LUND UNIVERSITY

Centre for Mathematical Sciences
Mathematics, Faculty of Science

Course Analysis for MATM35 Number Theory, Autumn 2020

Lecturer: Oscar Marmon
Number of students: 25 registered students.
Examination results:
22 students completed the mandatory written assignment.
18 students participated in the first exam on 2021-01-11, all of them passed. After completing the oral exam, 13 of these students received the total grade *pass with distinction* and 4 received the grade *pass*.
4 students participated in the second exam on 2021-01-23, 3 of them passed. After completing the oral exam, 2 of these students received the total grade *pass with distinction* and 1 received the grade *pass*.

Course evaluation

It was the first time that the course was given with this course code, so any comparisons will refer to the previous course MATM15.
Summary of students answers: 10 students completed the course evaluation questionnaire, which was open from 2021-01-14 to 2021-02-07. The feedback was in general very positive, for example the statement *"Overall, I am satisfied with the course"* had a mean score of 4.9 out of 5. Both the new teaching and learning activities (see below) were received quite well (4.4 for the Challenging Problems, 3.9 for the Cryptography Exercise). The seminars was slightly less appreciated (3.7 for *"The seminars (problem demonstrations) were valuable for my learning"*). Interestingly, the students' experiences of the move to online teaching were very disparate, positive as well as negative.

Like last year, a majority of the students are taking the course during their Bachelor studies, although it is formally a Master level course.
Teacher's comments: Overall, the course went well. The examination results were very satisfactory. The new teaching and learning activities (see below) were quite successful. Just as for the students, my experience from the seminars was a bit disappointing. Out of the 25 students, 10 demonstrated at least once and 7 at least twice. In the beginning, there was more variation as to which students stepped forward, whereas during the last few weeks one single student did most of the demonstration. The students also very rarely asked each other questions or gave feedback to each other. One should consider how to make the seminars more valuable for the students' learning. In the course evaluation, as well as in a survey during the course, I asked whether demonstration in smaller groups would be a better alternative, but there were differing opinions about that.

The move to online teaching went smoothly from my perspective. The lectures were given using an iPad as a scrolling whiteboard. The demonstration of exercises via Zoom also worked reasonably well. The written exam was conducted via Canvas and Zoom, but the camera was only used for an

initial identification and could then be turned off, to reduce the anxiety caused by video surveillance. Instead, the mandatory oral exam provided an extra layer of security to prevent cheating.
Changes from the previous course realisation: Two new teaching and learning activities were introduced.

- A group exercise in cryptography was carried out in course week 4 (replacing one of the seminars). A written report of this exercise comprised the mandatory written assignment in the course.
- At two occasions during the course, again instead of a regular seminar, the students were given a set of Challenging Problems to work on. Each set consisted of four problems, and in order to obtain 1/2 bonus point for the written exam, one had to hand in a solution to one of these within one week.

Demonstration of problems was no longer mandatory, in part because this would have had to be included as an assessment criterion in the revised curriculum, which it was not. Instead 1 bonus point for the written exam was rewarded for demonstrating at least twice.
Suggestions for the next course realisation: The Cryptography Exercise and the Challenging Problems can be kept for next year. The instructions for the Cryptography Exercise and its report could then be elaborated a bit. The question how best to arrange the seminars remains largely unresolved, and should be considered for future development of the course.
The evaluation has been discussed with the elected course representative.

Course leader, date

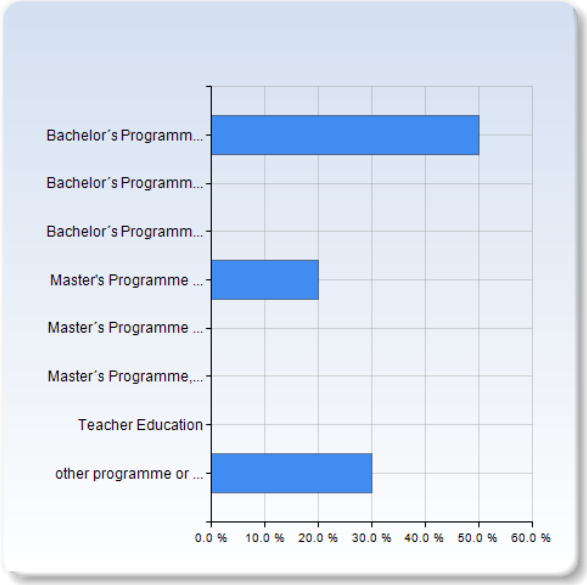
Oscar Marmon, March 20, 2021.

Number theory 2020/21

Answer Count: 10

I have studied this course as part of

I have studied this course as part of	Number of Responses
Bachelor´s Programme in Mathematics	5 (50.0%)
Bachelor´s Programme in Physics, Theoretical Physics, Astronomy	0 (0.0%)
Bachelor´s Programme, other specialization	0 (0.0%)
Master's Programme in Mathematics	2 (20.0%)
Master´s Programme in Mathematical Statistics	0 (0.0%)
Master´s Programme, other specialization	0 (0.0%)
Teacher Education	0 (0.0%)
other programme or as stand alone course	3 (30.0%)
Total	10 (100.0%)

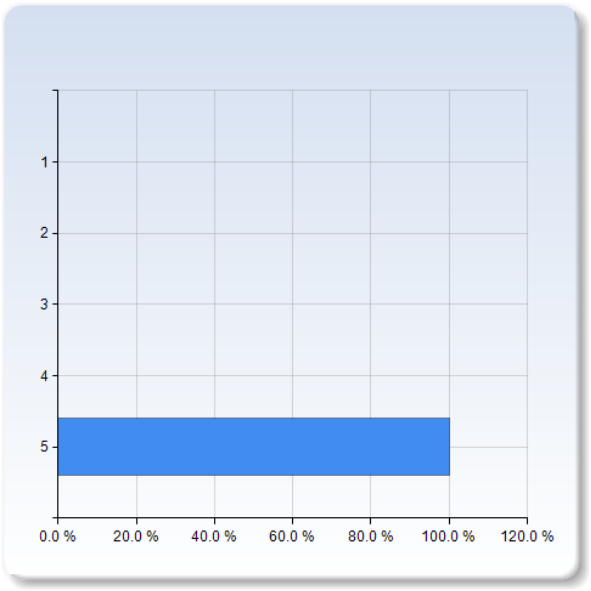


	Mean	Standard Deviation
I have studied this course as part of	3.7	3.2

On the scale 1-5 select the option that best matches your opinion: 1= disagree completely → 3= partly agree → 5= agree completely

2. My prior knowledge has been sufficient to assimilate the contents of this course.

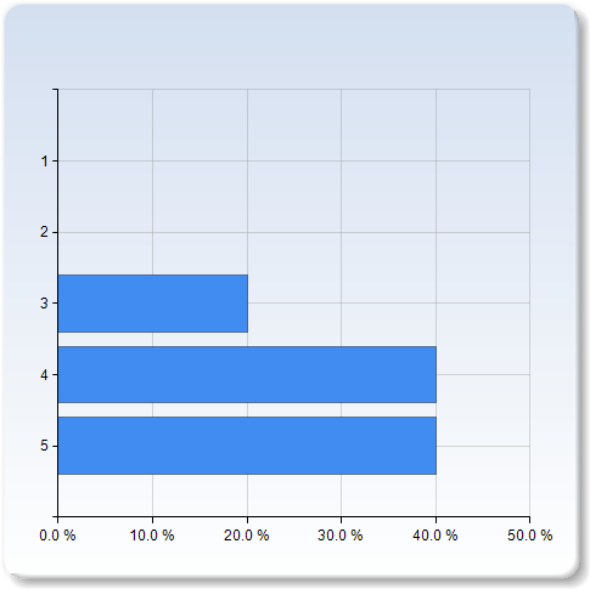
2. My prior knowledge has been sufficient to assimilate the contents of this course.	Number of Responses
1	0 (0.0%)
2	0 (0.0%)
3	0 (0.0%)
4	0 (0.0%)
5	10 (100.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
2. My prior knowledge has been sufficient to assimilate the contents of this course.	5.0	0.0

