MATH 697: Mathematical Statistics (4 credits)

Instructor: Omid Aghababaei Jazi

Office: Burnside Hall, Room 1023

Office Hours: Tuesdays and Thursdays, 10:45-12:00

Email: omidali.aghababaeijazi@mail.mcgill.ca

Lectures: Tuesdays and Thursdays 9:05-10:25 AM, **Room**: BURN 1214

Textbook: Probability and Statistics; The Science of Uncertainty, 2nd Edition, Michael J. Evans and Jeffrey S. Rosenthal. University of Toronto.

Course Description:

The main purpose of this course is to acquire a broad knowledge of some frequently used probability models as we as the principles and techniques in statistical inference. The course essentially compresses the core elements of MATH 323 and 324 as well as Bayesian inference with a strong focus on their application in life sciences, the implementation, and the interpretation of their numerical results. We will therefore introduce computational methods in statistics with the statistical software program R to illustrate the results. Most of the materials for the course will be drawn from the first eight chapters of the textbook. The book, however, does not contain all the materials we intend to cover in this course. Some extra notes will therefore be given on those topics.

Pre-requisites: MATH 141 or equivalent

Grading Scheme

	Formula I	**Formula II**
Assignments (4)	40%	40%
(Project, Take-Home Exam)	15%	-
Participation	5%	5%
Final Exam	40%	55%

Final Mark is the maximum of the marks computed from these two formulas.

Target Syllabus	
Weeks 1-3	Overview • Basic principles of inference through the use of probability and statistics. Probability • Populations, samples, Probability models • Conditional probability, Independence, Bayes Rule • Random variables. Continuous & discrete. Focusing heavily on normal distribution, and maybe binomial. • (Discrete) Probability distributions and cumulative distributions • (Continuous) Probability density functions and cumulative distribution functions • Hands-on examples: simulating from a probability distribution, generating random samples, plotting results. Expectation and variance • Expectation for discrete random variables • Expectation for continuous random variables • Higher order moments • Sampling distributions • Conditional expectation, conditional variance formulas Introduction to R (objects, data structure, basic graphics, useful packages)
Weeks 4-5	• Convergence in probability and distribution; Slutsky's Theorem • Weak law of large numbers • Central Limit Theorem (CLT) Illustrating asymptotic results in R (Law of Large numbers and CLT by graphical tools) Emphasis of these asymptotic concepts should be focused on intuition, rather than detailed mathematical proof.
Weeks 6-8	Point and Interval Estimation • Properties of Estimators (Bias, Variance, Mean-Squared Error) • Sampling distributions and estimation – finite sample • Sampling distributions and estimation – asymptotic • Consistency and efficiency Some Real Examples in R (obtain small and large sample C.I, simulation study to show sensitivity of large and small sample C.I for the mean and normality for the variance of population)
Weeks 9-10	Methods of Estimation • Sufficiency and Factorization Theorem • Maximum Likelihood Estimation (MLE) • Method of moments • Bayesian estimation and inference Using optim function for MLE, Bayesian Analysis in R (graphical tools to illustrate posterior function, Bayesian computation: Newton-Raphson, integral approximation, Monte

	Carlo for estimation, confidence and credible Intervals and prediction, introduction to MCMC)
Weeks 11-13	Hypothesis Testing • Null and alternative hypothesis; Type I and II errors • Large sample hypothesis tests • P-values • Likelihood Ratio Test Hypothesis Testing in R (Small and Large sample hypothesis testing, illustrating power, calculating P-value, etc.)

Take-Home Midterm Exam

Release	Deadline
Monday, October 15th 2018	Thursday, November 30th 2018

ASSIGNMENT TIMELINE

	Release	Deadline	Content
Assignment 1	Friday, Sept 14	Friday, Sept 28	Probability, Expectation
Assignment 2	Friday, Oct 5	Friday, Oct 19	Sampling Distribution, Estimation
Assignment 3	Friday, Oct 26	Friday, Nov 9	Methods of Estimation
Assignment 4	Sunday, Nov 12	Monday, Nov 28	Bayesian Inference, Hypothesis Testing

COURSE MANAGEMENT

a) The course website will be located on myCourses. You should be able to access all online course material through myCourses. It is the student's responsibility to check myCourses regularly. You will need your student ID number and Minerva password to access the materials.
b) Homework assignments will be posted once roughly every two weeks on myCourses. Late assignments will not be accepted for partial credit.

MCGILL POLICY STATEMENTS

The following three statements are included in this course outline, in keeping with various Senate resolutions:

a) McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures. For more information, see www.mcgill.ca/students/srr/honest/

[Approved by Senate on 29 January 2003]
b) In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded. [Approved by Senate on 21 January 2009]

c) Instructors who may adopt the use of text-matching software to verify the originality of students' written course work must register for use of the software with Educational Technologies and must inform their students before the drop/add deadline, in writing, of the use of text- matching software in a course. [Approved by Senate on 1 December 2004]

If you have a disability and need special arrangements, please contact the Office for Students with Disabilities at 514–398–6009.

McGill University Course Evaluation

MATH 697 : Reading Course in Statistics - Reading Course Section: 1
CRN: 26571

Term : Fall 2018
Instructor(s) : Omidali Aghababaei Jazi

End-of-course evaluations results, as one indicator of teaching effectiveness, are used to:

a. *to help instructors improve future offerings of courses;*
b. *to inform students about courses and instructors;*
c. *as a component of the teaching dossier; and*
d. *to help administrators and faculty committees in their decision-making processes.*

Written comments are treated as confidential and are not made available to the McGill community.

