Minutes of the 96th Articulation Meeting, May 15th - 16th, 2018
Capilano University

Version: June 22, 2018

Tuesday, May 15, 2018

Plenary Session

1. **Welcome:** Dr. Julia Denholm, Dean of Arts and Sciences, Capilano University, welcomed the BCcupms to its 96th meeting at Capilano University.

2. **Adoption of the agenda for the 96th meeting of the BCcupms.**

    Motion: (moved by Costa Karavas and seconded by Paul Ottaway)

    That the Agenda for the 96th Meeting be approved without changes.

    Approved by consensus

3. **Approval of the minutes of the 95rd meeting held at University of Calgary.**

    Motion: (moved by Deanna Baxter and seconded by Rick Sutcliffe.)

    That the Minutes of the 95rd be approved after some minor corrections.

    Approved by consensus

4. **Announcements:**

    4.1 **Announcements from the host:** Deanna Baxter provided information about internet access and meal options for the meeting.

    4.2 **Introduction of representatives.**

    4.3 **Attendance lists:** Susan Oesterle circulated the attendance lists.

    4.4 **Notice of election:** at this meeting, elections for the Chairs of the BCcupms and Statistics Subcommittee will be held. These have two-year terms. Shane Rollans and Richard Lockhart volunteered to form the nominating committee for the Chair of the Statistics Subcommittee. Susan Oesterle, Deanna Baxter, and Gary MacGillivray volunteered to form the nominating committee for the Chair of the BCcupms.

4.5 **Conferences:** Members brought the following upcoming conferences to the committee's attention.

2018 Joint Statistics Meeting, July 28 - Aug 2, 2018 in Vancouver. (Bruce Dunham)

Canadian Math Education Study Group, June 1 - 5, 2018 at Quest University. (Suzanne Feldberg)

Changing the Culture, May 18, 2018 at SFU downtown. (Susan Oesterle)

5. **Reports**:

5.1 **Ministry of Education** – Lisa Marshall, acting Mathematics Curriculum Coordinator EDUC.

5.1.1 **BC Ministry website:**
http://www.bced.gov.bc.ca/irp/transforming_curriculum.php

Lisa Marshall updated the committee on the state of the new curriculum. All Grade 10 curriculum is final and available on the Ministry website. All Grade 11-12 curriculum will be on the Ministry website in July 2018, and legislated for use as of July 2019. Curriculum comparison documents will be available this Fall. Students will be required to take two math courses: in grade 10, there will be only two choices (Foundations or Workplace); after grade 10 they will be required to take one more course, but there will be a wide selection of possibilities.

One key difference between the structure of the old curriculum and the new is the use of Learning Standards now, rather than Learning Outcomes. Lisa Marshall showed the committee examples of the new curriculum descriptions and planning documents, to illustrate how this new structure was developed and to what purpose.

In response to questions from Rick Sutcliffe, Lisa Marshall confirmed that the new curriculum will not include recommended textbooks, because in the past doing so resulted in the textbook becoming the curriculum document. The new curriculum is intended to allow educators flexibility in choosing their materials.

Lisa Marshall also described the new Numeracy Assessment to us. It is not linked to a specific course, and will be open to any student who has completed any Grade 10 math course. The content will be based on Grade 9 and Grade 10 concepts, although again not on a specific course. Students may attempt the Assessment at most three times; the highest score is recorded: Emerging (1), Developing (2), Proficient (3), Extending (4). This has been implemented once already, to over 9,000 students. Results were comparable to past provincial exams; reliability was greater than .8; a report from the markers will be available shortly. Although writing the Assessment will be mandatory there will be no minimum score required for graduation. Lisa Marshall said that the students' own goals will inform what score they think they need to achieve; if they wish to progress to postsecondary then they will know that "Emerging (1)" is not sufficient.

Committee members also asked whether the Assessment could be (or was intended to be) used to inform post-secondary admissions. Lisa Marshall told the committee that she did think that this Assessment could inform post-secondary admissions, but that each institution will need to look at the Assessment as well as the 1-4 scale descriptors, in order to determine what the most appropriate use of the Assessment, if any, would be for each institution. Committee members expressed the opinion that the students' scores in Precalculus 11 and 12 would probably be more useful for placement purposes, and also expressed a concern that if the Numeracy Assessment were used for admission purposes it could put pressure on grade 11 and grade 12 teachers to try to prepare their students for the Assessment. Lisa Marshall assured the committee that the grade 11 and grade 12 courses' curriculum is mandated, and so teachers will not have the option to focus on the Assessment when teaching grade 11 or grade 12 math courses. She added that the Assessment content was set to the grade 9 and grade 10 levels precisely so that the grade 11 and grade 12 courses could not become Assessment-focused.

Lisa Marshall made note of several questions from the committee members that she was not able to answer without looking into further, and said that she would send her responses to them to the secretary.

5.2 **BCCAT** – Anna Tikina, Research Officer (John FitzGibbon has retired)

Anna Tikina shared the Spring 2018 BCCAT Update flier, which is also available here: http://www.bccat.ca/articulation/announcements/bccat-2018-spring-update. Highlights included: a new and improved Transfer Credit System was launched in February, with new automation and data tools and the ability to manage articulations from outside of BC.

Publications of interest: "Being Seen, Being Counted: Establishing Expanded Gender and Naming Declarations" (available at http://www.bccat.ca/pubs/BeingSeen.pdf); "Indigenous Education Pathways" (available at http://www.bccat.ca/pubs/Indigenous_Pathways.pdf).

The 2017 Council Award Winners were Brian Dick, Tanis Sawkins, and Steven Earle. Nominations for the 2018 awards are open until June 29. See http://www.bccat.ca/system/awards.

Anna Tikina recommended that the committee apply for funding for transfer innovation projects if this committee has a project in mind that would be appropriate. See http://www.bccat.ca/companion/meetings/TIprojects for more information.

5.2.1 **Inter-Provincial Articulation.**

5.2.2 **System Initiatives; PCCAT** (meeting June 20–21, 2018 | Charlottetown, PEI) http://pccatweb.org/pccat/.

5.2.3 **BCCAT: 2017 and 2018 JAMs.** The 2018 Joint Annual Meeting will be held on November 16, at the Pinnacle Harbourfront Hotel in downtown Vancouver. See http://www.bccat.ca/articulation/jam

5.2.4 **BCCAT: Pending Requests in the Transfer Credit Evaluation System (TCES).**
The list of pending requests was circulated ahead of the meeting.

The meeting adjourned for a coffee break at 10:35am and reconvened at 10:56am.

5.3 **PIMS** – Jane Butterfield, on behalf of David Leeming.

The Pacific Institute for the Mathematical Sciences (PIMS) received a renewal on its funding from NSERC for the period 2014 to 2019. The current Director of PIMS is James Colliander, Professor of Mathematics at UBC. Former PIMS Director Alejandro Adem was a great supporter of PIMS initiatives in math outreach and is responsible for the current model for the PIMS Education Associates. Currently, there are twelve Associates in BC and four in Alberta. We would welcome more Associates. There is no annual fee or three-year limit. The PIMS Education Associate agreement with PIMS remains until one party terminates.

PIMS Education Associates in Alberta: Concordia University of Edmonton, MacEwan University, Mount Royal University, Red Deer College.

PIMS Education Associates in British Columbia: Camosun College, Capilano University, College of the Rockies, Douglas College, Langara College, Okanagan College, North Island College, College of New Caledonia, Selkirk College, Thompson Rivers University, University of the Fraser Valley, Vancouver Island University.

Please see the full report on page 33 for details of the various educational outreach activities by the PIMS Education Associates, and contact David Leeming if you are interested in making your institution a PIMS Education Associate.

5.4 **ABE** – Costa Karavas summarized the March 1-2, 2018 meeting of the Adult Basic Education Mathematics Working Group:

1. Adult Basic Education Math Articulation/BCCAT objectives
   a. Exchanging information and enhancing cooperation and coordination among institutions in Adult Basic Education courses.
   b. Promoting course and program equivalency.
   c. Contributing to the facilitation of inter-institutional transfer credit agreements.
2. Adult Basic Education in BC
   The Provincial Government's announcement in August 2017 that Adult Basic Education and English as an Additional Language Programs would return to a tuition-free status was very good news for adult students wanting to upgrade their courses or complete their high-school credential.
   With the support of the Federation of Post-Secondary Educators, a group of 11 faculty from around the Province met in Victoria on October 16th, 2017 with a group of policy developers from the Ministry of Advanced Education, Skills and Training for a round table discussion on policy development in Adult Education. They strongly encouraged

the Ministry to include educators on an ongoing basis in discussions about education. In April, 2018 the Ministry released the Adult Education Policy Framework document and a revised Adult Upgrading Grant Policy and Procedures Manual. We were very pleased to see that many of the policy changes that were advocated for were included. The Ministry is still working on a number of other policy issues that were raised during those sessions, including a long term funding model for adult education.

3. Enrolments

Enrolments have increased by approximately more than 25% across all institutions offering Adult Basic Education.

4. ABE Steering Committee meeting

The ABE Steering Committee meeting was held at VCC on April 26-27, 2018. Reports and presentations from:

– Bryan Dreilich, AEST:EX – BC Ministry of Advanced Education
– Ruth Erskine – BCCAT Update

Suzanne Feldberg asked whether changes to ABE have been made in response to the new high school curriculum. Costa Karavas says that they are waiting for now.

5.5 **Math Challengers** – Ian Affleck, on behalf of Leo Neufeld.

Math Challengers is a competition for Grade 8, 9 and, now for the first time, Grade 10 students who love math and excel in doing it.

This year well over 1000 students participated at the Regional level. Grade 8 teams came from 48 different schools, Grade 9, from 47 schools and Grade 10, from 36 schools. Students are also permitted to register as individual competitors. Top teams from each pool and Individuals then advance to the Provincial competition, which was held at UBCV this year. It's a really fun and enriching day for all!

Math Challengers 2018 Regional Competition

Grade 8	Lower Mainland	Vancouver Island	Okanagan	Fraser Valley	Prince George
Schools	25	9	4	10	-
Teams	42	17	5	17	-
Competitors	210	80	25	85	-
Grade 9					
Schools	29	4	6	8	-
Teams	47	8	8	12	-
Competitors	235	35	40	60	-
Grade 10					
Schools	26	3	2	5	-
Teams	38	4	4	10	-
Competitors	190	20	20	50	-

The format of the event consists of solving math problems individually and in teams with the prospect of trophies, medals and prizes when it's over. Brief talks or other math-related activities are also part of the day. In the final stage, called Face-off, the top ten students compete one-on-on to see who first solves a problem. Parents, coaches and the other competitors thoroughly enjoy the excitement of this elimination round.

All this is possible because of dedicated volunteers and committed teacher coaches, as well as financial assistance from organizations like PIMS, BCAMT, BCHydro, IBM and EGBC. UBC, SFU, BCIT, Camosun College, Okanagan College, UFV and UNBC provide generous competition-site hosting support.

For the Regional competition, besides the main competition site on the Lower Mainland, we also have competitions on Vancouver Island, in the Okanagan, the Fraser Valley and Prince George. Organizers are Satoshi Tomoda (Okanagan), Ian Affleck (UFV) and Erin Beveridge (UNBC, unfortunately no registrants this year). Colleges and universities are ideal sites for hosting MC. We'd love to see the MC opportunity expanded to include kids in the entire Province. The Kamloops and mid-Vancouver Island regions could easily become new start-ups.

For information about MC:

https://www.egbc.ca/Math-Challengers/Math-Challengers-Home

For previous competition problems:

https://www.egbc.ca/getmedia/5cfa019a-f50b-4a12-97b0-e8ebf020ce71/Quest-Archive.pdf.aspx

5.6 **Changing the Culture on Friday, May 18, 2018:** Nora Franzova summarized the program.

Deborah Hughes Hallet, the key person behind the Calculus Reform (and several other interesting projects) has agreed to be a plenary speaker: "What Makes Algebra So Hard? Knowing versus Doing".

Gary MacGillivray will speak in the morning about The evolution of UVic's Logic and Foundations course.