3. I have participated actively in the course.

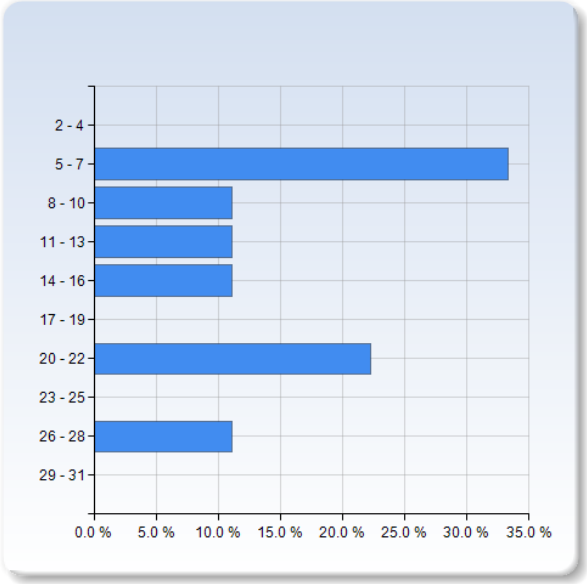
3. I have participated actively in the course.	Number of Responses
1	0 (0.0%)
2	0 (0.0%)
3	2 (20.0%)
4	4 (40.0%)
5	4 (40.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
3. I have participated actively in the course.	4.2	0.8

Average number of hours spent in total on the course per week (including scheduled activities):

Average number of hours spent in total on the course per week (including scheduled activities):	Number of Responses
2 - 4	0 (0.0%)
5 - 7	3 (33.3%)
8 - 10	1 (11.1%)
11 - 13	1 (11.1%)
14 - 16	1 (11.1%)
17 - 19	0 (0.0%)
20 - 22	2 (22.2%)
23 - 25	0 (0.0%)
26 - 28	1 (11.1%)
29 - 31	0 (0.0%)
Total	9 (100.0%)



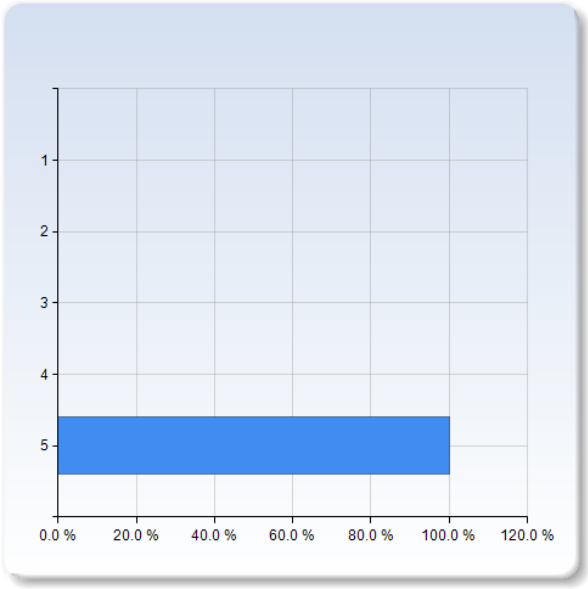
	Mean	Standard Deviation
Average number of hours spent in total on the course per week (including scheduled activities):	13.7	7.8

The course in general

On the scale 1-5 select the option that best matches your opinion: 1= disagree completely → 3= partly agree → 5= agree completely

The way the course was taught and organised suited me.

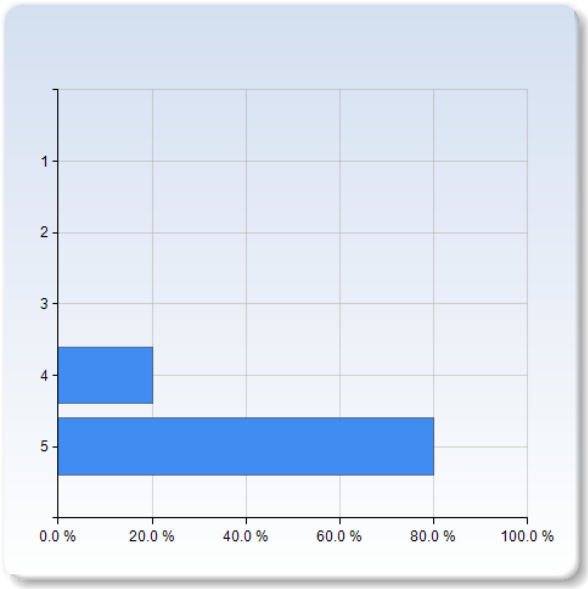
The way the course was taught and organised suited me.	Number of Responses
1	0 (0.0%)
2	0 (0.0%)
3	0 (0.0%)
4	0 (0.0%)
5	10 (100.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
The way the course was taught and organised suited me.	5.0	0.0

The number of teacher lead activities (lectures, seminars etc.) has been satisfactory.

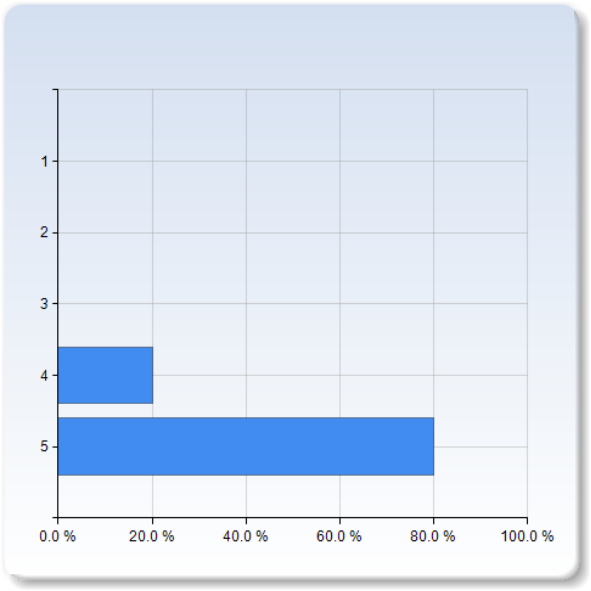
The number of teacher lead activities (lectures, seminars etc.) has been satisfactory.	Number of Responses
1	0 (0.0%)
2	0 (0.0%)
3	0 (0.0%)
4	2 (20.0%)
5	8 (80.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
The number of teacher lead activities (lectures, seminars etc.) has been satisfactory.	4.8	0.4

The lectures were valuable for my learning.