The course ratings reported here are only one indicator of teaching effectiveness and these results should be treated with caution since they represent reports on only one particular course.

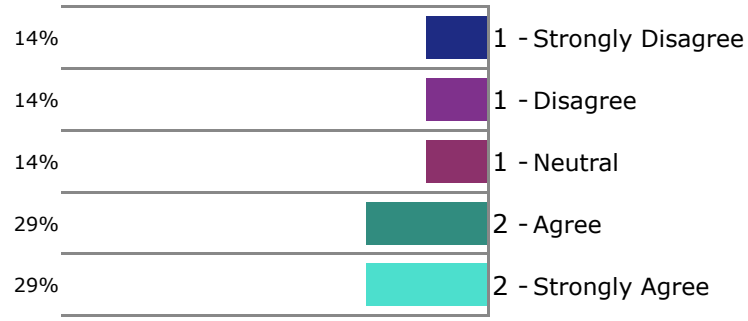
Show/Hide Instructor Comments

Show/Hide Definitions

Select a question language...

OVERALL RESULTS	
Total Number of Completed Evaluations	7
Total Enrollment in Course	8
Response Rate	87.5%

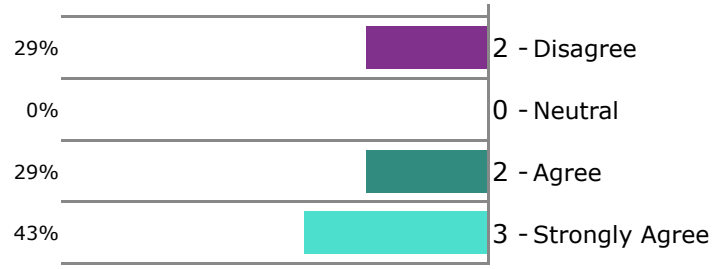
Question 1 - Overall, this is an excellent course.



Valid responses	7
Blank responses	0
Mean (Std Dev)	3.4 (1.5)
Std Dev of the Mean	0.2

Written comments are always treated as confidential and will not be disseminated to the McGill community.

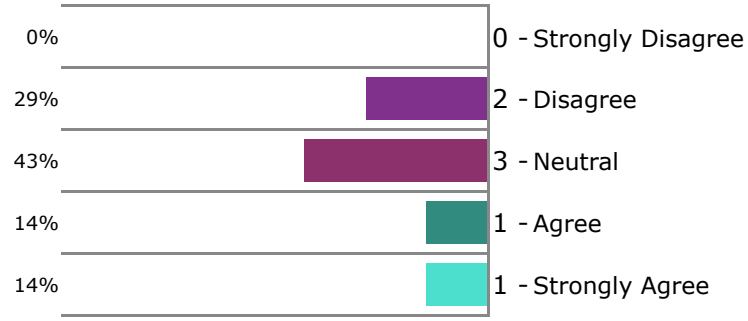
Question 2 - Overall, I learned a great deal from this course.



Valid responses	7
Blank responses	0
Mean (Std Dev)	3.9 (1.3)
Std Dev of the Mean	0.2

Question 3 - Overall, this instructor is an excellent teacher.

Instructor - Omidali Aghababaei Jazi

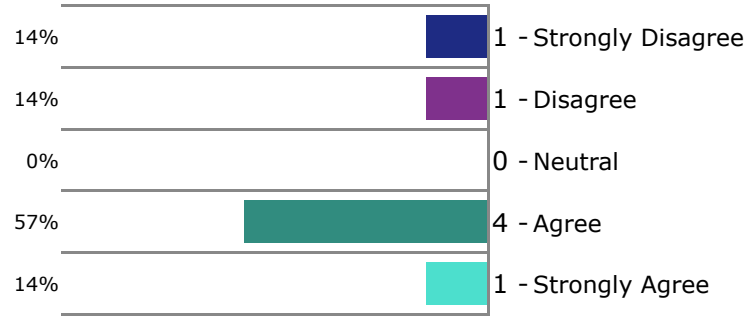


Valid responses	7
Blank responses	0
Mean (Std Dev)	3.1 (1.1)
Std Dev of the Mean	0.1

Written comments are always treated as confidential and will not be disseminated to the McGill community.

Question 4 - Overall, I learned a great deal from this instructor.

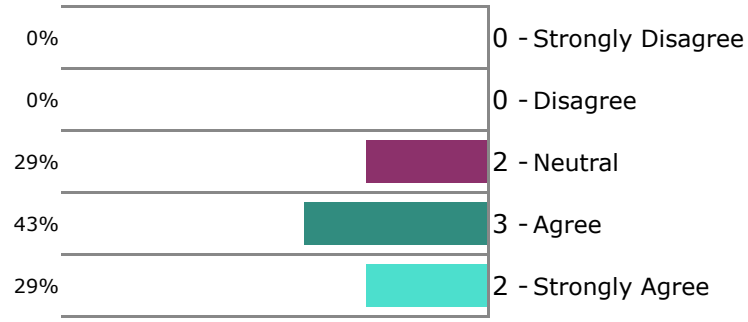
Instructor - Omidali Aghababaei Jazi



Valid responses	7
Blank responses	0
Mean (Std Dev)	3.4 (1.4)
Std Dev of the Mean	0.2

Question 5 - The instructor was well-prepared for class.