There will be three workshops: Krypto's Lock Box (Hans Bauk), Numeracy Tasks: Opening Pandora's Box (Phil Stringer), and Inside the calculus box: students' first year university experience (Kseniya Garaschuk).

6. Institutional Reports.

ACSENDA SCHOOL OF MANAGEMENT – Chehra Aboukinane

ASM has been known since year 2004 for offering predominantly the four-year Bachelor of Business Administration (BBA) degree as the core academic program with various areas of concentrations including Accounting, Human Resources Management, Marketing Management, and International Business Management and General Business Management. The major change at our institution is the addition of the Bachelor of Hospitality Management (BHM).

Both core programs require the completion of two math courses: The introductory level course is BADM 120 (Business Math). At a more advanced level, we offer BADM 221 (combining both Fundamentals of Applied Math and Business Statistics) with BADM 120 being the prerequisite.

It is our full intention to continue requiring both math courses in future program offerings and possibly add more data analysis / data science courses as we expand in the upcoming years.

ALEXANDER COLLEGE – Telyn Chan-Kusalik

Faculty and Staff: This past month, we've lost one of our longest-serving Mathematics instructors – Keira Gunn. She has left to pursue a Ph.D. at the University of Calgary. She will be missed. At the same time, we've hired two new instructors: Seyyed Hosseini and Mahsa Faizrahnemoon. We hired a new Statistics instructor – Ruwan Karunanayaka – to teach Stat 232 this Winter. Since we only occasionally offer our one Statistics course, he will not be continuing with us this new semester.

Program Updates: This past year, we introduced Math 099: Fundamentals of Algebra with Trigonometry as a prerequisite for Math 100: Precalculus. New students are now placed Math 099 by default, and are only eligible to take Math 100 or Math 104 if they have a recognized equivalent course to Math 12 in their high school transcript. There is also a math placement test available for students, but few take it.

As Math 099 has become the default math placement for new students, we have seen an increase in the number of sections of Math 099 offered and a decrease in the number of sections of Math 100 even though there has been an increase in the overall number of students.

We have switched to open-source textbooks (from OpenStax) for both Math 100 and Math 099. A large proportion of these students were not buying the textbook, and open-source texts seemed like the best option to ensure all students had access to course materials.

Enrolment: AC continued to experience growth in its student numbers (predominantly international student enrolment), setting institutional records for Spring 2017 (1593), Fall 2017 (1942), and Winter 2018 (2004). This represents a 22% increase in enrolment over last year.

The increase in enrolment, together with a lack of space means that almost all sections are running at capacity. This has caused an increase in the number of students enrolled in Mathematics courses who do not want or need to take Math. They are often taking it solely because they need an extra 3 credits that fit with their schedule, and it is the only course with space in it. This has caused a sharp increase in the failure and withdrawal rates.

The mathematics enrolments for the last 4 semesters are as follows:

	Spring 2017		Fall 2017		Winter 2018	
Course:	# sections	# students	# sections	# students	# sections	# students
Math 099: Fundamentals of Algebra with Trigonometry	0	0	1	32	2	49
Math 100: Precalculus	5	174	5	171	6	207
Math 104: Calculus I for Business	5	162	5	175	5	171
Math 105: Calculus II for Business	3	91	3	105	3	105
Math 115: Discrete Mathematics	0	0	1	35	0	0
Math 151: Calculus I	1	35	1	36	1	35
Math 152: Calculus II	1	34	1	35	1	35
Math 232: Linear Algebra	1	35	1	35	1	35
Math 251: Multivariable Calculus	0	0	1	35	0	0
Math 255: Ordinary Differential Equations	0	0	0	0	1	24
Stat 200: Introduction to Statistics	0	0	0	0	1	34
Total	16	531	19	659	21	695

Other Institutional Updates: We are searching for additional space to proactively address our developing enrolment trends.

We are in the testing phase of our new in-house developed Student Information System. This will consolidate all admissions, academic, finance, and support services data. This will also facilitate our growing institutional research initiatives.

This year Alexander College welcomed its first refugee student from WUSC's Student Refugee Program. We plan on fully funding 1 student per year and are already preparing to welcome our 2nd student in Fall 2018.

To support the institution's future growth, AC's Board recently approved the addition of new positions tasked with better supporting the needs of our faculty and students: an Associate Dean position, five Department Head positions, and a Director of Student Affairs position.

Our Writing and Learning Centre (WLC) continues to effectively assist a large portion of our student body avoid plagiarism (remediation workshops), develop their writing skills, and receive subject-specific tutoring.

Due to an increasing number of students who were repeat offenders for academic misconduct, we adjusted policy to apply a 1-term suspension for students who committed academic misconduct for a 2nd time.

We instituted a priority registration system for our Spring (May to July) term as part of our ongoing efforts to manage our strategic enrolment plans.

BC INSTITUTE OF TECHNOLOGY – Winona Cordua-von Specht

BCIT has no articulated Math courses with other institutions. We have seen steady growth in the relatively new Applied Data Analytics Certificate program offered through the School of Computing and Academic Studies: Part Time Studies. The certificate includes two stats courses: Math 1060 – Stats for Data Analysis and Math 3060 – Advanced Statistical Techniques for Data Analysis. R is the statistical software used in both courses. Math 1060 is offered three times a year often with multiple sets running. Math 3060 is offered two times a year.

CAMOSUN COLLEGE – Patrick Montgomery

Overall growth 3.3%, but noted decrease in Provincial Level Algebra and Trigonometry (Pre-calculus 12) equivalent of 7.4%, possibly as a result of changes in ministry tuition free policy for academic upgrading.

No changes in courses that require articulation activity.

Small increase (0.5 FTE) in faculty through regularization.

There is no curriculum change in our university transferable statistics courses this year. The enrolment in Stat 218 (Introduction to Probability and Statistics 1) was doubled from a year ago, while unchanged for Stat 116 (Elementary Statistics) and Stat 216 (Applied Statistics).

We adopted open source textbook "OpenIntro Statistics" by David Diez et. al. and open source online assignment system "MyOpenMath" for Stat 116 last fall. We ran two-stage midterms in all Stat 116 classes last year. Student feedback is positive for all the changes mentioned above. We continue to use R for the bi-weekly computer labs of Stat 216, 218 and 219, and MegaStat

add-ins for Excel for Stat 116 computer labs.

CAPILANO UNIVERSITY – Deanna Baxter

Enrollment in Math and Stat courses is stable with a slight increase in international students and corresponding decrease in domestic students. A further increase in international students is anticipated for the upcoming 2018/2019 academic year. Statistics courses offered will use the subject prefix STAT starting in Fall 2018. A new introductory level first year math course, "The Mathematics of Visual Art", is currently under development with first offering expected in Spring 2019. The School of STEM is in the process of developing a Bachelor of Science degree with an option for student to complete a "BSc General" as well as a selection of majors and minors to be developed over the coming years. One of the majors in development is in Data Science which will be a joint venture between Mathematics, Statistics, Computing and Data Science. The BSc General proposal will be posted to PSIPS later this summer. After 29 years as a faculty member of our department, Chris Morgan is retiring as of July 31 and we expect to be posting a full time regular position next year.

COLLEGE OF NEW CALEDONIA – Tracy Wall

During the past year the College has seen an increase in enrolments in most math courses, due mostly to the large increase in the number of international students. Due to the increased demand for math courses, we needed a second full-time instructor for the May semester so we have hired a full time sessional.

A new Associate Degree in Mathematics and Computer Science is proposed to begin in 2019, which will mean an increase in the number of second year math courses being taught, including some courses that have not been offered in several years. We will have to re-articulate our Math 203, Introduction of Analysis as the articulation agreements for that course have expired

COLLEGE OF THE ROCKIES – Andrea Hyde

In the 2017/2018 year, the biggest change at College of the Rockies was the strong increase in International student enrolment. In University Studies (US), the increase in total enrolment was 39%, but the increase in International enrolment was 88%. International students made up 26% of the US enrolments in September 2016 and 36% of enrolments in September 2017. There have been a variety of challenges related to an increased International student population and the department has been working on ways to manage those challenges. They have been working to improve language and math pre-requisite screenings to ensure all students have the skills to succeed in classes. There has also been a move to change practices around the ratio of Domestic to International students in each section.

As reported last year, our online Calculus I&II (Math 103&104) have been reworked to a gamified format. Overall the course went well. Leslie Molnar is working on a full analysis of the results.

Looking towards the 2018/2019 year, there are a few changes coming up. Jim Bailey has announced his retirement effective August 2018. He will be greatly missed! COTR has hired

two regular full-time Math Instructors. Dr. Benjamin Tippett has a mathematics PhD from the University of New Brunswick and six years of post-secondary teaching experience in Math and Physics. Ms. Andrea Hyde has an MSc in Mathematics from UBC Okanagan and has just finished a very successful year at College of the Rockies in a term appointment.

Currently we offer a Finite Math II course (Math 102) that transfers specifically only to TRU Math 1100, and generally to most other institutions as a first or second year math credit. One student took Math 102 this year. The Math 102 course outline is due for review at the end of 2018 and as a part of that process, we are planning to revise and re-articulate it to better meet student needs.

COTR offers Math for Elementary School Teachers (Math 105) for our teacher education program. UVIC offers two Math for Elementary School Teachers courses (Math 161 and 162). COTR is starting to work on building a second Math for Elementary School Teachers to line up with UVIC's offerings. Our current Math 105 course does not transfer to UBC and we would like to change that through the redesign process as well.

We are interested to compare our Finite Math I (Math 101) and non-calculus based Statistics (Stat 106) prerequisites to those of other institutions. There have been some changes in our prerequisites and our ABE offerings and we want to be sure we are preparing students appropriately for the coursework and staying in line with other institutions.

COLUMBIA COLLEGE – Ana Culibrk

- At the end of the Winter 2018 semester the total of 138 Associate degrees were awarded, 4 of which were Associate of Science with Math Concentration.

- There has been a change in the MPT – Math Placement Test; as of April 2018 we are offering 2 different level MPTs. Students who completed their education outside of BC are required to write an MPT in order to be placed in one of the following courses: Precalculus, Precalculus Plus, Introductory Statistics, Calculus for Science, and Calculus for Business & Social Science. We used to have one single format test for placing students prior to this change.

- In the Winter 2017 term the Mathematics Department articulated four new courses: Calculus I for the Life Science, Calculus II for the Life Sciences, Calculus IV, Differential Equations for Engineers (this course will hopefully get a transfer credit to UBC Math 256). The newly articulated courses haven't been offered yet.

- In each semester between 4 and 6 second year Math courses are being offered.

- Even though the overall College enrolment is very good, the enrolment in Math courses is in a slight decline. However, the peak in Math offering was in the Academic 2015/16 year.

Academic Year	2015/16	2016/17	2017/18
Number of sections of UT Math Courses	77	73	69

COQUITLAM COLLEGE – Gera Belchev

There are no changes to the current courses.

Enrolment has significantly increased in the past year, predominantly students from South East Asia. To accommodate them we opened more sections of college algebra and precalculus courses and hired three new instructors.

DOUGLAS COLLEGE – Dan Henschell

Programs/Courses: There have been no new courses added to the books at Douglas College this past year. We are however offering MATH 3316 – Numerical Analysis for the first time this summer, and our Mathematics and Science Teaching Graduate Diploma program has a cohort for this September.

Enrollments: Student numbers and numbers of sections offered have both continued to rise this past year. Like many other institutions, we are seeing demand for math courses from high international enrollments. We can also attribute some of this demand to the success of our emerging engineering and computer science programs.

Staffing: We have recently added Daryl Funk (MATH) and Arezoo Ariafar (CMPT) to our full-time regular faculty ranks. Pending further demand, limited sessional work may be available. There are no imminent retirements on the horizon.

KWANTLEN POLYTECHNIC UNIVERSITY – Michael Nyenhuis

No changes to courses. Enrolments have been steady, mainly because of overseas students. The B.Sc. in Applications of Mathematics is doing very well. I believe we have 6-7 students graduating this year, and many of them have applied to grad school. We were able to teach a course in Graph Theory, and reading courses in group theory and Galois theory. This past year we used WeBWorK for some of our courses. If you have WeBWorK installed on Redhat, our IT department would love to hear from you.