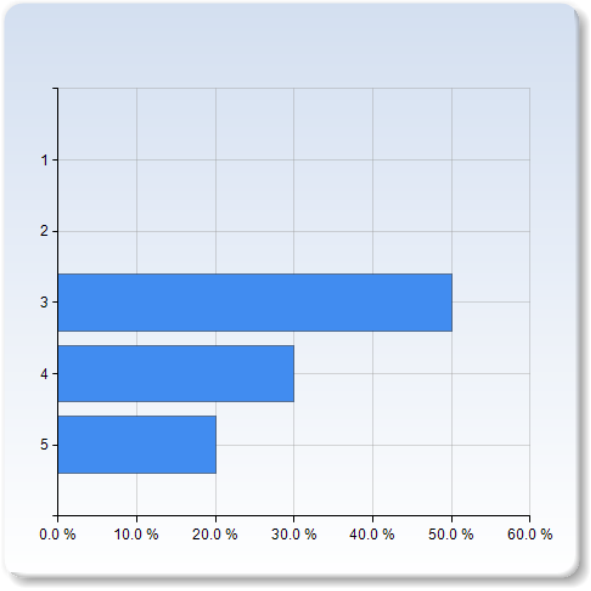
The lectures were valuable for my learning.	Number of Responses
1	0 (0.0%)
2	0 (0.0%)
3	0 (0.0%)
4	2 (20.0%)
5	8 (80.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
The lectures were valuable for my learning.	4.8	0.4

The seminars (problem demonstrations) were valuable for my learning.

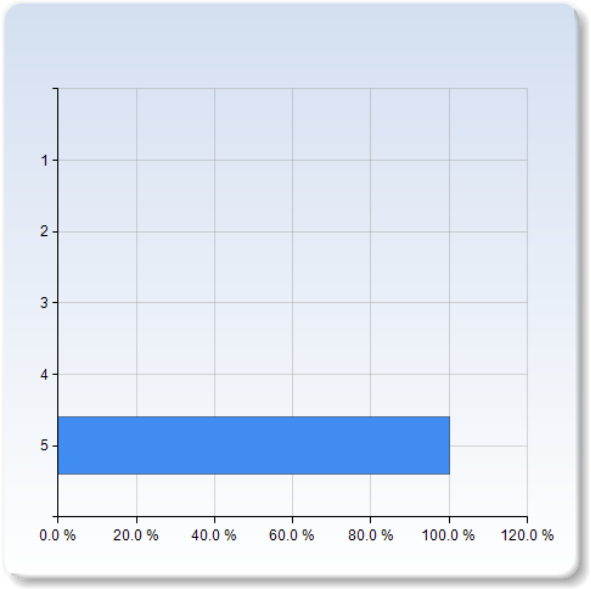
The seminars (problem demonstrations) were valuable for my learning.	Number of Responses
1	0 (0.0%)
2	0 (0.0%)
3	5 (50.0%)
4	3 (30.0%)
5	2 (20.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
The seminars (problem demonstrations) were valuable for my learning.	3.7	0.8

Studying on my own was valuable for my learning.

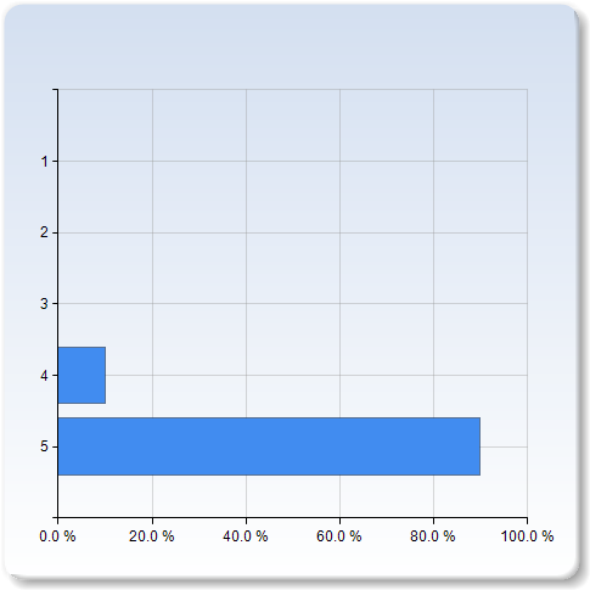
Studying on my own was valuable for my learning.	Number of Responses
1	0 (0.0%)
2	0 (0.0%)
3	0 (0.0%)
4	0 (0.0%)
5	10 (100.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
Studying on my own was valuable for my learning.	5.0	0.0

The course literature/material was a valuable learning resource.

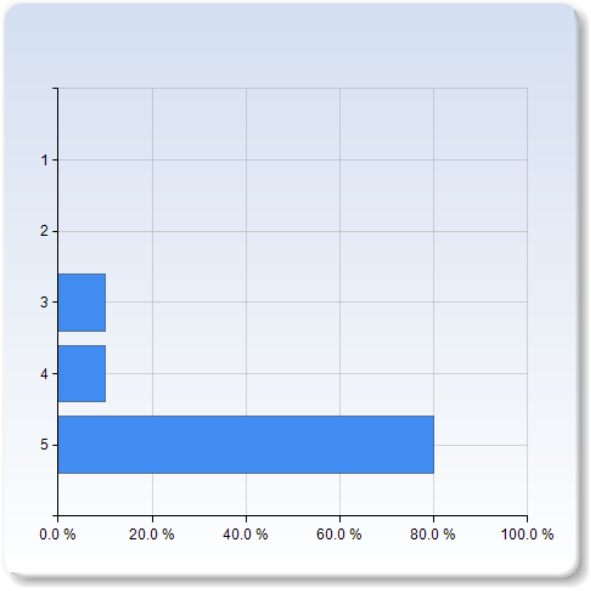
The course literature/material was a valuable learning resource.	Number of Responses
1	0 (0.0%)
2	0 (0.0%)
3	0 (0.0%)
4	1 (10.0%)
5	9 (90.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
The course literature/material was a valuable learning resource.	4.9	0.3

The information I received before the course start was satisfactory.

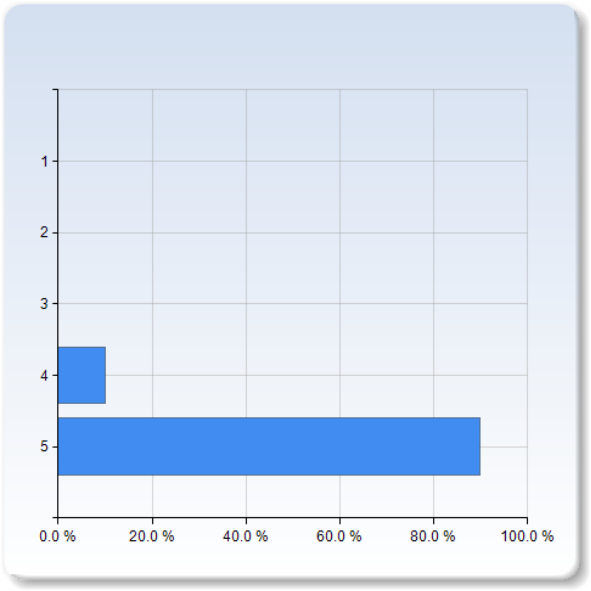
The information I received before the course start was satisfactory.	Number of Responses
1	0 (0.0%)
2	0 (0.0%)
3	1 (10.0%)
4	1 (10.0%)
5	8 (80.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
The information I received before the course start was satisfactory.	4.7	0.7

The communication with the teaching staff during the course was good.