Instructor - Omidali Aghababaei Jazi

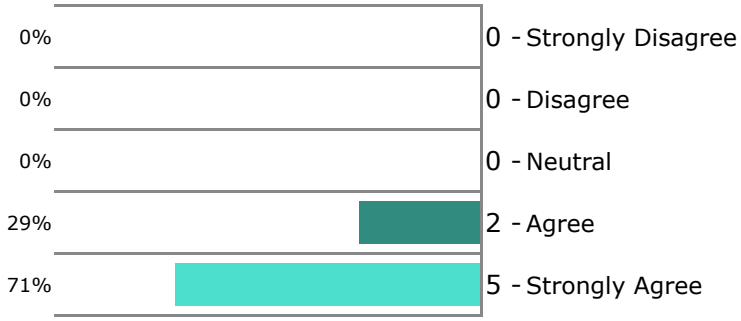


Valid responses	7
Blank responses	0
Mean (Std Dev)	4.0 (0.8)
Std Dev of the Mean	0.1

Written comments are always treated as confidential and will not be disseminated to the McGill community.

Question 6 - The instructor was available to students outside of class.

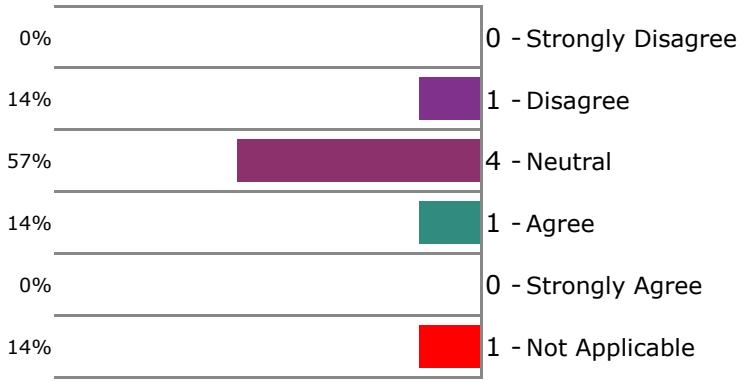
Instructor - Omidali Aghababaei Jazi



Valid responses	7
Blank responses	0
Mean (Std Dev)	4.7 (0.5)
Std Dev of the Mean	0.1

Written comments are always treated as confidential and will not be disseminated to the McGill community.

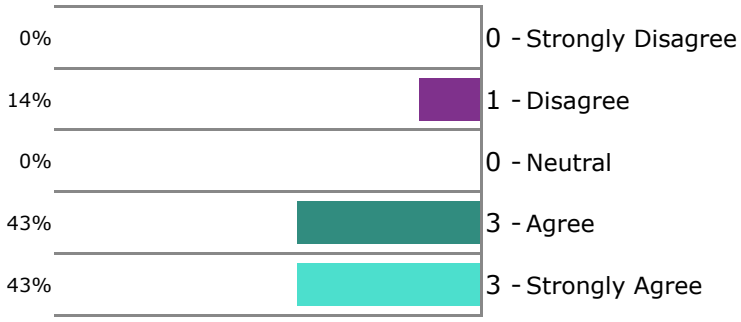
Question 7 - The textbook contributed to learning the subject matter.



Valid responses	7
Blank responses	0
Mean (Std Dev)	3.0 (0.6)
Std Dev of the Mean	0.1

Written comments are always treated as confidential and will not be disseminated to the McGill community.

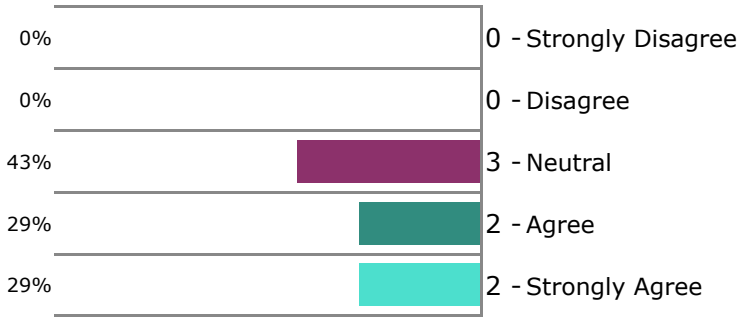
Question 8 - The assignments contributed to learning the subject matter.



Valid responses	7
Blank responses	0
Mean (Std Dev)	4.1 (1.1)
Std Dev of the Mean	0.1

Written comments are always treated as confidential and will not be disseminated to the McGill community.

Question 9 - The lecture room was conducive to effective instruction.



Valid responses	7
Blank responses	0
Mean (Std Dev)	3.9 (0.9)
Std Dev of the Mean	0.1

Question 10 - I would like to nominate the instructor for a teaching award.

Instructor - Omidali Aghababaei Jazi

Mean (Std Dev)	()
Std Dev of the Mean	

Written comments are always treated as confidential and will not be disseminated to the McGill community.

6 questions were skipped because they are not public questions.

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McGill University Course Evaluation

MATH 140 : Calculus 1 - Lecture Section: 1 CRN: 362

Term : Fall 2015
Instructor(s) : Dr Axel W Hundemer

Comments for question 12 : Overall, the performance of this TA was excellent.