LANGARA COLLEGE – Nora Franzova

Langara's Math and Stat Department had a fairly stable year. No new courses that would need an articulation were added. We are hoping to recreate/revive the Finite Math course (Math1162) that might be of interest to international students that want to fulfill their Quantitative reasoning course requisite. We are hoping to offer a Modelling Course in the Spring term.

Enrollment in Calculus for business is declining, but enrollment in Calculus for Sciences is increasing. We speculate that it might be due to the fact that our international students (now mainly from India) are heavily interested in studying Computer and Health Sciences.

We will be hiring for all positions – Math, Stat, Business Math, Math for Elementary Ed., and also for the new program in Data Analytics.

Data Analytics program is a Post Degree Diploma program, that will be a 4 semester program open to those that already hold a degree, but need to retrain themselves in this very popular subject area. The first cohort will be starting in January 2019.

The College has undergone a restructuring exercise and now we have 8 divisions and division chairs, and we are still looking to hire more deans. Dean for Faculty of Science remains the same (Margaret Heldman).

We (the College) started a new bursary/scholarship for Women is STEM programs. It is called 49 women on 49th. We already awarded 2 this year.

Registration is strong. It is very much supported by international students. For this summer term we have as high as 47% international students. Many chose to remain in school due to unsupported rumours about immigration issues.

Fall term looks equally full at this point. We are fighting to find some more space for instruction and for faculty.

NICOLA VALLEY INSTITUTE OF TECHNOLOGY – No representative sent

NORTH ISLAND COLLEGE – Jeannie Cameron

NIC is planning to reinstate MAT 210 Calculus III and is developing Calculus IV (proposed MAT 214, but no code officially attached as yet). PHY 215 Modern Physics and PHY 216 Electricity and Magnetism are also in development. Development funding is from the Office of Global Engagement. NIC has experienced a large increase in international enrolments.

Enrolment in first year UT math courses MAT 181 Calculus I/182 Calculus II/102 Calculus for the Life Sciences/151 Finite Mathematics is stable and relatively strong (but 102 and 151 numbers are across three campuses). Initial enrolment in MAT 181 Calculus I is about 70 system-wide. Enrollment in MAT 122 Logic and Foundations is small but stable.

This year MAT 115 Introduction to Statistics added a section in the Winter term and a section as part of a full four month Summer term because of the increase in international students.

First year Calculus is using WeBWorK for online math homework. Calculus labs have switched to Geogebra from Maple. First year Physics is going to use OpenStax textbooks.

NORTHERN LIGHTS COLLEGE – Hongbin Cui

There were no changes in the past year. In September, we are going to offer some new programs that will enable us to relaunch courses like Calculus II, Linear Algebra and Object Oriented Programming. The new programs include Engineering Certificate and Interactive Technology and Gaming Design Diploma. I'll give more details next year.

NORTHWEST COMMUNITY COLLEGE – Regan Sibbald (in absentia)

University Credit Transfer Courses

- Math 101: Calculus I

- Math 102: Calculus II
- Math 115: Pre-Calculus – Video Conference from Terrace
- Math 190: Principles of Mathematics for the Elementary Teacher – Online and face to face
- Math 131: Introduction to Statistics
- Math 235: Linear Algebra

Textbooks:

- Math 101/102: OpenStax Calculus text.
- Math 115: OpenStax text.
- Math 131: M. Triola, Elementary Statistics, Canadian 3rd edition
- Math 190: O'Dafferet al. Mathematics for Elementary School Teachers
- Math 235: Linear Algebra and its Applications by David C. Lay

Software: Maple 17/Mathematica, D2L for online offerings and Vidyo for VC

Enrollments: Enrollments were a bit low last year but there is a significant increase in enrollments this year compared to the same time last year due to international enrollments.

OKANAGAN COLLEGE – No representative sent

QUEST UNIVERSITY – No representative sent

ROYAL ROADS UNIVERSITY – No representative sent

SELKIRK COLLEGE – Doug Henderson

We had some personnel changes in the past year. Our longest-serving instructor left the college, a part-time math/physics instructor also left, and another part-time instructor took a paternity leave for the winter semester. The math offerings at Selkirk College were the same for 2017-18 as they were for 2016-17. Course offerings and student numbers were almost identical in comparing the student numbers from 2016-17 to this past year. Early application numbers indicate a drop is likely for student numbers next year.
We had a small issue with an openstax textbook one of our instructors was using for a business stats course. The CPA would not accept a course using this specific text, so a new one was found that was acceptable.

SIMON FRASER UNIVERSITY – Justin Gray & Richard Lockhart

Overall enrollment in undergraduate math courses is stable (up 0.4% from last year).

Our calendar descriptions for MATH 157 (Calculus I for the Social Sciences) and MATH 158 (Calculus II for the Social Sciences) have been updated to reflect that "functions of several variables with emphasis on partial derivatives and extrema" has been moved from MATH 158 to MATH 157.

Calculus II and Calculus III "prime" courses have been introduced. These sections offer special lectures to select students, providing enrichment, and a look at more tailored applications to material that will be encountered in subsequent courses. For enrollment a minimum grade of A is required in the prerequisite course.

We have renamed our special topics courses designed especially for math minors and increased the number of these courses from three to four so that they can run on a 2-year Fall/Spring cycle without conflict.

obsolete:
MATH 302 - Computing with Mathematics
MATH 303 - Perspectives on Geometry
MATH 304 - Quantifying Uncertainty

current:
MATH 301 - Mathematical Journeys I
MATH 302 - Mathematical Journeys II
MATH 303 - Mathematical Journeys III
MATH 304 - Mathematical Journeys IV

A proposal for a new mathematics and economics joint major/honour programme is pending senate approval.

The following initiatives undertaken by our department do not fall under curriculum changes, but are worth noting. We have:

- struck a committee to prepare exams and set grading standards for MATH 100, 150, 151, 152 in order to provide more consistency between multiple sections and across semesters.
- started using pre-class online quizzes to encourage student pre-reading in preparation for each lecture (MATH 151,152, 322)
- created Maple T.A. resources for some courses (MATH 100, 232, 322)
- created Matlab Apps for writing and grading code in MACM 316

Related to open education resources: MATH 157/158 course materials are being developed by Petra Menz via and OER grant from SFU. For MATH 154/155 we are now using source material obtained from Leah Keshet (UBC) that has been modified for use in these courses.

New hires: We hired two research faculty this year. Caroline Colijn and Amarpreet Rattan will join us in September. Caroline Colijn was hired as a Canada 150 Research Chair. She will hold the chair in Mathematics for Infection, Evolution and Public Health.

Please see the minutes of the Statistics Subcommittee parallel session, page for the SFU Statistics and Actuarial Science report.

THOMPSON RIVERS UNIVERSITY – Suzanne Feldberg

- Our Department of Applied Science and Engineering is in the final stages of approval, and should be running in the fall (2018).

- Our MATH 1130 and 1230 (currently "Enriched Calculus I and II" respectively) are being renamed "Calculus I and II for Engineers," respectively.

- We will have two new Math courses in Fall 2018: MATH 2650 and 2670 (Calculus 3 and 4 respectively), and STAT 2230 (Statistics for Engineers).

- Our MS in Data Science Program is in DQAB and should begin in Fall 2019.

- Our new hire of last year, Mateen Shaikh, gave a Data Science course and is working on undergraduate options to lead into our MS in Data Science.

- We will have another new Data Science hire shortly.

- TRU School of Education will have a STEM program starting this Fall 2018.

- Enrolments are steady.

THOMPSON RIVERS UNIVERSITY (OPEN LEARNING) – No representative sent

TRINITY WESTERN UNIVERSITY – Rick Sutcliffe

Trinity Western University is a fully accredited privately funded public Christian university offering a variety of graduate and undergraduate programs in the arts, humanities, fine arts, sciences, education, theology, and professional studies. Opened in 1962, it currently has approximately 1,400 domestic and 500 international students enrolled full time, as well as 2,000 part time, this spread over four physical campuses and extension (on line and with partners). The Mathematical Sciences department is part of the Faculty of Natural and Applied Sciences and encompasses Mathematics, Statistics, Computing Science, Physics, and Pre-Engineering. The department offers majors, concentrations, and minors in Mathematics, Mathematics with Computing Science, Computing Science, as well as a concentration and minor in Physics. (The Department also offers ancillary courses for our other science majors – Biology, Biotechnology, Chemistry, Environmental Studies – as well as for TWU's Schools of Business, Nursing, and Human Kinetics.)

Our courses and programme requirements (checklists) are listed in the university calendar twu.ca/calendar. Some general science take a concentration in Mathematics to go along with a Chemistry or Biology major. In the past there have been students completing a Math major along with majors such as Human Kinetics, Nursing, Music, and History.

Enrolment records and some success rates for some first-year courses:

Course	Enrolment (5-year average)	Enrolment (2017-18)	Passing rate (2017/18)
Precalculus (105)	26	23	
Calculus I (123)	110	90	87%
Calculus II (124)	41	40	90%
Elem. Educ. (190)	42	37	95%
Math. For Business (101)	153	29	92%
Nursing Stats (108)	49	55	100%
Other Stats (102)	63	56	

UNIVERSITY OF BRITISH COLUMBIA - OKANAGAN – Wayne Broughton

We have revised our "business differential calculus" course (MATH 116, Calculus I for Economics and Management) to bring it in line with the Core Curriculum standards and to make it substantially equivalent to our "science differential calculus" course (MATH 100). In particular, we added limits, trigonometric functions, Newton's method, and Taylor polynomials. In addition, the prerequisites have been upgraded to match our MATH 100 (i.e. 67% or higher in Pre-calculus 12). As a result, we will be reviewing all of the articulations to our business calculus course to see if they are still appropriate.

We are modifying our Mathematics for Elementary Teachers course (MATH 160) to "Mathematical Reasoning for Arts and Education", which now has Grade 11 math pre-requisites and counts for credit towards most B.A. programs. We expect this to be implemented this fall (September 2018). This will probably require a review of articulations to MATH 160.

Other changes that are in process or we are considering:

- Creating an Honours version of MATH 100
- Increasing the prerequisites for MATH 100 to a higher grade in Pre-calculus
- Increasing the prerequisite for our integral calculus course (MATH 101) to a grade of 60% in MATH 100
- Reducing or eliminating the use of Maple in MATH 100 and 101 labs and replacing them with tutorial sessions
- Creating a first-year matrix algebra course and perhaps upgrading the content of the second-year linear algebra course

UNIVERSITY OF BRITISH COLUMBIA - VANCOUVER – Wayne Nagata

There have been no changes to Math in the past year that would affect articulation.

UNIVERSITY CANADA WEST – Erik Korolenko

Institutional Update:

- General. University Canada West is a business oriented teaching intensive university located in downtown Vancouver providing business programs on campus and online.

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- Budgets/Facilities. Our campus consists of 6 floors of the London Building at 626 W. Pender St. Vancouver. We have added one floor recently and have another floor under redevelopment.

- Students/Enrolment. Our enrollments have been increasing rapidly, but primarily in the MBA program. Of total enrollment of 401 students; we have 35 in our Bachelor of Commerce and 13 in our BA in Business Communications.

- Staffing. We have about 70 faculty members, but most are part-time. We are actively recruiting for full-time faculty in all business fields.

- Instruction/Open Education Resources. We have a couple of courses where faculty have adopted open textbooks.

Program/Course Update:

- Curriculum Developments. We have developed a full stream of accounting courses for the BComm and plan to start introducing more advanced courses in the next two years. We are expecting final approval of our Associate of Arts degree in the near future.

- Transfer Credit Applications or Alterations. In line with the expected introduction of the Associate of Arts degree program we have increased our activity as a sending institution.

- Issues. With rapid growth, recruitment of full-time faculty and classroom space have been the major issues in the past year.

UNIVERSITY OF THE FRASER VALLEY – Ian Affleck

Our enrollments are stable in most areas, but up in first year Stats, Discrete Math and Business Calculus - mainly due to increased demand (mainly international) for Business and Computing programs.

We are happy to announce a new full-time permanent hire: Vanessa Radzimski, who is completing a PhD in Math Education at UBC.