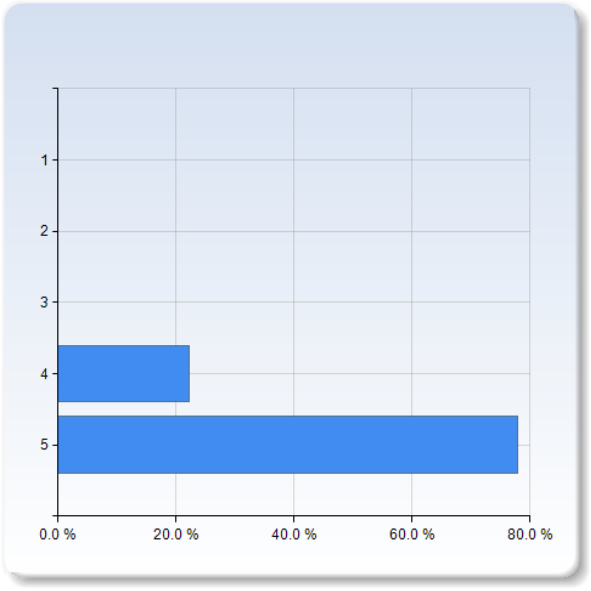
The communication with the teaching staff during the course was good.	Number of Responses
1	0 (0.0%)
2	0 (0.0%)
3	0 (0.0%)
4	1 (10.0%)
5	9 (90.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
The communication with the teaching staff during the course was good.	4.9	0.3

It was clear throughout the course what was expected of me.

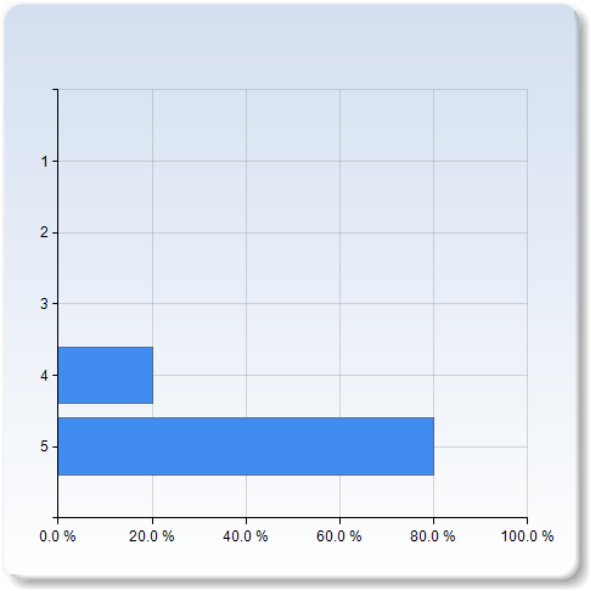
It was clear throughout the course what was expected of me.	Number of Responses
1	0 (0.0%)
2	0 (0.0%)
3	0 (0.0%)
4	2 (22.2%)
5	7 (77.8%)
Total	9 (100.0%)



	Mean	Standard Deviation
It was clear throughout the course what was expected of me.	4.8	0.4

I have received valuable feedback from my teacher/teachers during the course.

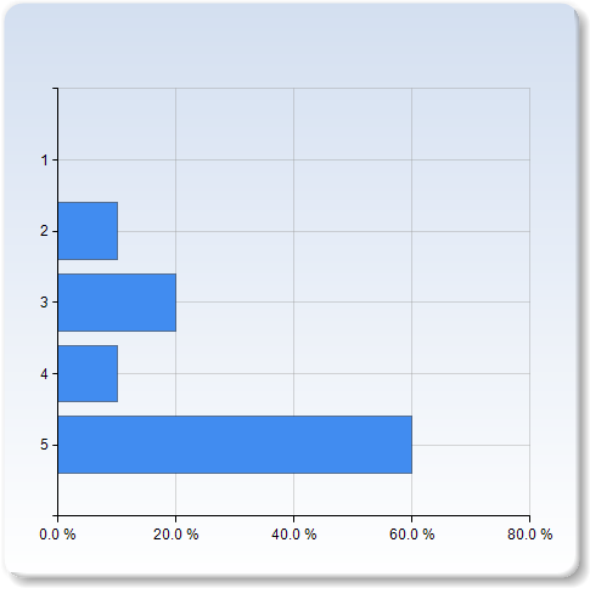
I have received valuable feedback from my teacher /teachers during the course.	Number of Responses
1	0 (0.0%)
2	0 (0.0%)
3	0 (0.0%)
4	2 (20.0%)
5	8 (80.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
I have received valuable feedback from my teacher/teachers during the course.	4.8	0.4

The course had a reasonable workload.

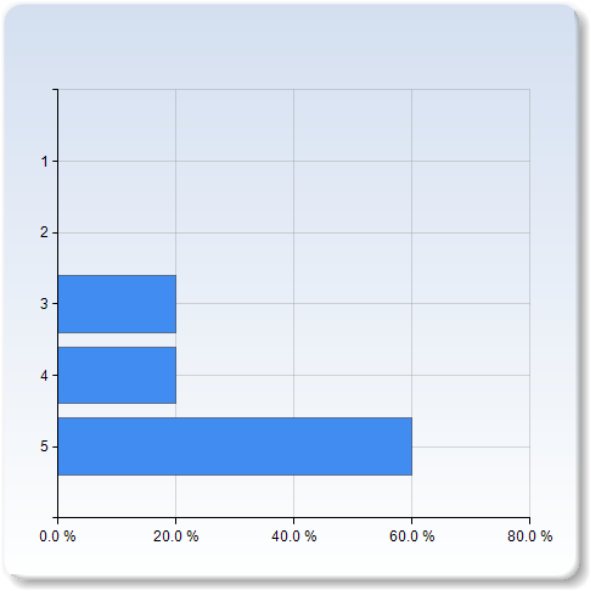
The course had a reasonable workload.	Number of Responses
1	0 (0.0%)
2	1 (10.0%)
3	2 (20.0%)
4	1 (10.0%)
5	6 (60.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
The course had a reasonable workload.	4.2	1.1

The workload was evenly distributed throughout the course.

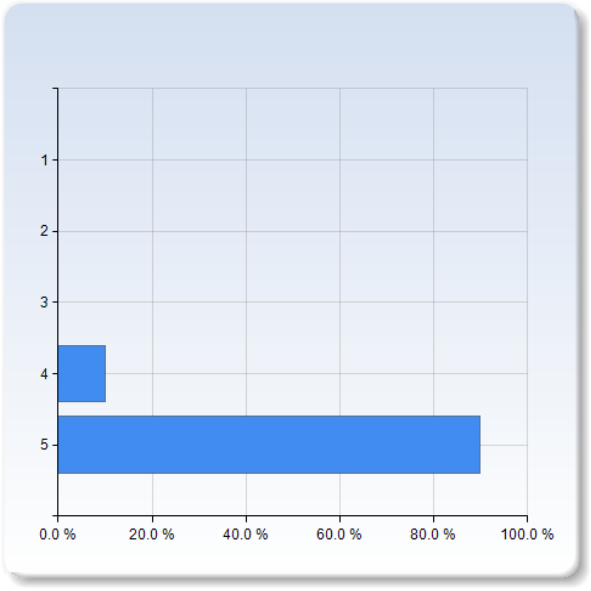
The workload was evenly distributed throughout the course.	Number of Responses
1	0 (0.0%)
2	0 (0.0%)
3	2 (20.0%)
4	2 (20.0%)
5	6 (60.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
The workload was evenly distributed throughout the course.	4.4	0.8

The examination matched the contents and level of the course.