TA : Mr Omidali Aghababaei Jazi

1. Submission #1207434: Mr Omidali Aghababaei Jazi was extremely helpful and approachable this semester. His tutorials are clear and consice. Practice sheets and tests are sent to the students through emails each week. This extra practice is very helpful and done completely out of his good will (not all TAs send practice sheets). The tests given in class are very fair to the material learned.
2. Submission #1208930: Extremely helpful, always willing to answer questions and explain on concepts. Complements what we have learned in lectures in the week very well. I would love to have Omid as my TA in the future and would definitely try to fit my schedule into tutorials he is responsible for in the future if he is TA to other courses.
3. Submission #1210052: Omi works hard, but he is difficult to pay attention to. He does not answer questions well, but he is a nice fellow.
4. Submission #1215440: Very well prepared and extremely helpful!!
5. Submission #1216639: Such a nice guy. Always sent out great practice problems for quizzes and had specific examples to work through in class. He also showed great enthusiasm when we as students performed well. I distinctly remember an email where he thanked us and applauded us for our hard work after receiving a good class average on a quiz. Shows that he genuinely appreciates effort and wants his students to do well.
6. Submission #1220372: He sent out practice quiz and it helps a lot because I got an idea of what the quiz will be like and he explain all the content really well especially the
7. Submission #1221176: Really really appreciated the practice quizzes (especially when solutions are provided). Practice problems/questions emailed to us regularly gave a good idea of what content we were supposed to be covering. Super friendly and approachable, seemed very willing to help. Only small thing is the actual teaching during tutorials was sometimes rushed (I would write down what he wrote on the board but needed more time to actually understand the process of the solution which didn't happen until I read over my notes later).
8. Submission #1236183: Great TA. Provided students with excellent pre-tutorial material to increase understanding and to allow for students to come to the tutorial ready to learn and ask questions. The worksheets were a great priming tool and provided practice that correlated well to the material at hand. The practice quizzes were excellent as well.
9. Submission #1240218: Very good. Comes well-prepared to the class with amazing mind-blowing questions that touch each and every concept of the topic. Hands down!!

McGill University Course Evaluation

MATH 140 : Calculus 1 - Lecture Section: 1 CRN: 362

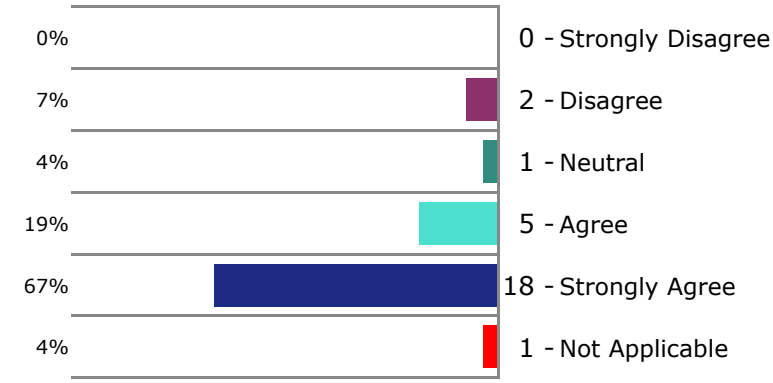
Term : Fall 2015
Instructor(s) : Dr Axel W Hundemer

Teaching Assistant/Other Instructor Results - Mr Omidali Aghababaei Jazi

Question 11 - Please select a Teaching Assistant (TA) to evaluate.
If none, please select "Not Applicable" for the following set of TA questions.

Valid responses	27
Blank responses	0
Comments	0
Mean (Std Dev)	0.0 (0.0)
Std Dev of the Mean	0.0

Question 12 - Overall, the performance of this TA was excellent.



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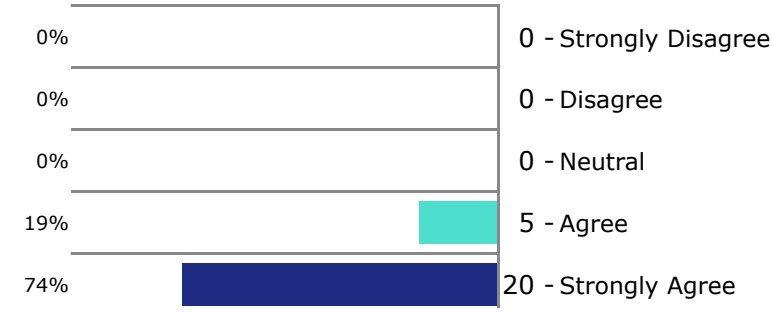
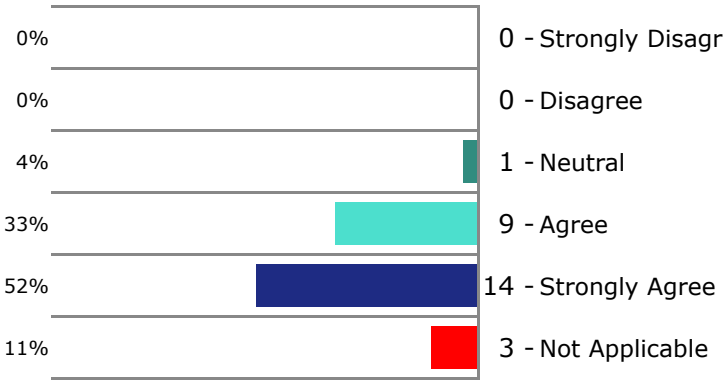
Valid responses	27
Blank responses	0
Comments	9
Mean (Std Dev)	4.5 (0.9)
Std Dev of the Mean	0.2

Question 13 - The TA was well prepared for the tutorials.



Valid responses	27
Blank responses	0
Comments	0
Mean (Std Dev)	4.8 (0.4)
Std Dev of the Mean	0.1

Question 14 - The TA was available to students outside of class.