We piloted a Calculus Readiness Test in Fall 2017. This test was written by all (Science-stream) Differential Calculus students early in the semester, and data was then gathered on how the students subsequently performed in that course and in (Science-stream) Integral Calculus. Kseniya Garaschuk coordinated the study, and presented the findings at Changing the Culture 2018.

Our Applied Statistics Minor program started in Fall 2017, and our Data Analysis Post-Baccalaureate Certificate begins accepting students for its Co-op option this coming Fall.

We ran the new course MATH 123: Everyday Math and Stats for the first time in Winter 2018. This course is designed to be an interesting and useful course on math and stats in everyday life, which meets quantitative and numeracy requirements of Arts and General Studies programs, but does not serve as a prerequisite course for any other university level courses.

In Summer 2018 we are taking our first steps toward adopting WeBWork in our first-year courses. The first courses which will use WeBWork will be Differential Calculus (for Science), Discrete Math, and Precalculus.

UNIVERSITY OF NORTHERN BRITISH COLUMBIA – No representative sent

UNIVERSITY OF VICTORIA – Gary MacGillivray

We have two matters related to articulation.

The first is that the new stats course announced last year, Stat 123 Introduction to Data Science, has been developed and was offered for the first time in January - April 2018.

The second relates to our second year calculus courses. Several years ago we changed from a multivariable / vector calculus course and a differential equations course to Calculus III, multivariable calculus, and a Calculus IV, vector calculus, multivariable series, and differential equations.

Physics noticed that incoming students who do not have vector calculus / multivariable series do not do well in the physics classes for which Calculus IV is a prerequisite, so transfer of differential equations classes to Calculus IV turns out to be bad for the students and apparently is being revisited.

Institutions whose second year courses include vector calculus and maybe some multivariable series (no matter in which course, or perhaps in some other course) can have their two courses transfer to our two courses. It is suggested to specifically ask for re-articulation in this regard.

Students who have a multivariable calculus and differential equations, but no vector calculus or multivariable series, can continue in a Math or Stat program (except combined Math - Physics) with no need to go back and take Calculus IV. An advisor needs to intervene for admission into courses with Calculus IV as a prerequisite. Students intending to take Physics need to take a course involving vector calculus / multivariable series.

VANCOUVER COMMUNITY COLLEGE – Costa Karavas

Existing and new courses

The Mathematics Department in the School of Arts and Sciences offers multiple sections of Calculus I (MATH 1100), Calculus II (MATH 1200), Precalculus (MATH 1020), Discrete Mathematics (MATH 1120), Applied Linear Algebra (MATH 1221) and Introduction to Statistics (MATH 1111).

New mathematics courses are: Calculus III (MATH 2251), Ordinary Differential Equations (MATH 2310), Probability and Statistics for Science and Engineering (MATH 2700), Mathematics for Teachers (MATH 1190) and Mathematics for the Arts (MATH 1210). Articulation transfer requests have been initiated and completed for the majority of these courses though BCCAT.

Pathways to University

First-year certificate programs in Engineering, Computing Science, Software Systems, and Environmental Studies continue to be offered, providing VCC students the option to complete their 1st year courses at VCC and then transfer to SFU by assured or competitive admission, or to UBC by competitive admission. These certificate programs have increased enrolment in the existing calculus courses.

An Associate of Science degree and flexible pre-major in Biology have gone through the governance process and curriculum development of 2nd year courses has started. The new credential is planned to be offered starting September 2019.

New VCC programs are being created in establishing pathways into 2nd year at SFU. Graduates of the VCC UTSC program, who are admitted into the SFU Faculty of Science, may be awarded up to 34 transfer credits to be applied toward the first year of a Bachelor's of Science Degree. Program options are available for the following nine Major areas of study within the Faculty of Science at SFU, Bachelor of Science in: Biological Sciences, Chemistry, Applied Mathematics, Mathematics, Molecular Biology and Biochemistry, Physics, Applied Physics, Biological Physics and Statistics.

Enrolment

Enrolment in the Calculus courses has moderately increased since last year as the certificate programs become popular with UT students. Enrolment in our Statistics course (MATH 1111) experiences high enrolment as it serves as a core course for many Health Science programs and especially for the BSN (Bachelor of Nursing).

Software

MAPLE and MATLAB software can be accessed remotely by VCC math students and instructors through virtual licenses. This has minimized computer lab dependency.

VANCOUVER ISLAND UNIVERSITY – Lev Idels

The proposal for a Mathematics Majors at VIU (BA & BSc) is in its very final stages. The degree proposal has been sent to the Ministry and has cleared the thirty-day period for public comments – no public comments were received. We now await DQAB's review which in turn makes a recommendation to the Minister to approve or reject the proposal. We are hoping the degree will at long last be up and running by this coming September-18.

We plan to offer a wide variety of upper level courses on a rotating basis. Almost twenty-five new third/fourth-year courses would be available. Next year we plan to introduce an upper year Linear Algebra course and a fourth-year abstract algebra course focusing on Galois theory.

We have a new hire: Jane Wodlinger who is recent UVic PhD. Jane is a full-time permanent faculty member and she will start with us this fall.

YUKON COLLEGE – Jaclyn Semple

DISCUSSION The Committee then discussed issues of academic integrity. In particular, Justin Gray warned of improved smartphone apps that make it easier for students to find solutions to

textbook problems or to crowdsource solutions for homework assignments. He also said that readily-available online homework help has impacted the way in which students use the SFU help centre, because students think of it as a source of homework hints and some students prefer not to wait in line for that. SFU are considering how to change the way the centre operates in response – possibly by introducing problem-solving clinics that students will recognize as valuable.

Rick Sutcliffe asked whether other institutions are having problems with falsified transcripts. Telyn Chan-Kusalik reports that Alexander College has to expel about 25 students each year for submitting fraudulent documents (e.g., fake IELTS scores, false transcripts, etc.). Anna Tikina told us that the new articulation software allows member institutions to upload courses that are not articulated to or from anywhere – this can allow other institutions to see what courses have been *rejected* for articulation – they are working with UBC to pilot that functionality.

7. **Business arising from the 95rd meeting:**

   7.1 **UBC Mathematics Department and the necessity of series in all Calculus II courses.** See also agenda item 17.

   Wayne Nagata updated the committee on this situation. There has been no change in the calculus/series issue at UBC. However, Sauder (the UBC business dept) does their own admissions, and transfer to UBC Sauder years 2 and 3 only requires MATH 104 or equivalent, which is Calc 1, which does not include infinite series (that is in UBC Calc 2). See

   http://www.sauder.ubc.ca/Programs/Bachelor_of_Commerce/Admission_Requirements/Transfer_to_Year_2 for more information.

   Susan Oesterle asks whether this has been addressed in the Core Calculus agreement. Wayne Nagata says that they did not look at the Core Calculus agreement, but are planning to in the next year. Justin Gray says that it would be useful for the Core Calculus committee to know whether the Committee believes as a body that this topic should be included in the business calculus course.

   7.2 **College of the Rockies response to last year's agenda item 12.3 Instructor qualifications** – Susan Oesterle.

   At the request of Jim Bailey and the Dean of Business and University Studies at the College of the Rockies, Susan Oesterle distributed the College of the Rockies' response to concerns raised about instructor qualifications at the last meeting. In brief, the College confirms its compliance with BCCAT instructor qualification standards and has hired two new regular Math faculty who both have a minimum of a Master's Degree in Mathematics. One of their current instructors, who has a Math degree as well as a Masters in Education, is a long-time faculty member whose qualifications were grandfathered. A one-time assignment of a STAT 106 course to an underqualified instructor was an emergency measure, but was delivered under supervision of a qualified instructor and will not be repeated. Susan

noted that a number of mathematics departments across the province have instructors with Masters in Math Education, and she does not have any concerns about their qualifications. Justin Gray commented that he is happy that the College of the Rockies has responded, and has provided information about the qualifications of their latest hires. Andrea Hyde said that the College of the Rockies has in the past had some difficulty finding qualified instructors and have therefore had to make some emergency decisions, but with the recent full-time hires she has confidence that this difficulty will not happen again. No further action was recommended.

Motion: (moved by Rick Sutcliffe and seconded by Kevin Craib)
That the BCCUPMS thank Jim Bailey for his exemplary service to this Committee over the years.

Approved by consensus

8. **Nomination of Jim Bailey for a BCCAT Franklin Gelin Lifetime Achievement Award.**

This award recognizes an individual whose long-term contributions and far-reaching impacts have become apparent over a career of commitment to advancing transfer and articulation in the BC post-secondary system.
Eligibility: An individual currently or previously employed at one or more BC Transfer System institutions and/or system agencies in support of higher education in the province of BC for eight or more years.
See http://www.bccat.ca/system/awards for more information.

Action item: Nora Franzova, Susan Oesterle, and Deanna Baxter will form a nomination committee.

The Tuesday session of the BCcupms adjourned at 3:01pm
(moved by Gary MacGillivray and seconded by Nora Franzova)

BCcupms Meeting with Public School Teachers

9. **Introduction and opening remarks.**

   The committee welcomed Michael Pruner and John Assadi

10. **Reports:**

    10.1 **BC Secondary Schools Mathematics Contest** – Suzanne Feldberg.

    This year there were over 1700 junior and nearly 1000 senior participants in the preliminary round. See page for details.

    Next year, the preliminary round is expected to be held on or around Wednesday April 3rd, 2019, and the final round is expected to be held on Friday May 3rd, 2019.

    10.2 **BCAMT** – Michael Pruner

    The 57th NorthWest Mathematics Conference will be in Whistler, BC, October 18-20, 2018. See http://bcamt.ca/nw2018/ for more information.

    Michael Pruner told the Committee that they are currently working to support BC teachers transition to the new curriculum, and that the BCAMT has been given permission to post the final draft of the grade 11 and grade 12 *math* curriculum on their website, even though the Ministry is not yet ready to post the full grade 11 and grade 12 curriculum. See http://www.bcamt.ca/mathematics-grade-10-12-final-curriculum-documents/ for more details. The Committee had several questions for Michael Pruner about the new curriculum; highlights of this discussion are below.

    Regarding the lack of recommended textbooks for the new curriculum: what support will teachers have to help them select materials? Most of the courses that are not completely new are quite similar to the old ones, and so the existing materials should still be appropriate. Michael Pruner described the changes in the curriculum as being more about pedagogical approaches, which he said teacher training and professional development sessions are more important for addressing than textbooks are.

    Regarding the new curriculum for existing courses, does BCAMT thinks that the knowledge students will have upon completing the new curriculum will be similar to their current knowledge? Michael Pruner expects that it will be, but that students will also learn more about how to explain their reasoning and communicate their thinking. There are already high school students who have come through the new K-9 curriculum, and he has as a result noticed a greater willingness and ability to communicate their thinking.

    Regarding to the new elective courses such as statistics, geometry, history of math, and computer science, what is the intent behind them? Michael Pruner expressed the opinion that the reasoning behind those courses is to acknowledge both that there is more to math than calculus and also that there are many high school teachers with a background in those areas who would be excited to teach them.

Regarding the new Numeracy Assessment, how does BCAMT feel about it, and in particular about it being recorded on the students' transcripts? The BCAMT does not have a position on that, but they did have some concerns about the Numeracy Assessment score being used to inform admission decisions. Susan Oesterle commented that in a province-wide meeting of registrars there was a concern that if the Assessment were used for admission purposes then it might change the spirit of the Assessment into a high-stakes test, but added that there was interest among the registrars in collecting Numeracy Assessment scores so as to study over the next few years whether it is a good predictor of success. Deanna Baxter asked whether these tests will replace the FSAs, and Michael Pruner said that the FSAs happen in earlier years, so the Numeracy Assessment is not a replacement for those.

