<td>MATH 115 (C-)</td>
<td>FINC 322 (D-)</td>
</tr>
<tr>
<td>MATH 116 (C-), (8/555)</td>
<td>GEOL 321 (0/0)</td>
</tr>
<tr>
<td>MATH 117 (C-)</td>
<td>ISYS 216 (C)</td>
</tr>
<tr>
<td>PHYS 130 (C-), (43/422)</td>
<td>ISYS 220 (C)</td>
</tr>
<tr>
<td>MATH 120 (C-), (18/1274)</td>
<td>MATH 122 (being replaced by MATH 114)</td>
</tr>
<tr>
<td>MATH 128 (C-), (1/120)</td>
<td>MATH 218 (C-)</td>
</tr>
<tr>
<td>MECH 250 (0/295)</td>
<td>MFGT 353 (1/246)</td>
</tr>
<tr>
<td>MFGT 130 (0/65)</td>
<td>MFGT 131 (0/64)</td>
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<tr>
<td>MFGT 140 (0/85)</td>
<td>MFGT 141 (0/85)</td>
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<tr>
<td>MFGT 210 (0/40)</td>
<td>PPET 223 (1/151)</td>
</tr>
<tr>
<td>PSYC 210 (C) (0/193)</td>
<td>SCWK 450 (0/170)</td>
</tr>
<tr>
<td>SOCY 471 (C) (0/0)</td>
<td>STQM 260 (C-)</td>
</tr>
</tbody>
</table>

Grades in parentheses are minimum grades in the prerequisite MATH course.

Numbers in parentheses are the total number of students who enrolled in the course since Fall 2012 who had previously been a COB major out of the total enrollment in the course since Fall 2012. COB courses have been left out of this count, as have MATH 115, MATH 117, and MATH 122. Note that GEOL 321 hasn’t been offered since Spring 2002, and SOCY 471 has no enrollment history.