Valid responses	27
Blank responses	0
Comments	6
Mean (Std Dev)	4.5 (0.6)
Std Dev of the Mean	0.1

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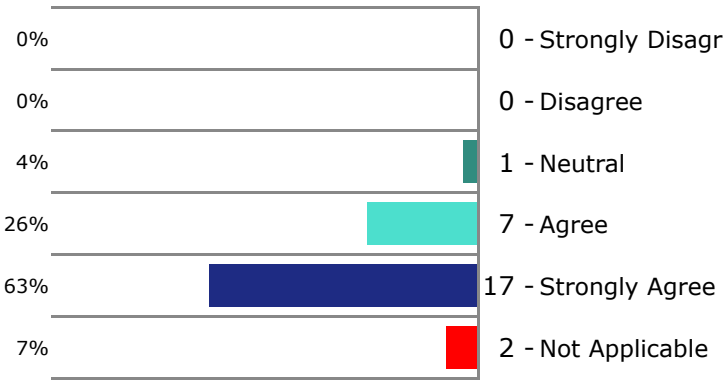
Question 15 - The TA provided satisfactory answers to students' questions.



Valid responses	27
Blank responses	0
Comments	4
Mean (Std Dev)	4.6 (0.6)
Std Dev of the Mean	0.1

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Question 16 - I would like to nominate my TA for the Mathematics and Statistics Teaching Assistant Award.

Valid responses	19
Blank responses	8
Comments	19

View Comments

McGill University Course Evaluation

MATH 141 : Calculus 2 - Lecture Section: 3 CRN: 151

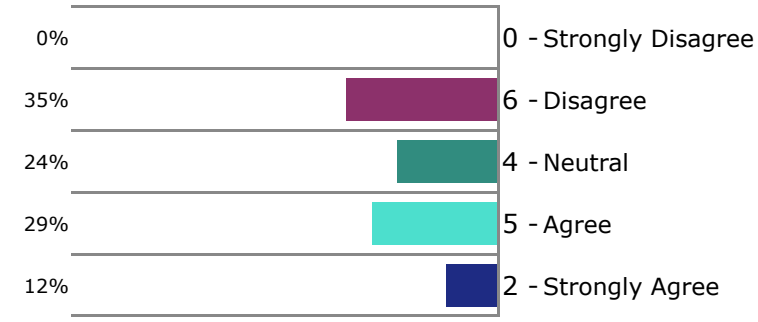
Term : Summer 2015
Instructor(s) : Dr Stephan Ehlen

Teaching Assistant/Other Instructor Results - Mr Omidali Aghababaei Jazi

Please select a Teaching Assistant (TA) to evaluate.
Question 11 - If none, please select "Not Applicable" for the following set of TA questions.

Valid responses	17
Blank responses	0
Comments	0
Mean (Std Dev)	0.0 (0.0)
Std Dev of the Mean	0.0

Question 12 - Overall, the performance of this TA was excellent.



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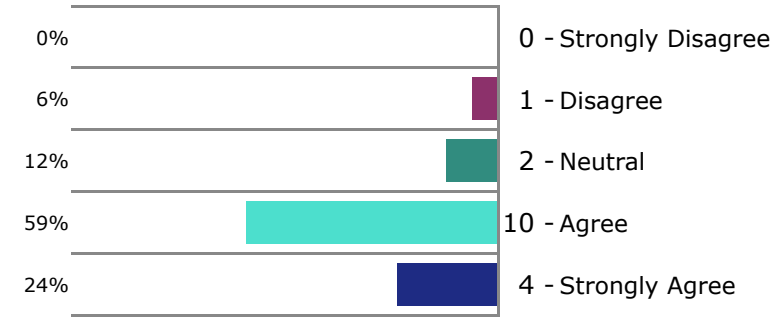
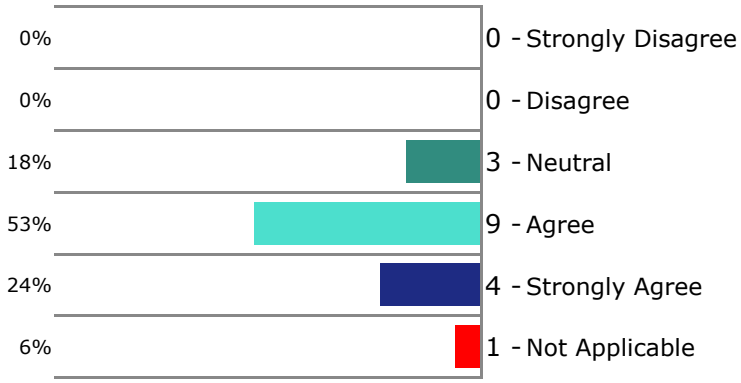
Valid responses	17
Blank responses	0
Comments	5
Mean (Std Dev)	3.2 (1.1)
Std Dev of the Mean	0.2

Question 13 - The TA was well prepared for the tutorials.



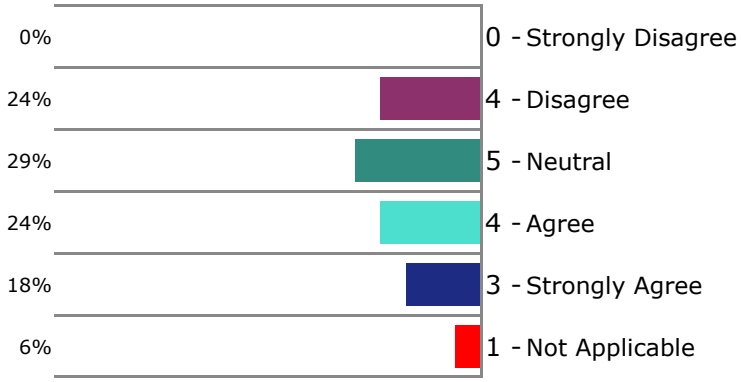
Valid responses	17
Blank responses	0
Comments	0
Mean (Std Dev)	4.0 (0.8)
Std Dev of the Mean	0.2

Question 14 - The TA was available to students outside of class.