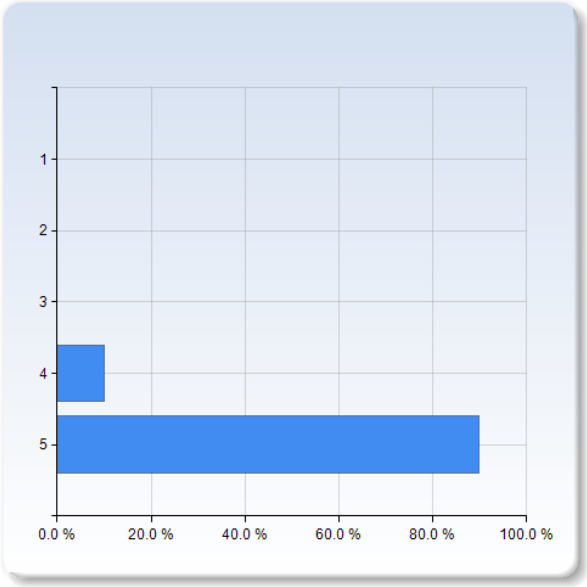
The examination matched the contents and level of the course.	Number of Responses
1	0 (0.0%)
2	0 (0.0%)
3	0 (0.0%)
4	1 (10.0%)
5	9 (90.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
The examination matched the contents and level of the course.	4.9	0.3

Overall, I am satisfied with the course.

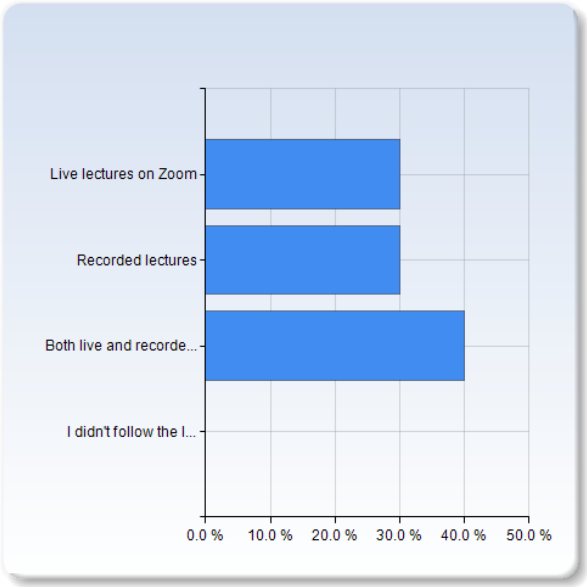
Overall, I am satisfied with the course.	Number of Responses
1	0 (0.0%)
2	0 (0.0%)
3	0 (0.0%)
4	1 (10.0%)
5	9 (90.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
Overall, I am satisfied with the course.	4.9	0.3

After the lectures on campus were cancelled, how did you mainly follow the lectures?

After the lectures on campus were cancelled, how did you mainly follow the lectures?	Number of Responses
Live lectures on Zoom	3 (30.0%)
Recorded lectures	3 (30.0%)
Both live and recorded lectures	4 (40.0%)
I didn't follow the lectures	0 (0.0%)
Total	10 (100.0%)



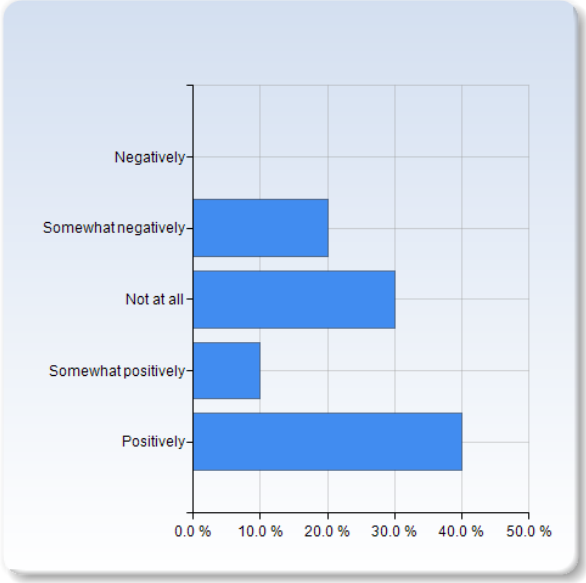
	Mean	Standard Deviation
After the lectures on campus were cancelled, how did you mainly follow the lectures?	2.1	0.9

Online teaching

How has the move to online teaching affected...

... your own achievement in the course

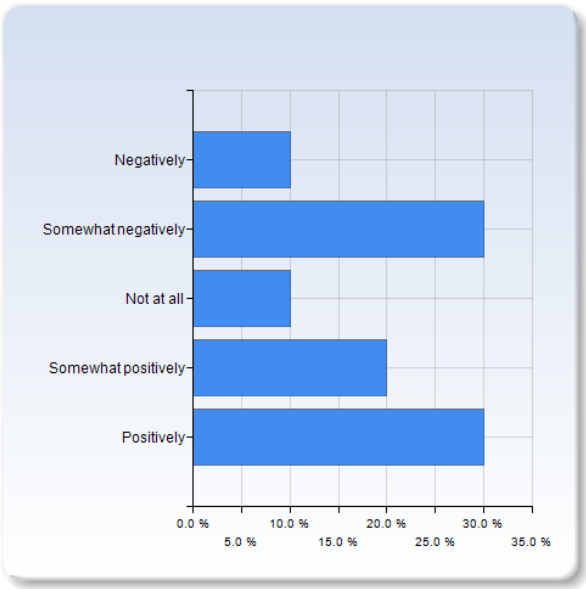
... your own achievement in the course	Number of Responses
Negatively	0 (0.0%)
Somewhat negatively	2 (20.0%)
Not at all	3 (30.0%)
Somewhat positively	1 (10.0%)
Positively	4 (40.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
... your own achievement in the course	3.7	1.3

... your overall experience of the course

... your overall experience of the course	Number of Responses
Negatively	1 (10.0%)
Somewhat negatively	3 (30.0%)
Not at all	1 (10.0%)
Somewhat positively	2 (20.0%)
Positively	3 (30.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
... your overall experience of the course	3.3	1.5