10.3 Calculus Challenge Exam run by UBC and SFU – Justin Gray.

Justin Gray summarized the purpose and administration of the Calculus Challenge Exam; it is SFU's turn to host the Calculus Challenge Exam this year. This exam is based on BC Calculus 12 curriculum from 2000, but given at the standard of a first semester university calculus course. It is open to any student currently taking a high school calculus course of any kind (Calculus 12, AP Calculus, even home schooled students). Successful students can claim credit for first semester calculus from any of the participating institutions (SFU, UBC, UVic, or UNBC) based on results of this exam. For students not close to the lower mainland, teachers can sign up as invigilators and administer the exam for their students. Reports on past exams are available here: https://www.sfu.ca/math/students_teachers/calculus_challenge_exam/exampractice.html

Ian Affleck said that UFV is interested in accepting the Challenge Exam for transfer credit in future years and will contact Justin Gray jgray@math.sfu.ca to update the Challenge Exam website appropriately.

Andrea Hyde asked whether the students' score on the Challenge Exam gets reported, because some institutions have different requirements for Calculus I scores when considering admission for Calculus II. Justin Gray confirmed that the score is reported, and that the test papers are scored by experienced TAs under the supervision of faculty members, who set the grading scheme.

11. General discussion: further topics to be suggested by the teachers.

12. **Adjourned to reception at 5:27pm**.
(moved by Shane Rollans and seconded by Susan Oesterle)

Wednesday, May 16, 2018

Plenary Session

Plenary Session (LB322)

13. **Opening remarks.**

    13.1 **Announcements from the host:** Deanna Baxter reminded the Committee of internet access, lunch, and dinner information.

    13.2 **Introduction of representatives.**

    13.3 **Attendance lists:** Susan Oesterle circulated the attendance lists.

14. **Our keynote speaker is Richard Hoshino: Four Problem-Solving Strategies for Mathematics and For Life.** Richard was winner of the 2017 CMS Adrien Pouliot award for his contributions to math education in Canada.

    Four Problem-Solving Strategies for Mathematics and for Life
    Richard Hoshino's talk explored ways in which mathematical problem-solving can connect with students, both those who are already interested in math and those who feel alienated from it, by giving them a real connection between mathematics and life. He shared examples of problem-solving exercises that have given students opportunities to make real progress on open problems, to explore the ways in which mathematics can solve problems in their own communities or experiences, and to feel empowered to study mathematics.

Parallel Sessions

15. **Mathematics Session**—Chair: Suzanne Feldberg

Math.15.1. **Report from the Calculus Readiness Test Subcommittee** – Justin Gray.

    Justin Gray reminded us of the origins and development of this multiple-choice test. In particular, the multiple-choice options for the new problems were generated by real student test-takers. Analysis of the students' incorrect responses allowed the CRT Subcommittee to created distractors for the randomly-generated variations on each problem. The first full-scale version of this test was administered at COTR, KPU, and UVic in Fall 2016 in introductory differential calculus courses; the anonymized results were forwarded to Justin Gray for analysis, and he reported on these at the 2017 BCCUMPS meeting. Please see the full analysis of these results, using Richard Taylor's app, at http://legendre.tru.ca/readiness_tests/ under the Dataset BCcupmsCRT2016.csv.

    Based on that analysis, the CRT Subcommittee has removed some problems that had weak correlation with the calculus grade, and has added some problems from the SFU calculus

test. This Version 2.0 has only 15 problems now. Unfortunately, it was tested only in two small sections at KPU and so not enough students have written the test for real analysis.

Justin Gray would like more data on this second version of the test, and asks for institutions who are willing to administer this test in their first-semester calculus courses for the Fall 2018 term. He is able to generate as many randomized versions of the test for you as you need. Justin Gray can set your students up with temporary passwords for LON-CAPA, if you are able to have your students write the test electronically, or he can advise you as to formatting if you will use Scantron sheets, or you can send him your results in spreadsheet form if you have an in-house way of administering multiple choice exams that works well for you.

It is important that all of the Fall 2018 participating institutions use the same time limit when administering this exam, so volunteer institutions will discuss that with Justin Gray (he recommends somewhere between 30 and 50 minutes). This is a calculator-free exam.

Justin Gray pointed out that the CRT Subcommittee does not have a recommended use of this exam, and that different institutions will certainly use it in different ways and for different purposes. Some might use it to place students, some might use it to identify students at risk for the purpose of interventions, and some might use it only for informal advice to students.

Please contact Justin Gray at jgray@math.sfu.ca **if you are interested in being part of the Fall 2018 CRT.**

On the topic of placement into first-semester courses, Suzanne Feldberg called for a straw poll on what Precalculus grade is required in a typical first-semester Calculus for science course. Kseniya Garaschuk replied that she recently analyzed this, and reported that most institutions require a B or higher in Precalclus 12 while UBC, SFU, and Capilano require an A or higher, and that moreover most institutions accept a lower score in their in-house pre-calculus course than they require from a high school pre-calculus course.

The Committee then took a straw poll on what score is required in the in-house pre-calculus course for admission to a first-semester calculus course for science students. Results: 4 institutions require a B, 2 require a B-, 6 require a C+, 4 require a C, 4 require a C-, and none accepted a D.

The Committee then took a straw poll on what score is required in Calculus I for admission to Calculus II. Results: 2 institutions require a C+, 5 require a C, 10 require a C-, and 4 accept a D.

For a few institutions, these requirements are guidelines for students rather than enforced prerequisites, but most institutions are enforcing them.

Math.15.2. **Two Stage Exams.**

Kseniya Garaschuk talked about the structure of the two-stage exams she has used. Her students wrote an exam individually in stage 1, and then worked together in self-selected

groups of three or four students to revise and resubmit in stage 2. If students did better on the individual portion then that is all that counted, otherwise their score was based 80% on stage 1 and 20% on stage 2. In her experience, students loved the structure – although the instructors did not see concrete gains in course grade outcomes. Interestingly, some students commented that although they did not benefit directly from the two-stage model they thought that it was so useful for their peers that they would want to have two-stage exams in the future.

Kseniya Garaschuk has detailed data on this two-stage exam experiment, which she spoke about at Changing the Culture in 2015. Her poster on this study is available at http://www.cwsei.ubc.ca/Files/EOY/EOY2016/Posters/Garaschuk_Math-Group-Exams_UBC-SciEd-OH2016.pdf, or if you would like a preprint of her paper please email her directly.

Some committee members were curious about academic integrity, and whether steps were taken to prevent collaboration between different groups. Kseniya Garaschuk said that no effort was made to prevent discussion between different groups, but that the students found they had not enough time to discuss with more than just their own group members.

Lev Idels pointed out that psychological outcomes are less important than learning outcomes. Kseniya Garaschuk pointed out that explaining one's thought process to another person can solidify understanding, as most of us have experienced when we first teach a new subject. and Regan Sibbald referenced studies in the educational literature that show that the best time for students to re-engage with material is immediately after they have struggled with it, making stage 2 of the two-stage exam quite valuable. Lev Idels also expressed a concern that students would be anxious about their peers discovering that they had failed in stage 1 (although given that the groups are self-selected that does not seem to be a significant danger). Kseniya Garaschuk also pointed out another concern that instructors should bear in mind if they are considering two-stage exams, which is the necessity of providing examination accommodations to students with learning or other disabilities.

The session adjourned for a lunch break at 12:00pm and reconvened at 1:10

Math.15.3. **Final examinations in first-year calculus** – Suzanne Feldberg on behalf of Nicholas Buck.

Nicholas Buck at the College of New Caledonea has asked us about the expectations of final exams for first-year differential and integral calculus. His understanding is that the final examination should be three-hours, comprehensive, and used for at least 40% of the final grade. He would like to develop a survey for the committee for the next meeting. Nicholas has asked if an institution such as his wanted to use a multiple-choice final exam for a first-year calculus course would it lead to articulation problems.

These guidelines are not mandated by current articulation requirements; although Committee members have in the past shared final exams with one another, assessment instru-

ments are not formally pat of the articulation process. The Committee compared current practices of final exams: time limits ranged from 2.5 hours to 3 hours and grade weighting ranged from 30% to 60%. Only two institutions, UBC-V and UVic, reported using a multiple-choice component on their final exams.

In general, there was not strong interest in this level of detail for considering courses for the purpose of articulation between BCCAT institutions, although most members had pedagogical concerns regarding the use of multiple-choice problems on a final exam. It was considered sufficient for the purpose of articulation between BCCAT institutions to have contacts at each institution who can provide information about exams if necessary.

Math.15.4. **First Year Core Engineering** – Deanna Baxter

Deanna Baxter reported that she had become aware that the Engineering articulation committee has put out a draft report to BCCAT that makes recommendations for the first year core curriculum that would ideally be province-wide. In the report that Deanna Baxter saw, it stated that Calculus I & II must contain sequences, series, and polar coordinates. Because Capilano has a first year transfer program that targets second year engineering at UBIC, this requirement to include polar coordinates would be a problem for Capilano and seems to be misaligned with UBC's own engineering program. Deanna Baxter asked whether this was something the other members of the Committee were aware of, and whether any action was required.

A draft of this report, from the 2017 Engineering articulation committee meeting, is posted on the BCCAT webpage at http://www.bccat.ca/pubs/engineering-final-report-v121, but Costa Karavas attended the 2018 Engineering articulation meeting, at which a significantly updated report was presented. The updated report was not available online at the time of these minutes, but Costa Karavas made it available to the Secretary and it can be circulated in advance of the next BCCUPMS meeting, at which the Committee can have a broader discussion.

Regan Sibbald added that his understanding was that students whose first year calculus courses did not include polar coordinates would not be denied transfer. Lisa Lajenussee agreed that it could be understood as a "wish list", and added that Engineering articulation is currently seeking feedback about where the gaps are between this list of desired topics and the topics actually covered by various institutions' courses.

Deanna Baxter emphasized her concern that the Engineering report seems to be misaligned with the curriculum of one of the main receiving institutions for Engineering programs in the province, and in particular that it seems to require more content from the sending institutions than this receiving institution includes.

Action item: The updated report will be circulated to the Committee before the next meeting, and discussion will be resumed then.

Math.15.5. **New 10 - 12 Math Curriculum and Numeracy Assessment: post-secondary admissions** – Jane Butterfield

What are our various institutions thinking in terms of admissions, particularly with respect to the Numeracy Assessment? (Discussion deferred to next year's meeting).

15. Statistics Session—Chair: Bruce Dunham—room LB186
(Please see the complete Minutes of the Statistics Subcommittee on page .

Plenary Session

16. **Highlights from the parallel sessions**

17. **New business:**

17.1 **Five Year Review of the Core Calculus Report: report from committee.**
Wayne Nagata reported that the CCR committee did not reevaluate the Core Calculus Report. They will review in time for next year.
Action item: Justin Gray will convene the first meeting.

17.2 **Mathematics Flexible Pre-Major Report:** Gary MacGillivray reported that there are no changes or updates. Michael Nyenhuis said he looked at the BCCAT website, and this flexible pre-major has not made it to their website.
Action item: Gary MacGillivray will look into why the flexible pre-major is not yet on the BCCAT website.

18. Committee business:

18.1 **BCcupms: Webmaster's Report** – Stephen Benecke (in absentia).
Nothing to report; let Stephen Benecke know if any changes are needed.

18.2 **Report from the Nominating Committee; elections for the Chairs of the BCcupms and Statistics Subcommittee if necessary.**
The nominating committees reported that: Bruce Dunham accepted the nomination as Statistics Subcommittee chair and Ian Affleck accepted the nomination as Chair of the BCcupms.
Call for nominations: three calls were made for each and nominations were accepted as recorded above.

18.3 **Theme for our 97th meeting.** Several topics were suggested for the 97thmeeting: New high school math for admissions purposes, and the Numeracy Assessment for admission purposes; Precalclus courses; Textbooks for Math for Teachers courses; Paperless testing; Open education resources; Indigenization of math and stats curriculum.

18.4 **Date and location of the 97th meeting of the BCcupms:** May 14–16, 2019 at College of the Rockies.

18.5 **Proposed future dates for BCcupms meetings:**

Year	Meeting Dates	Location
2018	May 15–17	Capilano University
2019	May 14–16	College of the Rockies
2020	May 12–14	Trinity Western University
2021	May 18–20	Camosun College
2022	May 17-19	Possible Joint AB-BC Meeting

The question was also asked whether Sharing Math would be part of the 2019 meeting. Enough members were interested in attending that Andrea Hyde confirmed that she will plan to include Sharing Math in the 2019 meeting plans; she will look into flights out of Cranbrook and schedule Sharing Math to be compatible with those flight times.

