



## Mathematics Quality Assurance Plan

**Date submitted to SSCPR:** February 11, 2022

**Date Self-Study Report approved by SSCPR:** October 28, 2020

**Date of External Review:** March 10 & 11, 2021

### **SUMMARY**

The Bachelor of Science in Applications of Mathematics program has been a solid and useful program for students since its recent beginnings. The three concentrations each provide students with a good grounding in their areas of interest. The program is losing too many students before they get to third and fourth year courses. Some areas are in need of updating to maintain relevance for the students progressing through the program, and support for graduating students needs to be bolstered, to ease their transitions into the workplace or graduate school.



## Mathematics Quality Assurance Plan

### QUALITY ASSURANCE GOALS

#### **GOAL 1: Attract and retain additional students**

RATIONALE FOR THIS GOAL: The BSc in Applications of Mathematics program needs to make its offerings more attractive and manageable for students; by attracting and keeping more students, the key courses could be offered more frequently, and a wider array of courses could be offered, making it even more useful and applicable for students.

Recommendation(s) this Goal Addresses	Report (page number)	Led by
<i>Short-term goals (within the first two years):</i>		
1a) Information Sessions should be reinstated in conjunction with an appropriate publicity strategy.	SS32	A. Rozell, T. Boboricken
1b) Replace CPSC 3110 with a MATH offering.	ER7	D. Anvari
1c) Address DFWs in first year courses.	SS32	T. Boboricken, M. Nyenhuis
1d) Explore costs and benefits of new delivery modes, online and blended, particularly with the aim of making courses more accessible, and providing better support to learners.	SS36	M. Nyenhuis
1e) Explore opportunities for students to participate in the governance of the department.	ER5	A. Rozell
<i>Medium-term goals (within the first three years):</i>		
1f) Address DFWs in MATH 1220 and MATH 2232, to increase retention of degree students.	SS32	V. Wei, A. Sanaei
1g) Offer key courses more frequently; MATH 3120, MATH 3315, MATH 3421, MATH 4240 should be offered at least once a year. Add additional sections for other degree courses as indicated by enrolment.	ER7	A. Rozell
1h) Make use of expertise from Academic and Career Prep (ACP) instructors, who have joined the Math Department, to help struggling students in 1st year courses.	ER8	T. Boboricken
1i) Liaise with high school math teachers to understand incoming students and new curriculum better.	SS36	A. Rozell, T. Boboricken



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1j) Increase experiential learning opportunities and expand opportunities to mentor student research.	SS33	T. Boboricken, A. Sanaei (student research)
1k) Implement more Universal Design for Learning (UDL).	SS33	A. Rozell, D. Anvari

### ***GOAL 2: Improve transitions for graduating students.***

RATIONALE FOR THIS GOAL: Alumni have indicated some difficulty with qualifying for graduate schools. Others had difficulty with finding relevant work after graduation. Some students were not aware of resources available for them at KPU. (Improvements to specific skills are listed under Goal 3.)

<b>Recommendation(s) this Goal Addresses</b>	<b>Report (page number)</b>	<b>Led by</b>
<i>Short-term goals (within the first two years):</i>		
2a) Increase student awareness of career services at KPU.	ER4	A. Rozell
<i>Medium-term goals (within the first three years):</i>		
2b) Improve students' soft skills, particularly in mathematics education concentration.	ER4	A. Rozell
2c) Implement a formal process to maintain connections with alumni.	SS32	A. Rozell
2d) Invite a panel of recent graduates to speak to current students about experiences.	ER5	A. Rozell
<i>Long-term goals:</i>		
2e) Add a work placement or co-op component to the program to build better connections to the discipline/sector.	SS32	A. Rozell
2f) Offer additional pure math courses.	ER2	M. Nyenhuis



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### **GOAL 3: Update program to maintain relevance.**

RATIONALE FOR THIS GOAL: With the rapidly changing nature of technology, it is important to continually update and re-evaluate program offerings to ensure that the program continues to be beneficial for students and applicable as they move on to careers or further schooling.

Recommendation(s) this Goal Addresses	Report (page number)	Led by
<i>Short-term goals (within the first two years):</i>		
3a) Work with Math Liaison Librarian to identify courses to receive library instruction sessions.	ER9	A. Rozell
3b) Consult with university librarian regarding MathSciNet.	SS33	J. Bicep
3c) Reactivate and expand Program Advisory Committee.	SS33	A. Rozell
3d) Include more emphasis on lesson planning in MATH 3130.	ER5	A. Rozell
<i>Medium-term goals (within the first three years):</i>		
3e) Include Python programming.	ER5	A. Rozell, M. Nyenhuis
<i>Long-term goals:</i>		
3f) Add to program: additional courses in statistics and probability; data science; introductory courses on proofs and logic; and computational math.	SS32	A. Rozell
3g) Find ways to support instructors in keeping up-to-date.	ER8	A. Sanaei

### **RECOMMENDATIONS THE QUALITY ASSURANCE PLAN DOES NOT ADDRESS**

Recommendations	Report (page number)	Rationale
4th year students taking on some paid TA duties as a way to allow faculty to have more time for professional development.	ER5	Inconsistent with KPU's culture of high instructor/student interaction; professional development time is included in the collective agreement.