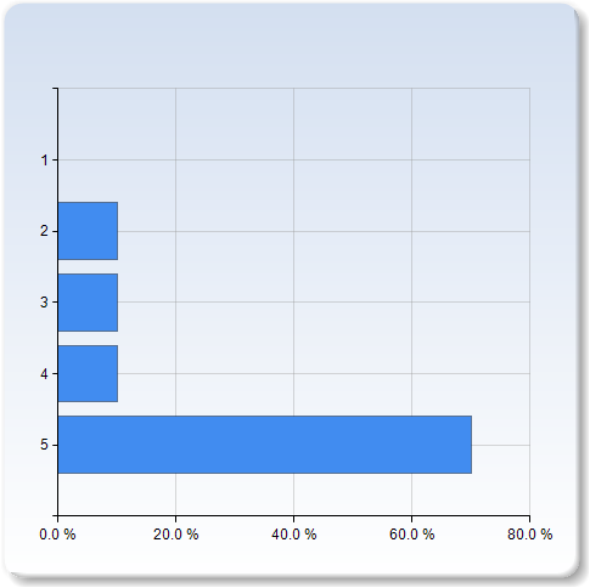
Comment
Since the Course was very organised (i.e clear what topics would be covered in the following weeks, precise deadlines for assignments, and very structured lectures). As I didnt know any fellow students before the course started, I studied almost exclusively by myself, which was hard at times. But due to the course being well organised, I could just rewatch the lectures, reread my notes etc, so it was highly appreciated!
I quite enjoy going to the lecture hall as it lets me discuss ideas with others taking the course in a way that just simply doesn't happen on Zoom; as such the cancellation of physical lectures did affect my enjoyment of the course negatively.
I think that the online lectures were well-structured and I liked that they were recorded and that the lecture notes were put online. I usually prefer physical lectures but I didn't feel that my studies were negatively affected.
In terms of learning the material and achieving a good grade, there are pros and cons of online teaching that pretty much cancel out, but the experience is worse. I much prefer live contact with the teacher and other students and walking around in the maths building. And I don't like being dependent on both the teacher's and my internet connection being stable enough.
Lectures on location are absolutely preferable. Having access to recorded lectures has been very helpful, especially when catching up (after focusing on a different course for a week or so) and doing revision for the exam.
Recorded live lessons were perfect!

Specific activities

On the scale 1-5 select the option that best matches your opinion: 1= disagree completely → 3= partly agree → 5= agree completely

The Challenging Problems were valuable for my learning

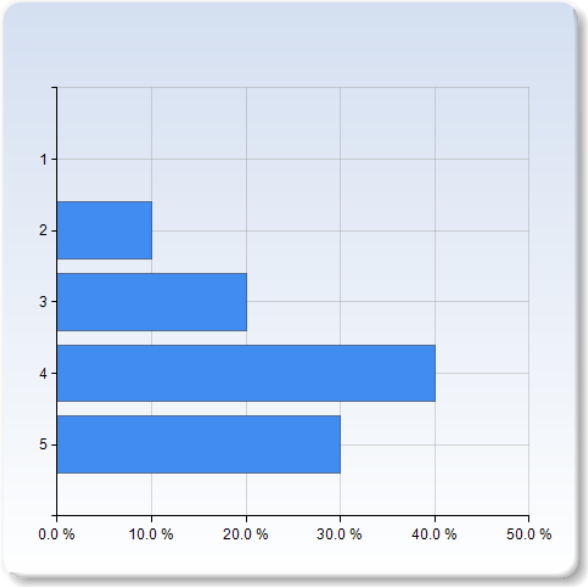
The Challenging Problems were valuable for my learning	Number of Responses
1	0 (0.0%)
2	1 (10.0%)
3	1 (10.0%)
4	1 (10.0%)
5	7 (70.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
The Challenging Problems were valuable for my learning	4.4	1.1

The Cryptography Exercise was valuable for my learning

The Cryptography Exercise was valuable for my learning	Number of Responses
1	0 (0.0%)
2	1 (10.0%)
3	2 (20.0%)
4	4 (40.0%)
5	3 (30.0%)
Total	10 (100.0%)

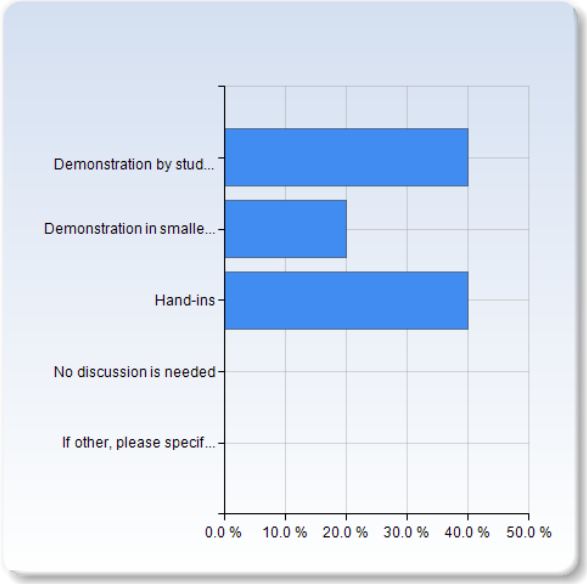


	Mean	Standard Deviation
The Cryptography Exercise was valuable for my learning	3.9	1.0

Comments on the Challenging Problems or the Cryptography Exercise
Yes! The challenging problems were very fun to do and of different type than the problems from the book, I.e felt like they required more creativity and not just applying theorems.
The cryptography exercise was interesting!
In most of the courses I've taken here the lecturer only gives out trivial problems so the challenging problems were a nice change of pace. More lecturers should do something similar, I think.
Both were great fun and a nice challenge and his feedback was very helpful. Would recommend other courses to see if they can fit in something similar. I would have liked to see solutions for the second set of challenging problems though, so I can compare them with my own.
Having not just a hand-in with regular exercises but a set of extra challenges felt like a good way to motivate some extra effort simply by being interesting. The cryptography exercise was likewise a good idea though the report instructions could have used some more detail (length, which questions are crucial to answer and which are optional but valuable). Comparing with e.g. a lab report in physics this was rather fuzzy, so to say.

What format for discussing the exercises do you think would be most valuable for your learning?

What format for discussing the exercises do you think would be most valuable for your learning?	Number of Responses
Demonstration by students in class (like we did)	4 (40.0%)
Demonstration in smaller groups	2 (20.0%)
Hand-ins	4 (40.0%)
No discussion is needed	0 (0.0%)
If other, please specify	0 (0.0%)
Total	10 (100.0%)

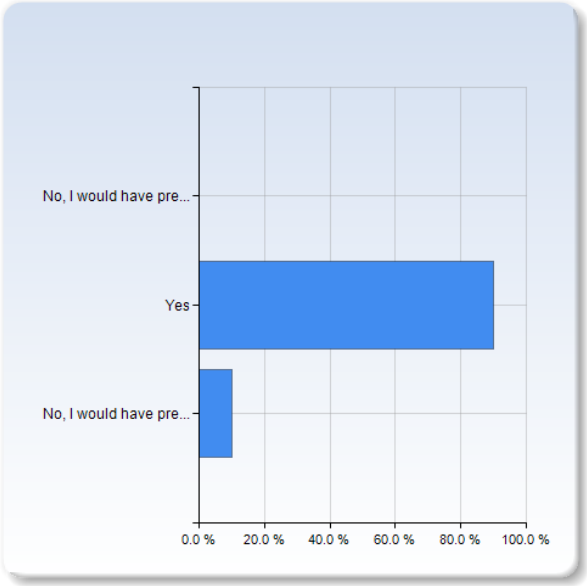


	Mean	Standard Deviation
What format for discussing the exercises do you think would be most valuable for your learning?	2.0	0.9

Comment
I did not find demonstration by students to be that valueable. When I knew how to solve a problem it was really no point to listen to an often very similar solution. When I didnt know the solution I would rather see Oscar explain it, especially during the distance teaching. What I did appreciate was the possibility to get feedback on my own solutions! Hand-ins would be nice for tough problems.
I love sharing my solutions with other math students. It was a shame that the participation was so low though, as I would have very much liked to see other approaches than the one I used or the one the book hinted at.
Demonstration by students, provided that enough people participate. Hand-ins could also be useful, since I am then "forced" to solve them.
I think both hand-ins and demonstrations are very valuable, but for something as frequent as the exercises from the book demonstrations probably work better. This does require a teacher comfortable with leading such demonstrations and this is where Oscar seems to be a bit out of his comfort zone. I am confident he will pick this up in time though, as there are great role models at the department. Tien, Kjell, or Sigmundur are just a few examples of colleagues who can lead demonstrations very well. Online demonstrations are a bit tricky though and are in general harder for students. Here, the whiteboard function of Zoom comes closest to a classroom experience and is in my opinion the least worst option, especially after students have become more used to it. Seeing as most students are not very familiar with each other (due to how many there are and how different each student's choice of courses is) it is and has been my experience and observation that without proper leadership group discussions are very dependent on the group and any spontaneous leadership structure that may arise, so they almost never work. They are neither fun nor valuable for learning then.