Valid responses	17
Blank responses	0
Comments	0
Mean (Std Dev)	4.1 (0.7)
Std Dev of the Mean	0.1

Question 15 - The TA provided satisfactory answers to students' questions.



Valid responses	17
Blank responses	0
Comments	1
Mean (Std Dev)	3.4 (1.1)
Std Dev of the Mean	0.2

View Comments

Question 16 - I would like to nominate my TA for the Mathematics and Statistics Teaching Assistant Award.

Valid responses	0
Blank responses	17
Comments	0

McGill University Course Evaluation

MATH 323 : Probability - Lecture Section: 1 CRN: 445

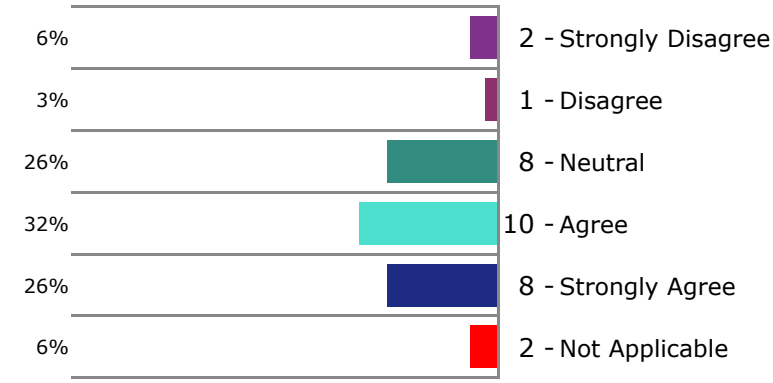
Term : Fall 2016
Instructor(s) : Dr Masoud Asgharian-Dastenaei

Teaching Assistant/Other Instructor Results - Mr Omidali Aghababaei Jazi

Question 11 - Please select a Teaching Assistant (TA) to evaluate. **If none, please select "Not Applicable" for the following set of TA questions.**

Valid responses	32
Blank responses	0
Comments	0
Mean (Std Dev)	0.0 (0.0)
Std Dev of the Mean	0.0

Question 12 - Overall, the performance of this TA was excellent.



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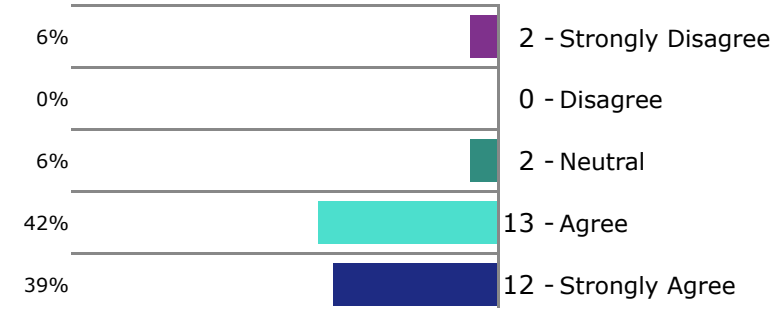
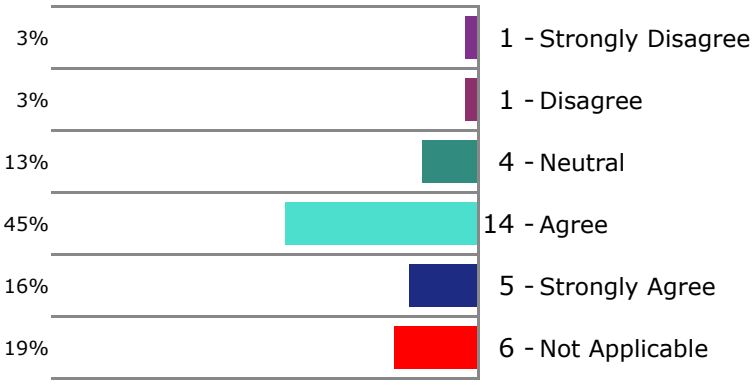
Valid responses	31
Blank responses	1
Comments	6
Mean (Std Dev)	3.7 (1.1)
Std Dev of the Mean	0.2

Question 13 - The TA was well prepared for the tutorials.



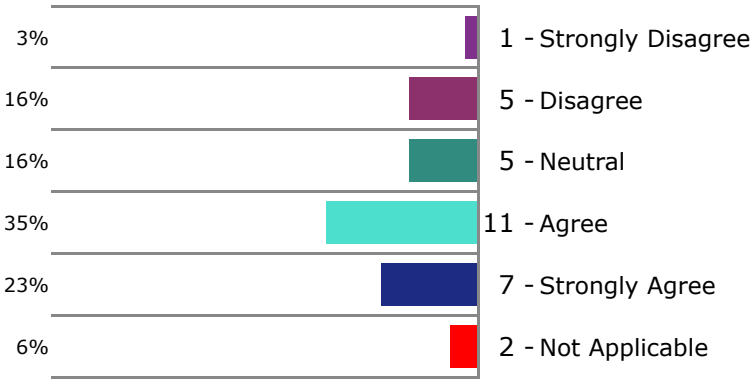
Valid responses	31
Blank responses	1
Comments	0
Mean (Std Dev)	4.1 (1.1)
Std Dev of the Mean	0.2

Question 14 - The TA was available to students outside of class.