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### **QUALITY ASSURANCE FIVE-YEAR ACTION PLAN**

**MONTH/YEAR WHEN THE FIVE-YEAR ACTION PLAN BEGINS: September 2021**

**STRATEGY 1a: Information Sessions should be reinstated in conjunction with an appropriate publicity strategy.**

GOAL(S) THIS STRATEGY SUPPORTS: 1. Attract and retain more students

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Info session with International (online); discuss frequency.	A. Rozell	6/21	8/23	6/21 orientation was cancelled due to lack of registration.
Hold yearly info session with Future Student Office (FSO)	A. Rozell	2/22	3/22	Scheduled as part of STEM info session with FSO Feb. 24, 2022.
Participate in annual outreach programs (Open Houses, Science Challenge, Science Rendezvous, etc.)	A. Rozell	2/22	5/23	
Consult with local high schools regarding feasibility of in-school info sessions.	A. Rozell	3/22	5/22	
To increase numbers there needs to be a focus on promotion via social media, high school visits, and working closely with international and domestic recruiters (FSO & Int'l). Invite recruiters to attend classes to get a better feel for the program and the target students.				

<b>Resource Implications</b>
What are the resources required to achieve this Strategy? Support from FSO, International, and Marketing (flyers, posters, etc.). Outreach programs need supplies.
When are these resources required? 2/22



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### STRATEGY 1b: Replace CPSC 3110 with new course: MATH 3110.

GOAL(S) THIS STRATEGY SUPPORTS: 1. Attract and retain more students

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Write course outline for MATH 3110.	D. Anvari	12/21	2/22	In progress (CPSC 3110 Simulations will be replaced with a more math specific course, MATH 3110).
Develop the course MATH 3110 (choose text, develop assignments, etc.).	D. Anvari	1/22	9/22	To be offered September 2022

**Resource Implications: N/A**

### STRATEGY 1c: Address DFWs in first year courses.

GOAL(S) THIS STRATEGY SUPPORTS: 1. Attract and retain more students

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Request and examine DFW data; particular emphasis on success rates based on students' preparation, including grade received in prereq courses, and admission from MPT	A. Rozell	5/22	8/23	
Improve placement testing: ALEKS implementation, determining cut scores	T. Boboricken, A. Rozell	1/22	4/22	
Consult with Teaching & Learning regarding matching assessments to outcomes.	A. Rozell	5/23	8/24	
Explore broadening MAC support.	M. Nyenhuis	5/22	8/23	
Develop and try out the techniques from Decoding the Discipline workshop to better support students.	A. Rozell, J. Bicep, A. Rapa, M. Hosseinyazdi	2/22	8/23	

Resource Implications
What are the resources required to achieve this Strategy? Catherine Siermacheski in Assessment & Testing has been setting up access to ALEKS. Data analysis from OPA. Teaching and Learning support; including Decoding the Discipline workshop.
When are these resources required? By Summer 2022



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**STRATEGY 1d: Explore costs and benefits of new delivery modes, online and blended, particularly with the aim of making courses more accessible, and providing better support to learners.**

GOAL(S) THIS STRATEGY SUPPORTS: 1. Attract and retain more students

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Review data from ad hoc faculty-administered surveys Spring 2020 and Fall 2021. Formulate recommendations.	M. Nyenhuis	5/22	9/23	

**Resource Implications:** Continued support from Office of Planning & Accountability (OPA).

**STRATEGY 1e: Explore opportunities for students to participate in the governance of the department.**

GOAL(S) THIS STRATEGY SUPPORTS: 1. Attract and retain more students

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Invite student(s) to next PAC meeting.	A. Rozell	2/22	5/22	
Consider other options for student involvement, including possible Student Advisory Committee.	A. Rozell	3/22	6/22	

**Resource Implications:** N/A



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**STRATEGY 1f: Address DFWs in MATH 1220 and MATH 2232, to increase retention of degree students.**

GOAL(S) THIS STRATEGY SUPPORTS: 1. Attract and retain more students

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
MATH 2232 support; from Math Assistance Centre (MAC) or from collaboration of instructors	V. Wei	5/22	8/24	Decoding the Discipline workshop
MATH 1220 support; from MAC or from collaboration of instructors	A. Sanaei	5/22	8/24	Decoding the Discipline workshop
Examine DFW data; particular emphasis on success rates based on students' preparation, including grade received in prereq courses.	V. Wei	5/22	8/23	
Consult with Teaching & Learning regarding matching assessments to outcomes.	A. Sanaei	5/22	8/25	
Explore broadening MAC support.	M. Nyenhuis	5/22	8/24	

<b>Resource Implications:</b> Support from Teaching & Learning, the Learning Centre and OPA.
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### STRATEGY 1g: Offer key courses more frequently.