Did you feel comfortable with the format for the written exam

Did you feel comfortable with the format for the written exam	Number of Responses
No, I would have preferred a written exam with constant video surveillance to prevent cheating	0 (0.0%)
Yes	9 (90.0%)
No, I would have preferred a take-home exam with aids allowed but possibly more complicated problems	1 (10.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
Did you feel comfortable with the format for the written exam	2.1	0.3

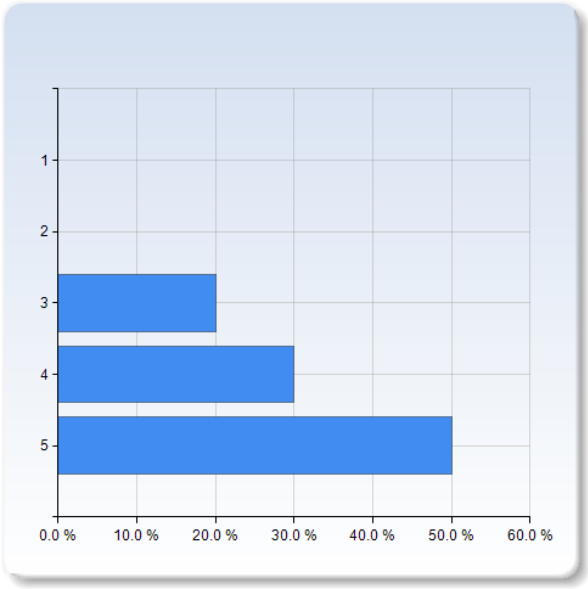
Comment
I would have preffered a takehome exam with harder problems.
It felt a bit distracting with having zoom on and the quiz setup - i.e having to upload 6 separate files. I would much prefer to have gotten rid of these distractions.
Constant video surveillance sounds awful and I'm very glad I was not subjected to this.
The format of the exam was fine, although an exam with aids allowed and possibly more complicated problems would have been fine as well, but then you would also need to give more time so you can get a more fair assessment of our problem solving and information gathering skills. An advantage of this latter option is that it is a bit more like the reality of a working mathematician.
I only disliked having to split up the exam pdf and post each problem separately. I would have much preferred uploading 1 pdf like in other courses.
Having had exams using each of the above options, number two or three is definitely preferable. Constant video feed feels rather intrusive when it means being surveilled in my own home.

On the development of generic skills

On a scale 1-5 select the option that best matches your opinion: 1= disagree completely → 3= partly agree → 5= agree completely

The course has increased my ability to read a mathematical text.

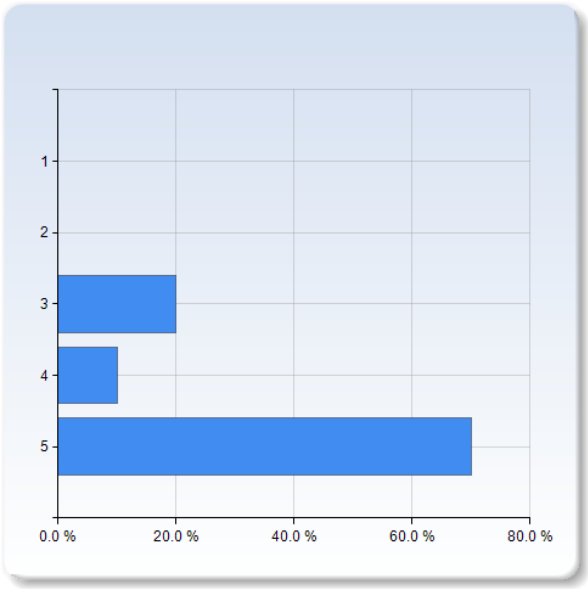
The course has increased my ability to read a mathematical text.	Number of Responses
1	0 (0.0%)
2	0 (0.0%)
3	2 (20.0%)
4	3 (30.0%)
5	5 (50.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
The course has increased my ability to read a mathematical text.	4.3	0.8

The course has increased my ability to communicate the subject in writing.

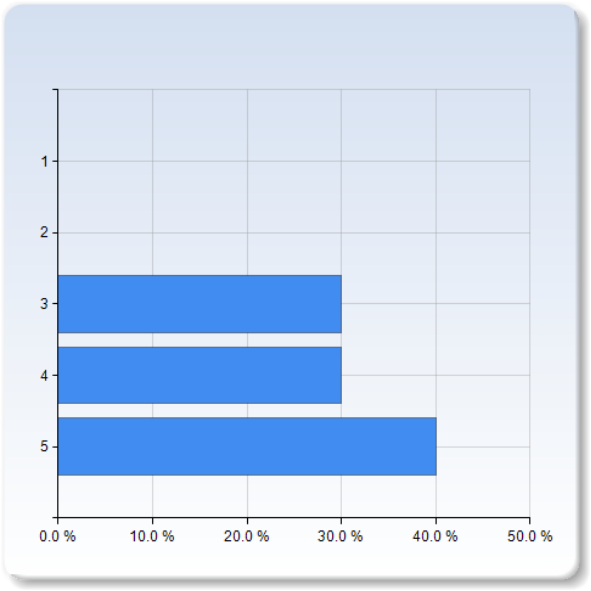
The course has increased my ability to communicate the subject in writing.	Number of Responses
1	0 (0.0%)
2	0 (0.0%)
3	2 (20.0%)
4	1 (10.0%)
5	7 (70.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
The course has increased my ability to communicate the subject in writing.	4.5	0.8

The course has increased my ability to communicate the subject orally.

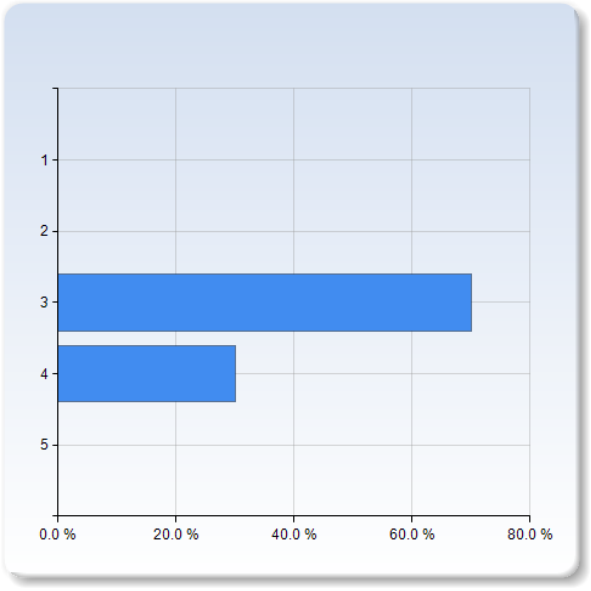
The course has increased my ability to communicate the subject orally.	Number of Responses
1	0 (0.0%)
2	0 (0.0%)
3	3 (30.0%)
4	3 (30.0%)
5	4 (40.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
The course has increased my ability to communicate the subject orally.	4.1	0.9

The course has increased my ability to cooperate.