18.6 **List updates:** please look at our web page

<p align="center">http://www.bccupms.ca/</p>

and check that contact information, email, telephone, fax, and address are up-to-date. Please send any corrections to our web master, Stephen Benecke.

19. **Adjournment.**
    The meeting adjourned at 2:45pm
    (moved by Natasha Davidson and seconded by Rick Sutcliffe)

Many thanks to Deanna Baxter and Capilano University for their excellent work in hosting us for this meeting.

List of Committee members Present

Plenary Session TUE (a.m./p.m.); Secondary Teachers Session (Teach); Plenary Session WED (a.m./p.m.); Concurrent Math/Stat

Name	Affiliation	TUE	Teach	WED	MATH	STAT
Chehra Aboukinane	Acsenda School of Management	x		a.m.	x	
Ian Affleck	UFV	x	x	x		x
Josiah Akinsanmi	Corpus Christi	x				
Marsha Anderson	Capilano University	p.m.		p.m.	x	
John Assadi	Handsworth S.S.		x			
Mahshid Atapour	Capilano University					x
Jim Bailey **(Chair)**	College of the Rockies					
Deanna Baxter	Capilano University	x	x	x	x	
Eugene Belchev	Langara College	x	x	p.m.	x	
Gera Belchev	Coquitlam College	x	x	x	x	
Wayne Broughton	UBC-O	x	x			
Jane Butterfield **(Secretary)**	University of Victoria	x	x	p.m.	x	
Raquel Cabral	Kwantlen Polytechnic University			x	x	
Jeannie Cameron	North Island College	x	x	x		x
Telyn Chan-Kusalik	Alexander College	x	x	x	x	
Patrick Cheng	Acsenda School of Management	a.m.		x	x	
Winona Cordua-von Specht	BCIT	a.m.			x	
Kevin Craib	Langara College	x		x		x
Hongbin Cui	Northern Lights College	x	x	x	x	
Ana Culibrk	Columbia College	x		x	x	
Natasha Davidson	Douglas College			x	x	
Rika Dong	Columbia College			x		x
Bruce Dunham **(Stats Chair)**	UBC-V	x	x	x		x
Suzanne Feldberg **(Vice-Chair)**	Thompson Rivers University	x	x	x	x	
Nora Franzova	Langara College	x	x			
Kseniya Garaschuk	UFV	x		x	x	
Justin Gray	SFU Department of Mathematics	x	x	x	x	
Doug Henderson	Selkirk College	x	x	x	x	
Dan Henschell	Douglas College	x	x			
Richard Hoshino				x	x	
Andrea Hyde	College of the Rockies	x	x	x		x
Lev Idels	Vancouver Island University	x		x	x	
Simin Jolfaee	BCIT	p.m.		x		x
Costa Karavas	Vancouver Community College	x		x	x	
Susan Kinniburgh	Camosun College	x		x		x
Erik Korolenko	University Canada West	x	x	x		
Lisa Lajeunesse	Capilano University		x	x	x	
Michael Lo	Langara College	x		x		x
Richard Lockhart	SFU	x	x	p.m.		x

List of Committee members Present, cont.

Plenary Session TUE (a.m./p.m.); Secondary Teachers Session (Teach); Plenary Session WED (a.m./p.m.); Concurrent Math/Stat

Name	Affiliation	TUE	Teach	WED	MATH	STAT
Gary MacGillivray	University of Victoria	x		x	x	
Lisa Marshall	Ministry of Education	a.m.				
Alan Meichsner	Douglas College	x	x	x		x
Chris Morgan	Capilano University		x			
Patrick Montgomery	Camosun College	x	x	x	x	
Wayne Nagata	UBC-V	x		x	x	
Michael Nyenhuis	KPU	x	x	x		x
Susan Oesterle	Douglas College/SLP	x	x	x	x	
Paul Ottaway	Capilano University	a.m.	x	x	x	
Harsha Perera	Simon Fraser University			a.m.		x
Michael Pruner	Windsor / BCAMT		x			
Shane Rollans	Thompson Rivers University	x	x	x		x
Jaclyn Semple	Yukon College	x	x	x	x	
Regan Sibbald	NWCC	x	x	x	x	
Rick Sutcliffe	TWU	x	x	x	x	
Anna Tikina	BCCAT	x				
Tracy Wall	College of New Caledonia	x	x	x	x	

Supplemental Reports

PIMS Report

Introduction

The Pacific Institute for the Mathematical Sciences (PIMS) received a renewal on its funding from NSERC for the period 2014 to 2019. The current Director of PIMS is James Colliander, Professor of Mathematics at UBC. Former PIMS Director Alejandro Adem was a great supporter of PIMS initiatives in math outreach and is responsible for the current model for the PIMS Education Associates. Currently, there are twelve Associates in BC and four in Alberta. We would welcome more Associates. There is no annual fee or three-year limit. The PIMS Education Associate agreement with PIMS remains until one party terminates.

PIMS Education Associates in Alberta

Concordia University of Edmonton, MacEwan University, Mount Royal University, Red Deer College.

PIMS Education Associates in British Columbia:

Camosun College, Capilano University, College of the Rockies, Douglas College, Langara College, Okanagan College, North Island College, College of New Caledonia, Selkirk College, Thompson Rivers University, University of the Fraser Valley, Vancouver Island University.

Concordia University College – Edmonton

Math Kangaroo Clubs: We organized mathematics clubs for Grades 1-9 students aiming to provide math enrichment as well as prepare students for national and international competitions such as the Canadian Math Kangaroo Contest. The purpose of the classes is to meet the educational needs of students who require math challenges beyond the regular school curriculum.

Coding and Engineering Workshops: During one of the club sessions, February 25, 2018, we hosted coding and engineering workshops for students, teachers, and parents. The workshops were attended by approximately 120 people. Contest Training About 90 students came to Concordia University of Edmonton for training on March 11, 2018.

Math Kangaroo Contest: On March 18, Concordia University of Edmonton and MacEwan University welcomed 370 students in grades 1 through 12 from Edmonton area who participated in the international Mathematical Kangaroo contest-game. Concordia University of Edmonton and MacEwan University work very closely in running the contest and providing training. This competition is one of the largest in the world attracting over six million students and hundreds of mathematicians from more than 70 countries. The main purpose of the Math Kangaroo competition is to dispel the myth that mathematics is boring by creating a positive environment with fun events that emphasize the practical nature of mathematics. Problems are created to be attractive, entertaining and appealing to the students; nevertheless, they are rich in math content and provoke exploration of novel ideas and approach. Everything went well. The Award Ceremony will be on May 11, 2018. We intend to present two major awards, one is existing – Robert Jerrard Memorial Award to a winner in grade 7-12, and the other is new – Tiina Hohn award to a winner in grade 1-6 (elementary

school). Each award consists of an engraved trophy and a $250 cheque.

<u>International Math Competition Participation</u>: We also formed a team of 4 students and 2 team leaders in grades 5 and 6 to participate in the International Mathematics Competition this summer (2018) hosted by Bulgaria. They are now travelling to Burgas, Bulgaria to participate in IMC. We hope to be able to receive support from PIMS for assisting participants in the IMC with the travel expenses. We also intend to seek support from the City of Edmonton under the Community Investment Recreation and Multicultural Travel Grants. Applicants may receive 25% of the eligible costs up to the specific maximums.

Mount Royal University – Calgary

Explore IT is held at three of Calgary's premier post-secondary institutions – the University of Calgary, Mount Royal University, and SAIT Polytechnic – the participants are educated and entertained by a variety of hands-on and highly interactive workshops, as well as an inspiring keynote speech presented by a successful woman from the STEM sector. In 2018, the event is re-branded as Explore STEM. Furthermore, this year I have received *NSERC *PromoScience* grant to assist in subsidizing the inclusion of young Indigenous women to partake in this event, and linked to the re-envisioning and realignment of the program. We are pleased to announce that our 19th annual *Explore STEM* Conference is scheduled for May 16, 2018, and this year is in conjunction with NSERC's *Science Odyssey 2018*! *Explore STEM *is a fun, engaging and hands-on opportunity for grade 9 girls to explore potential opportunities in STEM (science, technology, engineering and, mathematics) related fields.

This year, another 890 grade 9 girls will have the opportunity to be inspired, motivated and educated in a variety of aspects within the STEM fields and the related career possibilities available to them.

Further information can be found at http://www.explore-it.ca

Explore STEM has had a significant impact. Over 650 grade nine girls attended the Conference in 2017, 890 spaces will be available in 2018 and to date, almost 9000 girls in total have participated since it began in 1999. When surveyed, an average of 75-80% of participants said that they would consider pursuing a career in ICT as a result of attending the Conference. Many of the young women who attended the Conference in grade 9 are pursuing their post-secondary education in STEM areas of study. By encouraging more young women to pursue higher level math and science-related subjects, these girls will have far more options available to them upon graduation.

Camosun College

Camosun helped support Math Challengers on Feb 17, 2017, a well-established annual competition for local schools. Ninety-seven students participated in BCMC this year – 68 from grade 8 and 29 from grade 9. It was supported by 7 department members for the afternoon at Camosun?s Interurban Campus Also helping out were a number of retired teachers and UVic faculty. This was an exciting and fun event for the students and faculty involved. PIMS UVic provided the PIMS medals.

We have also been involved in two formal outreach activities as follows.

Four math workshops at Colquitz Middle School. Approximately 18 students have been involved in enrichment activities designed to expand their knowledge and excite their interest in mathematics. This has been augmented by a school-led plan for the students to participate in the Gauss mathematics contest, so part of the workshop time was devoted to helping students to prepare for this experience. The workshops have been led by Stephen Benecke and Patrick Montgomery.

Development of a summer math camp, to be held in July 2018. CMS funding has been approved for a week-long math camp for high school students, and plans are in development for an initial offering. Lead planner is Amanda Malloch.

Capilano University
Capilano University hosted SNAP Math Fair in November 2017 and March 2018.

Also, they held Pi Day on March 14, 2018 in the Math Learning Centre with pie, games, digits of pi reciting contest and prizes.

Capilano Universtiy again hosted the BC Secondary Schools Math Contest in May 2018 as well as Sharing Mathematics on May 17, 2018.

Douglas College
No Report.

Langara College
Langara will host the BC Secondary School Math Contest.

We hosted AMC (American Math Contest) - for grade 8, then AMC10/12 Ab, then AIME and then the next level (for 1 student). We had more than 50 students participating in total.

We also hosted the regional Vancouver District Science Fair.

Math1190 students - organized a MATH FAIR twice - in the Fall (Nov. 2nd) and in the Spring (March 1st). The Fall term projects were with an indigenous theme - all projects involved stories and story telling related to some puzzles and tricks. (Melania Alvarez helped with this project.) On December 15th, one of Math1190 students and I went to visit her elementary school - a grade 7 class, and brought over the Math Fair projects to work on with the class.

College of New Caledonia
No math outreach activities to report this year.

North Island College
No Report.

Okanagan College
Here are our outreach events hosted this year.

Math Challengers: Feb. 16, 2018 about 80 students (partially funded by PIMS Education Fund).

S.N.A.P. Math Fair: Mar. 13, 2018 about 150 students (partially funded by PIMS Education Fund).

Canadian Kangaroo Math Contest: Mar. 18, 2018 – 76 participants.

Spring in to Math: April 10 & 12, 2018 – over 200 students.

BC Secondary School Math Contest: May 4, 2018 – 85 participants.

Selkirk College
At Selkirk College, I did two outreach activities this past year for math:
In early June, I hosted 3 sessions of a 'mathematical games' session for elementary students from grades 2 - 6 (I had approximately 20 students per session so 60 total). This was during a 'College For a Day' field trip for the schools where they were bused in to the college and attended 3 sessions. In late June, I organised and graded our math scholarship contest on our Castlegar campus. The scholarship contest is essentially a condensed version of the BC Colleges Math Contest (we only have one round, and the students have 60 minutes to complete it). It is done at the same time as other departmental contests (e.g. there are English, Chem, History, etc. contests the same day) so the length of test and the date are fixed so that students can do up to 3 contests the same day). Our contests are only open to Grade 11 & 12 students. They each write the same test, but prizes are handed out for each grade separately. I believe I had around 10 students from each grade write the contest.