GOAL(S) THIS STRATEGY SUPPORTS: 1. Attract and retain more students

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Rework schedule of course offerings, with increased course offerings: MATH 3120, MATH 3315, MATH 3421, MATH 4240 should be offered at least once a year (these are used in all concentrations). Add additional sections for other degree courses as indicated by enrolment. Consult with dean's office regarding adding sections or transferring sections from other courses.	A. Rozell	5/22	6/22	

Resource Implications
What are the resources required to achieve this Strategy? Consult with dean's office
When are these resources required? 9/23

### STRATEGY 1h: Make use of expertise from Academic and Career Prep (ACP) instructors, who have joined the Math Department, to help struggling students in 1st year courses.

GOAL(S) THIS STRATEGY SUPPORTS: 1. Attract and retain more students

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Explore ways of overcoming barriers, structuring assessment to better enable success, and other teaching methods to help students.	T. Boboricken	5/22	12/23	

<b>Resource Implications:</b> Support from Teaching & Learning
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**STRATEGY 1i: Liaise with high school math teachers to understand incoming students and new curriculum better.**

GOAL(S) THIS STRATEGY SUPPORTS: 1. Attract and retain more students

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Meet with high school math teachers in Surrey, Langley, etc.	A. Rozell, T. Boboricken	5/22	9/24	

**STRATEGY 1j: Increase experiential learning opportunities and expand opportunities to mentor student research.**

GOAL(S) THIS STRATEGY SUPPORTS: 1. Attract and retain more students

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Explore more experiential opportunities in current courses. Consult with Career Development Centre, Teaching & Learning experiential specialists, and Lin Hammill, emerita math faculty.	T. Boboricken	5/22	9/24	
Compile online resource relating to experiential and project-based learning in math.	A. Rozell	5/22	9/23	
Explore ways to support student research	A. Sanaei	5/22	9/24	

<b>Resource Implications:</b> Support from Career Development Centre, Office of Research Services, and Teaching & Learning.
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### STRATEGY 1k: Implement more Universal Design for Learning (UDL).

GOAL(S) THIS STRATEGY SUPPORTS: 1. Attract and retain more students

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Consult with Teaching & Learning and FSH Teaching and Learning Committee regarding a workshop, particularly for 1 <sup>st</sup> and 2 <sup>nd</sup> year MATH courses.	D. Anvari, A. Rozell	5/23	9/23	

**Resource Implications:** Support from Teaching & Learning.

### STRATEGY 2a: Increase student awareness of career services at KPU.

GOAL(S) THIS STRATEGY SUPPORTS: Improve transitions for graduating students

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Discuss with advisors to determine when orientations should be offered, at multiple stages of the program, to help prepare to find work or go to grad school.	A. Rozell	2/22	3/22	
Develop appropriate orientations.	A. Rozell	2/22	9/22	
Implement appropriate orientations.	A. Rozell	1/23	4/23	

Resource Implications
What are the resources required to achieve this Strategy? Room and/or support for online orientation.
When are these resources required? TBD
What Faculty and/or Institutional support is required? Room and/or support for online orientation.



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**STRATEGY 2b: Improve students' soft skills, particularly in mathematics education concentration.**

GOAL(S) THIS STRATEGY SUPPORTS: Improve transitions for graduating students

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Meet Consult with academic advisors and plan development of additions supports with appropriate timelines.	A. Rozell	4/22	9/22	

**STRATEGY 2c: Implement a formal process to maintain connections with alumni.**

GOAL(S) THIS STRATEGY SUPPORTS: Improve transitions for graduating students

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Consult with Alumni Office and Alumni Association to set up tracking, and a process to maintain connections.	A. Rozell	11/22	2/23	

**Resource Implications: N/A**

**STRATEGY 2d: Invite a panel of recent graduates to speak to current students about experiences.**

GOAL(S) THIS STRATEGY SUPPORTS: Improve transitions for graduating students

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Set up a seminar with panel of recent graduates.	A. Rozell	12/22	2/23	

**Resource Implications**

What are the resources required to achieve this Strategy? Refreshments for meeting.



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**STRATEGY 2e: Add a work placement or co-op component to the program to build better connections to the discipline/sector.**

GOAL(S) THIS STRATEGY SUPPORTS: Improve transitions for graduating students

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Revamp degree program to include optional Co-op	A. Rozell	2/22	6/23	
Consult with Learning Centre regarding possible options for documenting the training and contribution of peer tutors to better support transition to their future academic or career pursuits.	A. Rozell	5/23	8/24	

### Resource Implications

What are the resources required to achieve this Strategy? Additional courses may be needed.