Valid responses	31
Blank responses	1
Comments	0
Mean (Std Dev)	3.8 (0.9)
Std Dev of the Mean	0.2

Question 15 - The TA provided satisfactory answers to students' questions.



Valid responses	31
Blank responses	1
Comments	1
Mean (Std Dev)	3.6 (1.1)
Std Dev of the Mean	0.2

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Question 16 - I would like to nominate my TA for the Mathematics and Statistics Teaching Assistant Award.

Valid responses	6
Blank responses	26
Comments	6

View Comments

McGill University Course Evaluation

MATH 324 : Statistics - Lecture Section: 1 CRN: 608

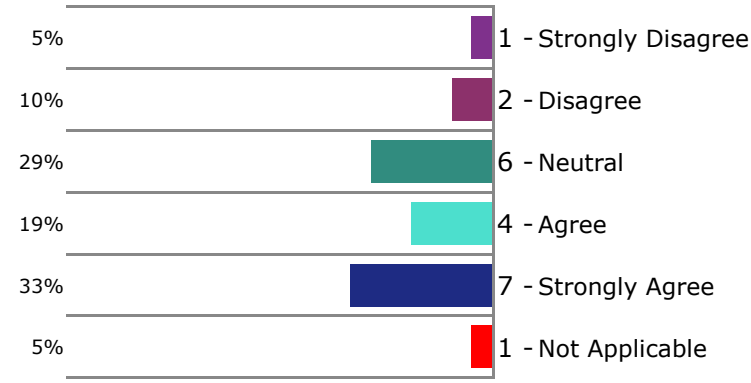
Term : Winter 2018
Instructor(s) : Dr Masoud Asgharian-Dastenaei

Teaching Assistant/Other Instructor Results - Mr Omidali Aghababaei Jazi

Question 11 - Please select a Teaching Assistant (TA) to evaluate. **If none, please select "Not Applicable" for the following set of TA questions.**

Valid responses	21
Blank responses	0
Comments	0
Mean (Std Dev)	0.0 (0.0)
Std Dev of the Mean	0.0

Question 12 - Overall, the performance of this TA was excellent.



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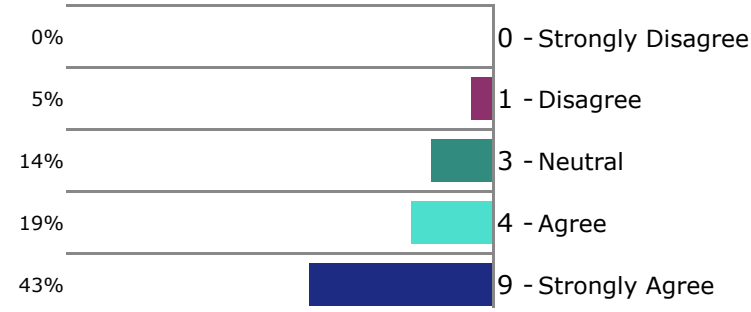
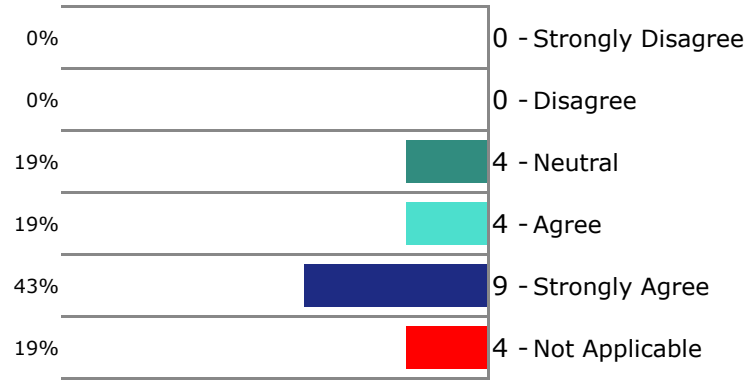
Valid responses	21
Blank responses	0
Comments	4
Mean (Std Dev)	3.7 (1.2)
Std Dev of the Mean	0.2

Question 13 - The TA was well prepared for the tutorials.



Valid responses	21
Blank responses	0
Comments	0
Mean (Std Dev)	4.2 (1.0)
Std Dev of the Mean	0.2

Question 14 - The TA was available to students outside of class.



Valid responses	21
Blank responses	0
Comments	1
Mean (Std Dev)	4.3 (0.8)
Std Dev of the Mean	0.2

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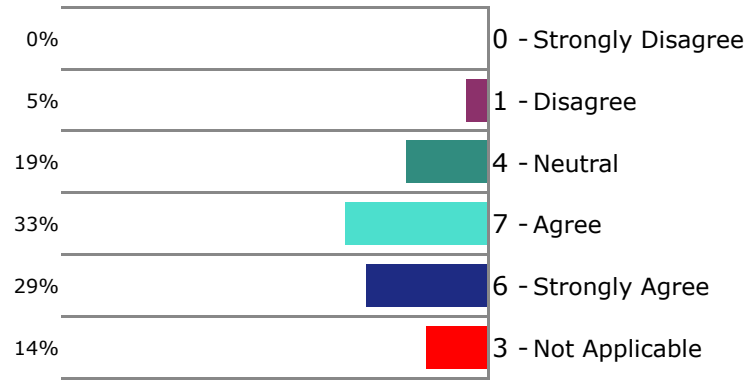
Question 15 - The TA provided satisfactory answers to students' questions.