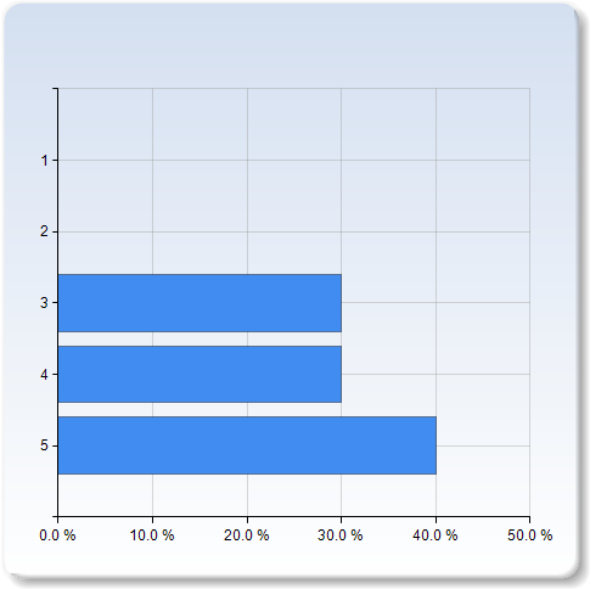
The course has increased my ability to cooperate.	Number of Responses
1	0 (0.0%)
2	0 (0.0%)
3	7 (70.0%)
4	3 (30.0%)
5	0 (0.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
The course has increased my ability to cooperate.	3.3	0.5

The course has increased my ability to search and process information.

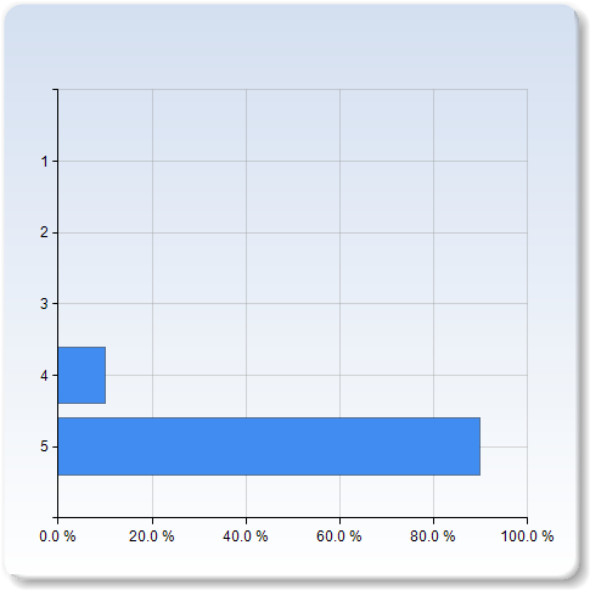
The course has increased my ability to search and process information.	Number of Responses
1	0 (0.0%)
2	0 (0.0%)
3	3 (30.0%)
4	3 (30.0%)
5	4 (40.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
The course has increased my ability to search and process information.	4.1	0.9

The course has increased my ability to analyze and solve problems.

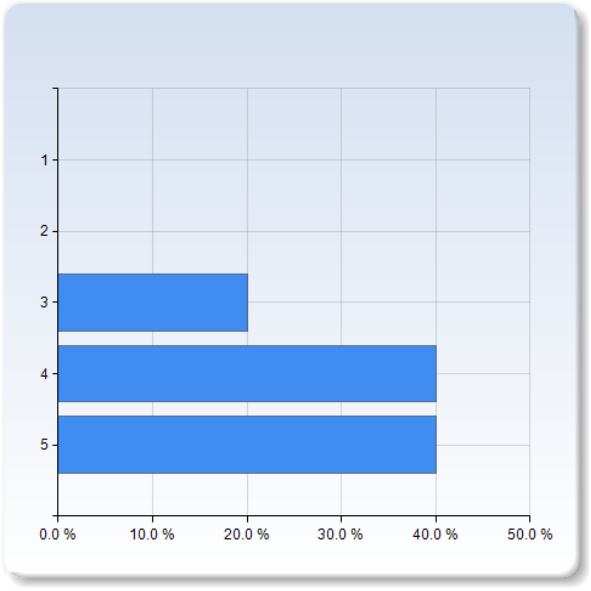
The course has increased my ability to analyze and solve problems.	Number of Responses
1	0 (0.0%)
2	0 (0.0%)
3	0 (0.0%)
4	1 (10.0%)
5	9 (90.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
The course has increased my ability to analyze and solve problems.	4.9	0.3

As a result of this course, I feel confident about tackling unfamiliar problems.

As a result of this course, I feel confident about tackling unfamiliar problems.	Number of Responses
1	0 (0.0%)
2	0 (0.0%)
3	2 (20.0%)
4	4 (40.0%)
5	4 (40.0%)
Total	10 (100.0%)



	Mean	Standard Deviation
As a result of this course, I feel confident about tackling unfamiliar problems.	4.2	0.8

What did you appreciate most with the course?

What did you appreciate most with the course?
Again, that it was so structured. Clear what was expected from the students. Really good and structured lectures which made self study alot easier compared to other courses. In addition to this: The extra material and connections to algebra in the lectures were very nice to have! It's probably the best course I've taken so far :)
The challenging problems, quadratic reciprocity and representing integers as sums of squares.
I liked that it was well-organized and one could easily see what was expected via the Canvas page. I liked the lectures as well.
Oscar is very interested in what works for us and in becoming a better teacher, he also explains the proofs and other material very well. The book is good.
The course literature (Burton) really is very good, both in mathematical prose and a wealth of historical footnotes. Despite this, it is fairly simple and a few times the lecturer gave more advanced (i.e. more abstract) proofs and reasonings, which was much appreciated.
The knowledge I get from it
Interesting topics, nice lecturer
Best course book i ever read in any subject. Interesting course for those who like mathematics. The teacher was good and knew what he was talking about.
the interesting content

What do you think should be improved?

What do you think should be improved?
(This is my second master course, so that should maybe be taken into consideration). The amount of material in the course was not alot. It was very difficult at times, but also overlapped with previous courses (Discrete Mathematics, Foundations of Algebra) at times. In my opinion it would have been nice to cover more material by for example having 75% lectures, 25% seminars.
I think it's a great introduction to number theory as is. I do hope that the next batch of students that will have the pleasure of taking it can do so at campus.
The seminars were a bit short sometimes.
See other comments.
Another lecture (or frequent comments throughout the course) covering the basics of some more advanced problems, solved or unsolved. Basically an appetiser for further studies in this particular subject and a possible direction for a master's thesis.
I am satisfied with what I learnt overall
Generally (not only this course), I think written exams are better than oral ones
Cant think of anything.
I think the lectures shouldalways be recorded, its very helpful to be able to paus the lecture to take notes or look up something in the book for example

Have you during this course experienced course literature, staff or teaching methods to be discriminatory in any way (gender, ethnicity, etc.)?

Have you during this course experienced course literature, staff or teaching methods to be discriminatory in any way (gender, ethnicity, etc.)?
No
No
No.
No
No.
Not at all
No.