In April, 2018, the West Kootenay Regional Science Fair was held at our gym on the Castlegar campus. Aside from the displays, Science World came and put on some shows. A number of our departments put up smaller, interactive displays beside the main stage, and we did have a math display as one of these. I estimate it would have been visited by anywhere between 50 - 100 students of all grades – but mainly elementary.

Thompson Rivers University
We ran puzzle sessions for 4 groups of students at the 2018 Cariboo Mainline Regional Science Fair. One comment from the event: "Your session was definitely one of the kids' favorite, so great to see! Now if they could only make it that interesting in high school kids would be more engaged".
On May 3, 2018 Saeed Rahmati is doing a session on knots for the Day of Arts and Science. We organize and host the regional BCSS Math Contest, the finals of which are happening Friday, May 4. We are bringing in Dr. Egan Chernoff, an Associate Professor of Mathematics Education at University of Saskatchewan for our local version of the contest. He is giving two talks; "Math Wars: Coast to Coast...Almost" to the teachers (with lots of time for discussion) and "Counterintuitive Probability Problems: Countering Intuition" as the keynote presentation.

University of the Fraser Valley
No Report.

Vancouver Island University
We had about 1500 students write the preliminary contest in their home schools and approximately 100 students from nine (maybe ten) schools were invited to VIU on May 4th for the final round of the BC High School Math Competition. I gave a talk on "The First Two Thousand Years of Cryptography". Fun was had by all!

Thank you to those PIMS Education Associates who are taking the time to do Math outreach – whether or not PIMS provides financial support. Also, thanks to the following individuals who

contributed to the writing of this Report: Rossitza Marinova (Concordia University of Edmonton), Roberta La Haye and Pamini Thangarajah (Mount Royal University), Chris Odgers (Camosun College), Deanna Baxter (Capilano), Nora Franzova (Langara), Satoshi Tomoda (Okanagan), Doug Henderson (Selkirk College), Shane Rollans (TRU), and David Bigelow (VIU).

BC Secondary School Mathematics Contest, 2018

On May 4, 2018 the Final Round of the BC Secondary School Mathematics Contest was written at a number of provincial colleges and universities. Students who had performed well on an earlier Preliminary Round held within their own high schools were invited (together with a teacher sponsor) to attend the Final Round and spend a day at the local post- secondary institution with several activities involved.

Reporting institutions are:

Capilano University (CapU)
Douglas College (Douglas)
Langara College (Lang)
North Island College (NIC)
Northwest Community College (NWCC)
Okanagan College/UBC Okanagan (OC/UBCO)
Thompson Rivers University (TRU)
Vancouver Island University (VIU)
University of the Fraser Valley (UFV)

The table below gives a summary of the number of students and the top scores (out of a possible 100) on the Final Round at each institution that reported the Final Round.

Institution	Final Round		Top Three Scores		Averages	
	Juniors	**Seniors**	**Junior**	**Senior**	**Junior**	**Senior**
CapU	22	19	99, 98, 96	97, 92, 92	71.9	64.2
Douglas	12	15	93, 93, 87	90, 83, 80	73.0	54.1
Langara	33	9	99, 98, 95	92, 86, 82	56.6	69.9
NIC	11	14	87, 80, 72.5	59, 55, 53	55.5	37.8
NWCC	8	3	95, 50, 45	55, 35, 20	42.5	37
OC/UBCO	66	35	90, 88, 84	81, 73, 68	43.3	42.7
TRU	30	28	84, 71, 71	54, 53, 46	42.6	30.2
VIU	44	31	93, 83, 79	74, 65, 63	46.9	43.8
UFV	49	37	90, 87, 85	91, 88, 87	54.5	50.8
TOTAL	275	191				

The top reported Junior and Senior Preliminary scores were both 60 out of 60, with averages between 17 and 35, somewhat lower than 2017. Seven schools reported a total of 1767 junior and 996 senior participants in the preliminary round. It is noteworthy that close to 55% of these students were reported by VIU. Not all schools report Preliminary Round scores or participation numbers, so there is no way to know exactly how many students actually participate. A total of 466 students, from the nine institutions reporting, participated in the Final Round this year. The preliminary

numbers were about the same as 2017 with a slight rise in the juniors and a slight drop in seniors. The number of students writing the final round was slightly higher than in 2017.

This report, together with information on winners from the individual institutions, will be posted on the BCSSMC web site:

http://mathcontest.sites.tru.ca/files/2016/06/MathContestBCCUPMReport_2018.pdf

For those planning for next year, the dates we are suggesting for the 2019 contest are:

Preliminary Round: Near April 3, 2019

Final Round: May 3, 2019

Due to the variable timings and lengths of spring breaks we suggest that we be flexible with when schools write the preliminary.

While some progress was made this year on getting drafts out earlier we hope to do still better for the next contest. All help is welcomed whether in the form of suggested problems, feedback, solutions and TeX typesetting! Please contact Suzanne Feldberg sfeldberg@tru.ca if you are interested.

The Math Contest website is http://mathcontest.sites.tru.ca/. On it you will find the most recent provincial summaries, and previous contest papers dating back to 1999.

The top three students in at the Junior and Senior levels are given below. Note that participants were asked to submit a Freedom of Information Protection of Privacy Consent form in order for their names to be reported. In the following, only the names of participants who submitted a form are included, though school and grade are sometimes provided.

Capilano University

	Name	School	Grade
First Place Senior	Boya Yang	Burnaby South	10
Second Place Senior	Risha Saran Vijayarajan	Moscrop Secondary	11
Third Place Senior	Michael He	Moscrop Secondary	11

	Name	School	Grade
First Place Junior			
Second Place Junior	Charles Xu	Mulgrave School	10
Third Place Junior	Eric Zhou	Burnaby Mountain Secondary	10

Douglas College

	Name	School	Grade
First Place Senior	Allen Zhang	Pinetree Secondary	12
Second Place Senior	Whenchen Shao	Centennial Secondary	12
Third Place Senior	Michael Yu	Pinetree Secondary	11

	Name	School	Grade
First Place Junior	David Liu	Deer Lake Secondary	10
Second Place Junior	Yu Lin Liu	Pinetree Secondary	10
Third Place Junior	Jason Wang	Riverside Secondary	10

Langara

	Name	School	Grade
First Place Senior	Tony Liu	Olympic Education Center	10
Second Place Senior	George Huang	Olympic Education Center	10
Third Place Senior	Colin He	Delta Secondary School	12

	Name	School	Grade
First Place Junior	Kaixin Wang	Olympic Education Center	7
Second Place Junior	Derek Li	Olympic Education Center	
Third Place Junior	Kevin Liu	Olympic Education Center	

North Island College

	Name	School	Grade
First Place Senior			
Second Place Senior	Robert Russell	Highland Senior Secondary	11
Third Place Senior	Teagan Parkin	GP Vanier Senior Secondary	12

	Name	School	Grade
First Place Junior	Noah Aldinger	Mark Isfeld Senior Secondary	9
Second Place Junior	Lucian Yun	Mark Isfeld Senior Secondary	9
Third Place Junior	Rachelle Park	Mark Isfeld Senior Secondary	8

Northwest Community College

	Name	School	Grade
First Place Senior	Name withheld	Smithers Secondary	12
Second Place Senior	Name withheld	Smithers Secondary	11
Third Place Senior	Name withheld	Smithers Secondary	12

	Name	School	Grade
First Place Junior	Name withheld	Smithers School	9
Second Place Junior	Name withheld	Skeena Secondary	9
Third Place Junior	Name withheld	Skeena Secondary	9

Okanagan College/UBC Okanagan

	Name	School	Grade
First Place Senior	Jordan Colledge	Kelowna Secondary School	11
Second Place Senior	Kurt Hu	Okanagan Mission Secondary School	11
Third Place Senior	Jeanine Looman	Clarence Fulton Secondary School	12

	Name	School	Grade
First Place Junior	Marcus Grainger	Penticton Secondary	10
Second Place Junior	Zijun Meng	Okanagan Mission Secondary School	10
Third Place Junior	Samantha Yudlin	Okanagan Mission Secondary School	8

Thompson Rivers University

	Name	**School**	**Grade**
First Place Senior	Bill Wan	Westsyde Secondary School	12
Second Place Senior	Brayden Turner	Kamloops School of the Arts	11
Third Place Senior	Stuart Klenner	South Kamloops Secondary	11

	Name	**School**	**Grade**
First Place Junior	Jodh Nahal	Sa-Hali Secondary	8
Second Place Junior	Paige Hembling	Sa-Hali Secondary	8
Second Place Junior	Midori Sugiyama	Sa-Hali Secondary	10
Third Place Junior	Jordyn Maywood	Brocklehurst Middle School	9

University of the Fraser Valley

	Name	**School**	**Grade**
First Place Senior	Davina Zhou	Walnut Grove Secondary	11
Second Place Senior	Bella Lim	Yale	11
Third Place Senior	Joel Peters	MEI	12

	Name	**School**	**Grade**
First Place Junior	Kate (Min) Jin	Highbroad Academy	7
Second Place Junior	Zichao Sun	Walnut Grove Secondary	9
Third Place Junior	Sung Jae Bae	MEI	9

Vancouver Island University

	Name	**School**	**Grade**
First Place Senior	Mingjie Zhao	Dover Bay Secondary School	11
Second Place Senior	Rocky Zhao	Dover Bay Secondary School	12
Third Place Senior	Braiden Gent	Nanaimo Christian School	11

	Name	**School**	**Grade**
First Place Junior	Freyja Wang	Nanaimo District Secondary	10
Second Place Junior	Noah Isaacson	Ladysmith Secondary	10
Third Place Junior	Simon Wang	Dover Bay Secondary School	10

Minutes of the Statistics Subcommittee

Wednesday, May 16th, 2018

Present: Ian Affleck (UFV), Mahshid Atapour (Capilano University), Jeannie Cameron (NIC), Kevin Craib (Langara College), Rike Dong (Columbia College), Bruce Dunham (Chair, UBC-V), Andrea Hyde (COTR), Simin Jolfaee (BCIT), Susan Kinniburgh (Camosun College), Michael Lo (Langara College), Richard Lockhart (SFU), Alan Meichsner (Douglas College), Michael Nyenhuis (KPU), Harsha Perera (SFU), Shane Rollins (TRU).
Chair: Bruce Dunham
Acting Secretary: Michael Lo

Stat.14.1. **Approval of agenda.**

Motion to approve agenda: Kevin Craib; seconded: Shane Rollins. **Carried unanimously.**

Stat.14.2. **Approval of the minutes of the Statistics Subcommittee Session of the 95$^{\text{rd}}$ meeting.**

Motion to approve minutes: Kevin Craib; seconded: Shane Rollins. **Carried unanimously.**

Stat.14.3. **Matters arising from the minutes.**

Following the discussion last year on open source textbooks, Julie Peschke (Athabasca) had asked the Chair to find out if anyone on the subcommittee was aware of an open source textbook that used the critical value approach to hypothesis testing. No-one was able to provide a title, but all agreed to report to the Chair if they found a relevant text.

Stat.14.4. **Institutional reports.**

British Columbia Institute of Technology

The Department of Mathematics at BCIT teaches about 20 statistics courses. The courses are primarily introductory, but there are a couple of intermediate-level statistics courses as well. The Applied Data Analytics program is in its second year and the enrollments are adequate. The computing system technology program will now have a statistics course in it and the bachelor of technology program now also requires a statistics course. R, Excel, and Minitab are all used in statistics courses; more courses however are moving toward using R in classroom.

Camosun College

There is no curriculum change in the university's transferable statistics courses this year. The enrolment in STAT 218 (Introduction to Probability and Statistics 1) was doubled from a year ago, while unchanged for STAT 116 (Elementary Statistics) and STAT 216 (Applied Statistics). The open source textbook "OpenIntro Statistics" by David Diez et. al. and open source online assignment system "MyOpenMath" were adopted for STAT 116

last fall (https://www.openintro.org). Two-stage midterms were used in all STAT 116 classes last year. Student feedback is positive for all the changes mentioned above. The R software is used for the bi-weekly computer labs of STAT 216, 218 and 219, and MegaStat add-ins for Excel for Stat 116 computer labs.