Valid responses	21
Blank responses	0
Comments	1
Mean (Std Dev)	4.0 (0.9)
Std Dev of the Mean	0.2

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Question 16 - I would like to nominate my TA for the Mathematics and Statistics Teaching Assistant Award.

Valid responses	3
Blank responses	18
Comments	3

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McGill University Course Evaluation

MATH 203 : Principles of Statistics 1 - Lecture Section: 1 CRN: 412

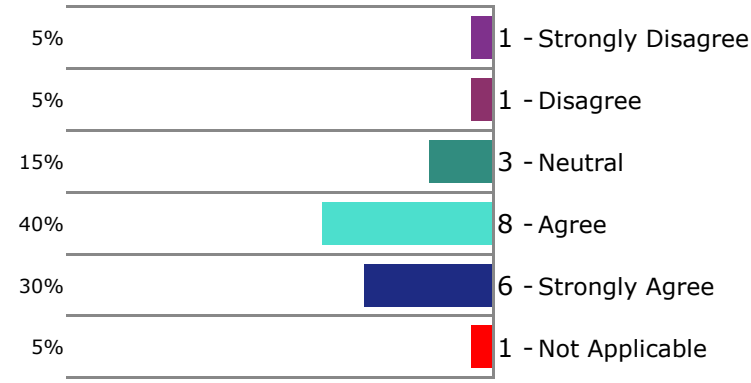
Term : Fall 2017
Instructor(s) : Prof Abbas Khalili Mahmoudabadi

Teaching Assistant/Other Instructor Results - Mr Omidali Aghababaei Jazi

Question 11 - Please select a Teaching Assistant (TA) to evaluate.
If none, please select "Not Applicable" for the following set of TA questions.

Valid responses	20
Blank responses	0
Comments	0
Mean (Std Dev)	0.0 (0.0)
Std Dev of the Mean	0.0

Question 12 - Overall, the performance of this TA was excellent.



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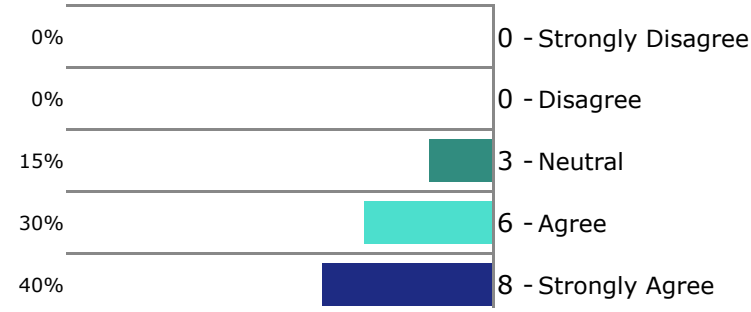
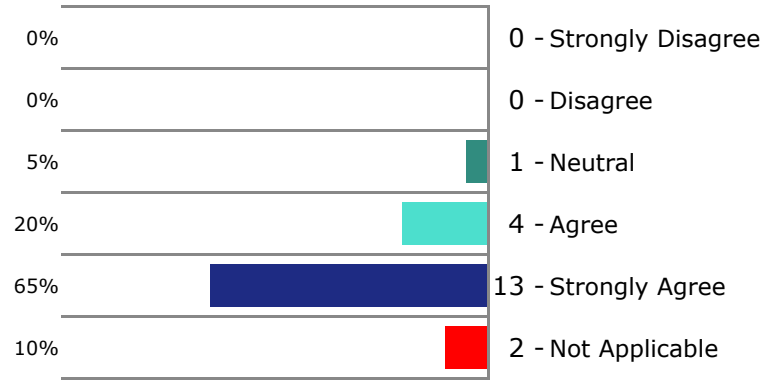
Valid responses	20
Blank responses	0
Comments	5
Mean (Std Dev)	3.9 (1.1)
Std Dev of the Mean	0.2

Question 13 - The TA was well prepared for the tutorials.



Valid responses	20
Blank responses	0
Comments	0
Mean (Std Dev)	4.3 (0.8)
Std Dev of the Mean	0.2

Question 14 - The TA was available to students outside of class.



Valid responses	20
Blank responses	0
Comments	2
Mean (Std Dev)	4.7 (0.6)
Std Dev of the Mean	0.1

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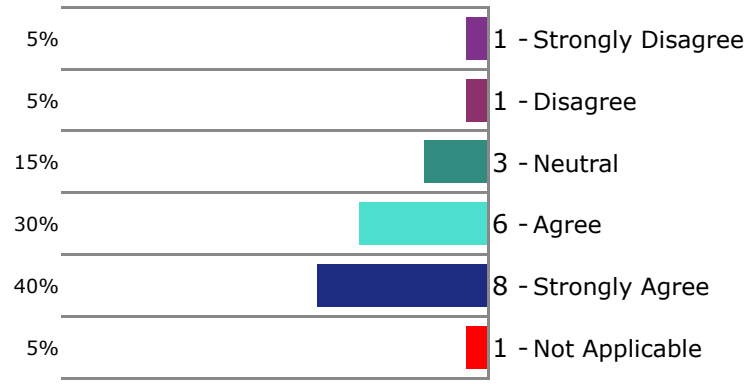
Question 15 - The TA provided satisfactory answers to students' questions.



Valid responses	20
Blank responses	0
Comments	2
Mean (Std Dev)	4.0 (1.2)
Std Dev of the Mean	0.3

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Question 16 - I would like to nominate my TA for the Mathematics and Statistics Teaching Assistant Award.

Valid responses	8
Blank responses	12
Comments	8

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