Memorandum

Westmont College
Department of Mathematics and Computer Science

To: Academic Senate
From: Russell W. Howell Russell W. Howell
Date: March 21, 2022
Re: Program change request for mathematics

Our department is recommending changes to the mathematics major and minor in response to a request by Academic Senate to consider reducing the number of units required. While we do not think that our current unit counts are out of alignment with other institutions, we found ways in our discussion to improve and streamline our programs. If enacted, the "Breadth" requirement for the B.S. and B.A degrees would be reduced by four-units, MA 180 (the required capstone course) would increase from two- to four-units, and two-units of load credit would be granted to the person in charge of the department's annual Mathematics Field Day. Thus, this proposal incurs a financial cost to the college of four-units "load" per year (presumably by adjunct hiring).

Summary of Proposed Changes (details are on the following pages)

1. B.S. Degree (52-units instead of 54-units)
- Increase the unit count for MA 180 (Capstone Problem Solving) from 2-units to 4-units.
- Reduce the "Breadth" unit count from 12 units to 8 units.

2. B.A. Degree (44-units instead of 46-units)
- Increase the unit count for MA 180 (Capstone Problem Solving) from 2-units to 4-units.
- Reduce the "Breadth" unit count from 16-units to 12-units.

3. Minor
- Keep the unit count the same.
- Increase flexibility by eliminating required categories of courses.

4. Load Credit: Two-units credit will be granted for organizing the annual Mathematics Field Day.

Brief Rationale
(1-2) The unit increase for MA 180 will allow more time for the exploration of historical, philosophical, and cultural issues germane to the discipline. It will also facilitate the circulation of this course among all departmental mathematicians, as its current two-unit status tends to force its pairing with the person who teaches the two-unit MA 165 (Fundamentals of Mathematics II, required for Liberal Studies majors). Currently, expertise in the latter area resides with only one faculty member. With an increase in units for MA 180, we think that the reduction in the "Breadth" unit count will not decrease the quality of our programs, but will make them more flexible.

(3) We think the increased flexibility in the change for the minor does not diminish its quality.

(4) The duties required for the person organizing the annual Mathematics Field day are attached.

Current Requirements for the B.S. Degree in Mathematics: 54-units

Lower-Division Courses: 28-units

MA 009 Elementary Calculus I (4)
MA 010 Elementary Calculus II (4)
MA/CS 015 Discrete Mathematics (4)
MA 019 Multivariable Calculus (4)
MA 020 Linear Algebra (4)
CS 010 Design and Implementation of Solutions to Computational Problems (4)
CS 030 Abstract Models for Concrete Problems Using Java (4)

Foundation Courses: 8-units

MA 108 Mathematical Analysis (4)
MA 110 Modern Algebra (4)

In-Depth Study: 4-units

Choose one of the following 4-unit courses:
MA 109 Advanced Mathematical Analysis
MA 111 Applied Modern Algebra

Capstone Course: 2-units

MA 180 Capstone Problem Solving

Breadth: 12-units

Choose any 12 additional units chosen from 4-unit upper-division mathematics courses.

Proposed Revision of the B.S. Degree in Mathematics: 52-units

Lower-Division Courses: 28-units

MA 009 Elementary Calculus I (4)
MA 010 Elementary Calculus II (4)
MA/CS 015 Discrete Mathematics (4)
MA 019 Multivariable Calculus (4)
MA 020 Linear Algebra (4)
CS 010 Design and Implementation of Solutions to Computational Problems (4)
CS 030 Abstract Models for Concrete Problems Using Java (4)

Foundation Courses: 8-units

MA 108 Mathematical Analysis (4)
MA 110 Modern Algebra (4)

In-Depth Study: 4-units

Choose one of the following 4-unit courses:
MA 109 Advanced Mathematical Analysis
MA 111 Applied Modern Algebra

Capstone Course: 4-units ***** Change 1**

MA 180 Capstone Problem Solving (4)

Breadth: 8-units ***** Change 2**

Choose any 8 additional units chosen from 4-unit upper-division mathematics courses.