Capilano University

Enrolment in the statistics courses has been good and stable. The two statistics courses MATH 101 and MATH 205 are now labeled as STAT 101 and STAT 205. The department is in the process of developing a post-bac program in Data Science that is going to be partially focused on applications related to "social good". Work is ongoing towards creating a B.Sc. program with a major in Data Science.

Douglas College

Demand remains strong for introductory statistics courses, all 17 sections offered during the past year were full. Demand for calculus-based statistics course remains steady at one section per year. There have been no changes that affect articulation.

Langara College

A new post-degree program in Data Analytics will start in January 2019. The main statistical software in the program includes SAS and R.

The department has had four different new hires (mostly part-time) since September 2017. There will be more hiring for January 2019.

The failure rate of international students is very high. This has led to a number of initiatives around Langara College. The Math & Stats Department will do a pilot this summer term in helping international students succeed.

North Island College

North Island College has one statistics course: MAT 115, Introduction to Statistics. MAT 115 is an algebra-based course which serves life science, business, and criminology students with a minimum Foundations of Math 11 prerequisite. There are approximately four sections per year of MAT 115 with three at the Courtenay campus and one ITV (interactive TV) section between the Campbell River and Port Alberni campuses as well as a distance option offered in the fall and winter terms. This year an increase in international students supported additional sections at the Courtenay campus in winter 2018 and summer 2018. Students use free onlineăstatistics software applets to perform statistical analysis. There is no lab attached to the course. The textbook changed last year to Deveaux et al. Stats: Data and Models, Second Canadian Edition (2nd Edition).

Simon Fraser University

The department have been making a number of changes over the past few years on efforts to move towards data science and an increased focus on computation. There has also been work to grow the minor and major enrolments. Finally, the department have been building programming in Data Science. An undergraduate interdisciplinary major in Data Science has been created and will be housed in the department. It is a joint Stat/Act Sci; Math;

Comp Sci; and Business program and replaces the previous Management and Systems Science. There are no truly new lower division items since last year but reproduced below are summaries of the major and minor statistics requirements at the lower division level and discussions of the contrast between the major and minor programs.

Current lower division major requirements: 2 CPSC; Calc 1, 2, 3; Linear Algebra; STAT 180 (1credit); STAT 240, 270, 285.

1) STAT 180 is "Career Development Seminar for Statistics and Actuarial Science".

2) STAT 240 is "Introduction to Data Science".

3) STAT 270/285 traditional Math Stat introductory courses; no significant recent changes.

Current lower division minor requirements: Calc 1, 2; one of STAT 201, 203, 205 (all non-calc), 270 (calc), or Business Statistics (BUEC 232).

Upper division: creation of courses with multiple entry routes (these courses are shared between minor and major students); introduction of Big Data course.

1) Time Series (STAT 485), Discrete Data (STAT 475), Applied Multivariate Analysis (STAT 445). All are cross-listed with 6XX graduate numbers for students in other disciplines.

2) All have prerequisite structures which permit students to by-pass theory; use non-calculus based courses (one of STAT 201/203/205 plus one of STAT 302/305 – none of these courses count for majors students).

3) Big Data in STAT 452, Statistical Learning and Prediction.

Personnel: Recent and upcoming retirements: Rick Routledge, Carl Schwarz. Recent and upcoming appointments: Marie Loughin, Harsha Perera, Lloyd Elliott. Michelle Zhou has resigned her position and Luke Bornn remains on leave with the Sacramento Kings.

Enrollments: There have been moves to try to grow enrollments by adding sections of heavily subscribed courses. So this summer STAT 100 is offered and 500 students have registered. The 2017/2018 enrolments are 10% higher than 2016/2017. Of this growth $\frac{3}{4}$ is accounted for by the new offering of STAT 100.

BCCUPMS Representative: Richard Lockhart is leaving the committee, likely permanently. The regular replacement is Harsha Perera, a recently hired lecturer.

Thompson Rivers University

The proposed Masters of Science in Data Science has been submitted to DQAB and the department is currently in the process of hiring a second tenure track position to help support this degree.

A new statistics course has been added for the Software Engineering program, STAT 2230, Probability and Statistics for Engineers. The department offered a special topics course in Data Science which was very well received and there is intent to make it a regular offering.

David Tomkins, a long-time member of the department and a statistician, made a sudden decision to retire in the middle of last summer. The new position is also to help replace Dave. He moved to the Island and is now teaching part-time at Camosun.

The numbers in all statistics courses remain stable, including the section for Tourism students, which has not seen a decrease despite being replaced in their program. There are hopes that Tourism will eventually revisit that decision.

University of British Columbia, Vancouver

Demand for places on statistics specialisations has continued to increase, to the extent that many students wishing to enter a major involving statistics are unable to do so. Enrolments on STAT courses have also hit new highs. In addition, some new programs in Applied Science in the approval stage will increase enrolments on certain STAT courses in future years. In total 83 students will graduate from statistics programs this year, excluding minors and students on certain combined programs.

The department has collaborated with the Department of Computer Science to create a new data science course at first year level, DSCI 100: Introduction to Data Science. The course has a pre-requisite of any Mathematics 12 course. Featured topics include data wrangling, visualisation, classification methods, clustering, and regression. There is no credit exclusion with existing STAT courses. In the initial run seats will be limited to Science students, but there is appreciable interest from other units.

The calculus-based introductory courses STAT 241 and 251 have been taught concurrently for over twenty years. Retaining the two codes no longer serves any purpose and STAT 241 will be discontinued from next year though will remain in the calendar for a while. More importantly, the credit exclusion between STAT 241/251 and MATH/STAT 302 has been removed. This means that students with STAT 241/251 wishing to take upper-level STAT courses may do so without the need to take a course for no credit.

There are changes to the breadth requirements for all BSc programs likely coming into effect from 2019/18. From then BSc majors will be required to take at least one course from six of seven categories, one of which is MATH, another STAT, and a third CSPC. Students in a combined program complete a course from at least five of the categories. There are minor changes to the lab requirement.

The Flexible Learning in Introductory Statistics project, funded by UBC's Teaching and Learning Enhancement fund, has continued developing and testing resources for introductory courses. All resources created will be open-source and made freely available via a new website, StatSpace. The full launch of StatSpace is expected by early July.

Two new faculty members joined the department recently. Tiffany Timbers is a new instructor who had previously taught on the Masters in Data Science program. Tiffany's work will be weighted towards the MDS, with 20% of her time devoted to undergraduate teaching. Trevor Campbell is to join as an assistant professor having previously worked at MIT.

Further details on any of the above can be obtained by either visiting `www.stat.ubc.ca` or contacting Dr. Bruce Dunham at `b.dunham@stat.ubc.ca`.

Stat.14.5. **Articulation agreements between Alberta and BC: Introductory Statistics transfer credit proposal**

Prior to the meeting the Chair circulated a revised version of the proposal for the content of a generic introductory course put forward by Julie Peschke, a document modified in the light of discussions at last year's meeting. The document proposes core and elective topics, with previous suggestions from the subcommittee incorporated.

After some clarification on the purpose of the document, where the Chair reiterated that the aim was not to revisit existing articulation agreements but to inform the development of new courses and prompt healthy discussions about what we teach and why, there were suggestions to further modify the core and elective content. The discussions were informed by BCCUPMS representatives outside the subcommittee who communicated suggestions to reduce the proposed core content.

There was general agreement that the core content as presented was rather too much and that the core could comprise an entire course, prompting the proposal that "core" be 75-100% of the course, and "Elective" content be 0-25%. Other specific suggestions on which there were broad agreements are as follows:

- Under "Sample Surveys", while sources of error should be discussed at least informally, definitions and detailed discussion for sampling, non-sampling, selection, and voluntary response errors were better as elective topics. Similarly judgemental sampling and systematic sampling are more appropriate as elective topics.

- Under "Graphing Quantitative Data", frequency polygons, stem-and-leaf plots, and pie charts should be optional. Frequency polygons and stem-and-leaf plots are rarely seen outside of statistics textbooks, and pie charts are inferior to corresponding bar charts with regards ease of comparisons.

- Given the practical equivalence of the two approaches, it was agreed that either "Inference about the difference in two population proportions" or "Tests for independence and homogeneity" should be core, not both. There was agreement that handling both these topics was time-consuming.

- After a discussion about the difficulties in teaching ANOVA as it is usually treated in introductory textbooks, there was agreement that the topic should be designated elective. The Chair expressed the view that although some treatment of ANOVA is highly desirable in an introductory course, the bar is usually set too high for what students are expected to master, which tends to result in minimal learning.

- Presumably some discussion of the correlation coefficient is intended as core, including why the statistic should be treated with caution.

There were conversations about whether the "critical value" approach to hypothesis testing should be core. There was some consensus that the approach was not used in practice today and is not typically advocated in textbooks. Moreover the use of critical values is

a throwback to a time when computing P-values was impractical, whereas today students have ready access to freely available software tools. There was agreement that students should have some familiarity with the concept of P-value after an introductory class, and in the teaching of that approach the use of critical values is typically implicit if not formally discussed.

Stat.14.6. **Statistics 12: Update on curriculum and support for teachers. (Bruce Dunham, UBC)**

The Chair gave a brief overview of the background of the new Statistics 12 course will be in the high curriculum as a mathematics elective starting September 2019. Further details are in the minutes from the 2018 subcommittee meeting. Information on the course may found at the BCAMT website, and details are expected to appear before July on the Ministry of Education's website. The Chair has worked with the Ministry and representatives of the BCAMT to develop the course. The course is not intended to articulate to any existing courses at university or college level, but should provide an excellent grounding in preparation for a traditional introductory course.

It is evident that teachers in the province require support if they are teach the new course. To that end, the Chair ran both a two-hour workshop in October at the BCAMT annual conference and a one-day workshop in April in Burnaby. In total around 25 teachers attended at least one of these sessions, the responses being very positive.

It is hoped that other members of the subcommittee will assist in rolling out the one-day workshop, or something very similar, across the province. With that in mind, the Chair provided a session giving an overview of the workshop for interested parties on the evening of 15th May, prior to this meeting.

Stat.14.7. **Provincial Minitab license (Bruce Dunham, UBC)**

Representatives of BCNET and Minitab met last year to discuss pricing and options for a province-wide license for Minitab. The shortfall between the sum of what institutions pay who currently have local licenses and the cost of the provincial license is around $4k, which could be reduced if, as communicated to the Chair earlier in the year, another institution adopts the software. There are still questions about how the license would be administered and who would pay.

Related to the previous agenda item, the Chair has proposed that Minitab would be good software for teachers and students on the new Statistics 12 course. He has explored possible sources of funding with the BCAMT. Subsequently ERAC, a consortium supporting K-12 education in BC (see www.bcerac.ca for details), was contacted in April about the possibility of financial support for the license. There has been no response as yet. The Chair will continue his efforts to pursue this.

Stat.14.8. **Articulation of non-STAT statistics courses.**

Following some email conversations between members of the subcommittee, the Chair raised the issue of articulating statistics courses that were likely not taught by qualified

statisticians and have non-STAT (or MATH) codes. His suggestion is, where possible, to refer articulation in the institution to an appropriate alternative unit in the discipline indicated by the course code. For instance, if an institution has a psychology department teaching their own introductory statistics class, articulation requests for PSYC-code statistics classes should be referred to that department. Otherwise, there may be little choice but to transfer for STAT credits.

Ian Affleck mentioned that the use of statistical software was one of the important criteria of credit transfer at his institution.

Stat.14.9. **Election of Statistics chair.**

The Chair indicated his willingness to stay on in the role, while inviting volunteers to consider assuming the role. Kevin Craib nominated Bruce Dunham to stay as the chair of the statistics subcommittee, which was seconded by Richard Lockhart. Bruce accepted the nomination and will be the statistics subcommittee chair for another term by acclamation.

Stat.14.10. **Any other business.**

There was no further business.

Stat.14.11. **Motion to adjourn.**

Moved: Kevin Craib, seconded: Richard Lockhart. **Carried unanimously.**