**STRATEGY 2f: Offer additional pure math courses.**

GOAL(S) THIS STRATEGY SUPPORTS: Improve transitions for graduating students

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Explore sharing upper level, rarely offered courses with UFV, likely online.	M. Nyenhuis	9/21	12/22	
Explore offering courses that combine more than one course; e.g. a Set Theory course that combines an introductory stream with a more advanced stream, so it can be listed as both a 1 <sup>st</sup> year and a 3 <sup>rd</sup> year course.	M. Nyenhuis, A. Rozell	5/22	9/23	
Develop new course "Topics in Combinatorics"	A. Sanaei	5/22	1/24	

### Resource Implications

What are the resources required to achieve this Strategy? Course development support, and support coordinating with Registrar to facilitate course sharing.



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**STRATEGY 3a: Work with Math Liaison Librarian to identify courses to receive library instruction sessions.**

GOAL(S) THIS STRATEGY SUPPORTS: 3. Update program to maintain relevance.

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Work with Math Liaison Librarian to identify courses to receive library instruction sessions.	A. Rozell	1/22	9/22	

**Resource Implications:** Support from Math Liaison Librarian.

**STRATEGY 3b: Consult with university librarian regarding MathSciNet.**

GOAL(S) THIS STRATEGY SUPPORTS: 3. Update program to maintain relevance.

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Consult with university librarian regarding MathSciNet.	J. Bicep	12/21	1/22	

**Resource Implications**

What are the resources required to achieve this Strategy? License has been acquired.



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### STRATEGY 3c: Reactivate and expand Program Advisory Committee.

GOAL(S) THIS STRATEGY SUPPORTS: 3. Update program to maintain relevance.

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Set up PAC meeting.	A. Rozell	2/22	6/23	
Invite new members, guests.	A. Rozell	2/22	6/23	
Ask for input on curriculum, as a whole, and cycling through individual courses.	A. Rozell	2/22	6/23	

#### Resource Implications

What are the resources required to achieve this Strategy? Dean's office support to organize meeting.

### STRATEGY 3d: Include more emphasis on lesson planning in Math 3130.

GOAL(S) THIS STRATEGY SUPPORTS: 3. Update program to maintain relevance.

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Include more emphasis on lesson planning in MATH 3130, giving specific lesson plan formats to better prepare students for teacher preparation programs.	A. Rozell	5/22	9/22	

**Resource Implications: N/A**



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### STRATEGY 3e: Include Python programming.

GOAL(S) THIS STRATEGY SUPPORTS: 3. Update program to maintain relevance.

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Explore whether Python can be incorporated into existing courses (probably into MATH 3140).	M. Nyenhuis	5/22	9/22	
If not, develop new course with Python programming.	M. Nyenhuis	5/22	9/23	

#### Resource Implications

What are the resources required to achieve this Strategy? Course development support may be needed

### STRATEGY 3f: Add to program: additional courses in statistics and probability; data science; introductory courses on proofs and logic; and computational math.

GOAL(S) THIS STRATEGY SUPPORTS: 3. Update program to maintain relevance.

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Revamp degree program to include stats/data analysis concentration	A. Rozell	5/22	6/23	
Develop Post-Bacc stats/data analysis	A. Rozell	5/22	6/24	
Develop Minor stats/data analysis	A. Rozell	5/22	6/25	
Suggestions: MATH 2XXX Operations Research, MATH 3XXX Probability, STAT 3XXX Machine Learning, STAT 3XXX Data Analysis, STAT 4XXX Statistical Theory, STAT 4XXX Biostatistics, STAT 4XXX Design and Analysis of Experiments				

#### Resource Implications

What are the resources required to achieve this Strategy? New courses will need to be developed; additional faculty will need to be hired in specialty areas. Clerical and administrative support for program development will be needed.

When are these resources required? 5/22, new instructors 9/22

What Faculty and/or Institutional support is required? New courses will need to be developed; additional faculty will need to be hired in specialty areas. Clerical and administrative support for program development will be needed.





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**STRATEGY 3g: Find ways to support instructors in keeping up-to-date.**

GOAL(S) THIS STRATEGY SUPPORTS: 3. Update program to maintain relevance.

Step(s) Required to Achieve this Strategy	To be Led by	To Start on (M/YY)	To be Completed By (M/YY)	Notes
Identify appropriate professional development opportunities and encourage instructors to apply for appropriate educational leaves and support.	A. Sanaei	5/22	9/25	

<b>Resource Implications:</b> Existing professional development and educational leave funds.
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PLAN SUPPORTED BY:

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Provost's Name

Jeff Dyck

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Dean's Name

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Date

March 16 /22

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Date