Current Requirements for the B.A. Degree in Mathematics: 46-units

Lower-Division Courses: 24-units

MA 009 Elementary Calculus I (4)
MA 010 Elementary Calculus II (4)
MA/CS 015 Discrete Mathematics (4)
MA 019 Multivariable Calculus (4)
MA 020 Linear Algebra (4)
Choose one of the following applied 4-unit courses: (4)
CS 010 Design and Implementation of Solutions to Computational Problems
CHM 005 General Chemistry I
PHY 021 General Physics I

Foundation Course: 4-units

Choose one of the following 4-unit courses:
MA 108 Mathematical Analysis
MA 110 Modern Algebra

Capstone Course: 2-units

MA 180 Capstone Problem Solving

Breadth: 16-units

Choose any 16 additional units chosen from 4-unit upper-division mathematics courses.

Proposed Revision of the B.A. Degree in Mathematics: 44-units

Lower-Division Courses: 24-units

MA 009 Elementary Calculus I (4)
MA 010 Elementary Calculus II (4)
MA/CS 015 Discrete Mathematics (4)
MA 019 Multivariable Calculus (4)
MA 020 Linear Algebra (4)
Choose one of the following applied 4-unit courses: (4)
CS 010 Design and Implementation of Solutions to Computational Problems
CHM 005 General Chemistry I
PHY 021 General Physics I

Foundation Course: 4-units

Choose one of the following 4-unit courses:
MA 108 Mathematical Analysis
MA 110 Modern Algebra

Capstone Course: 4-units ***** Change 1**

MA 180 Capstone Problem Solving

Breadth: 12-units ***** Change 2**

Choose any 12 additional units chosen from 4-unit upper-division mathematics courses.

Current Requirements for the Mathematics Minor: 24-units

MA 009 Elementary Calculus I (4)
MA 010 Elementary Calculus II (4)
MA 020 Linear Algebra (4)
Choose one of the following 4-unit courses: (4)
- MA/CS 015 Discrete Mathematics
- MA 19 Multivariable Calculus

Choose one of the following 4-unit courses: (4)
- MA 110 Modern Algebra
- MA 124 Codes and Encryption
- MA 136 Geometry
- MA 155 History of Mathematics

Choose one of the following 4-unit courses: (4)
- MA 108 Mathematical Analysis
- MA 121 Introduction to Numerical Analysis
- MA 130 Probability and Statistics
- MA 140 Complex Analysis

Proposed Revision of the Mathematics Minor: 24-units

MA 009 Elementary Calculus I (4)
MA 010 Elementary Calculus II (4)
MA 020 Linear Algebra (4)
Choose one of the following 4-unit courses: (4)
- MA/CS 015 Discrete Mathematics
- MA 19 Multivariable Calculus

Choose any 8 additional units from 4-unit upper-division mathematics courses: (8) ***** Change**

Load Request: Two Units for Organizing the Mathematics Field Day

(Usual date: first Saturday in February before the 4-day holiday, *e.g.*, February 12, 2022)

Required Tasks
(* Indicates that the task can be done by an administrative assistant, but with coordination.)

Problem Writing:

- Create College Bowl Questions and Answers (Grades 9 – 10, Grades 11 – 12)
  - Write 4 "toss-up" and 4 "follow-up" questions/answers for each preliminary round per grade and 15 "toss-up" and 15 "follow-up" questions/answers for the final round per grade. There are 5 preliminary rounds, so a total of 110 questions with answers are needed combined.
  - Typeset questions and divide into rounds appropriately. Format for use by readers with MC instructions where needed.
  - Work with the volunteer editor to proofread the problems once written.
- Create Team Exam Questions and Solutions (Grades 9 – 10, Grades 11 – 12)
  - Write 5 questions/solutions per grade for a 75-minute long written team exam. This will make a total of 10 questions with solutions combined.
  - Type comprehensive solutions for use by graders and to be distributed to teachers at the end of the competition.
  - Work with the volunteer editor to proofread the problems once written.

Summer:

- Coordinate with the Art Department for the T-shirt design contest. The student who submits the winning design gets a $25 amazon gift card. Note: sometimes the organizer of the contest has had to create the design.
- Coordinate with the Gaede Institute and Admissions to ensure the Field Day date does not conflict with major college functions (*e.g.*, Liberal Arts Conversation; Augustinian interviews).

Fall:

- School Coordination
  - Contact high schools to determine who will be participating.
  - Explore relations with schools who may be interested in attending.
  - Get confirmation of school attendance; request T-shirt size information.
- Room Reservation*
  - WH 106, WH 110, WH 212, WH 216: 10:00 am – 3:45 pm
  - WH 210: 10:00 am – 5:15 pm
  - WH 311, WH 321: 10:00 am – 2:15 pm
  - Founders Room (or GLC, depending on how many schools attend): 4:00 – 6:30 pm
- Order catering from the DC.*
- Decide on a banquet speaker, make appropriate contacts.
- Make sure buzzers are in good working order.
- Begin recruiting student and faculty volunteers (about 25 student volunteers and 3-5 faculty volunteers are needed).

January:

- Physical Logistics
  - Coordinate with physical plant for chair and table delivery.*
  - Make sure microphones and projection systems are available. Coordinate with IT to have someone present on the day of the contest to sort out any technical glitches.
- T-Shirts
  - Solicit student input to select the best T-shirt design.
  - Collect volunteer T-shirt information.
  - Order T-shirts from American Silkscreen (Milpas St., 805-564-1264).*
  - Pick up T-shirts.*
  - Prepare T-shirts for volunteer and school distribution.
- Order Trophies*
- Materials
  - Prepare rotation schedules (College Bowl Rounds and Chalk Talks).
  - Print schedules for teachers and volunteers.*
  - Prepare problem packets for readers.
  - Print written exams and prepare for teams.*
  - Assemble packets of problems and solutions for teachers to take home at the end of the event.
  - Order 100 pencils and 8 reams of paper. Sharpen pencils*
- Volunteers
  - Finalize which volunteer positions are needed. Recruit volunteers until all positions are filled. Follow up with volunteers to confirm.
  - Assemble packets of materials for all volunteers based upon their assigned tasks.
  - Prepare and run two volunteer training events the week prior to the event.
- Coordinate publicity with Scott Craig. Personally contact Noozhawk, KEYT, and the Santa Barbara *News-Press*.

Evening Prior to Field Day:

Coordinate Event Setup (4 student volunteers)

- Set up buzzers and make sure tables are in proper positions; paper and pencils in place.
- Set up team exam room (WH 206) with paper and pencils.

Field Day:

- Coordinate Registration (2 student volunteers)
  - Welcome and check in each school.
  - Collect payment.
  - Distribute T-shirts.
  - Take team photos.

- Oversee the General Utility Person Tasks (1 student volunteer).
- Take Photos (minimum amounts)
  - Team photos (one per school)
  - Chalk Talk photos (one per school)
  - College Bowl photos (one per school)
  - Written and Team Exams miscellaneous photos (about 4 for 9-10 and 4 for 11-12)
  - Chalk Talk final (2 photos per school)
  - College Bowl 9 – 10 finals (2 photos per school)
  - College Bowl 11 – 12 finals (2 photos per school)
  - Note: a minimum of about 70 photos will be taken.
- Ensure the Reservable Dining Room is properly set up for the banquet.
- Lay out trophies on a trophy table.
- Ensure the microphone is properly set up, and take care of any requests of the banquet speaker.

Oversee the Main Events; Introduce and Participate in the Finals

- **1:00 – 2:15 pm**

  College Bowl (11 – 12): 8 student volunteers
  Chalk Talk Prelims (11 – 12): 2 student volunteers
  Written Exam Proctor (9 – 10): 1 student volunteer

- **2:30 – 3:45 pm**

  College Bowl (9 – 10): 8 student volunteers
  Written Exam Proctor (11 – 12): 1 student volunteer
  Graders (9-10 exam): 4 student volunteers, 1 faculty volunteer

- **4:00 – 5:00 pm**

  Chalk Talk Final: 1 – 2 student volunteers, 2 faculty (1 judge, 1 MC), and 1 outside guest
  9-10 Bowl Final: 2 student volunteers (1 MC, 1 to reset buzzers), 1 faculty volunteer
  11-12 Bowl Final: 2 student volunteers (reverse roles from 9 – 10 bowl final), 1 faculty volunteer
  Graders (11 – 12 exam), 4 student volunteers, 1 faculty volunteer
  Final team point tally: 1 faculty volunteer

- **5:15 - 5:45 pm**

  Cleanup: 2 student volunteers

After Field Day:

- Contact Schools with a follow-up survey and thanks.
- Thank Westmont students who helped run the event.
- Update the Field Day Website to include
  - Team photos
  - Winners for the various events
  - T-shirt explanation
  - Slide show
  - Videos