View By: Groups Groups: 1219-MATH.135.019.1.LEC Apply

MQ2 (Wed Sep 15) Class Statistics

Number of submitted grades: 59 / 61

Minimum: 35 %

Maximum: 100 %

Average: 94.15 %

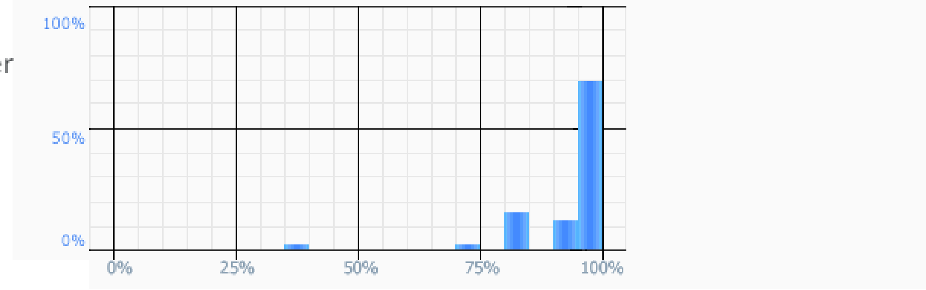
Mode: 100 %

Median: 100 %

Standard Deviation: 11.21 %

Grade Distribution

Number of Users (%)



View By: Groups Groups: 1219-MATH.135.016.1.LEC Apply

MQ2 (Wed Sep 15) Class Statistics

Number of submitted grades: 50 / 53

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Maximum: 100 %

Average: 91.4 %

Mode: 100 %

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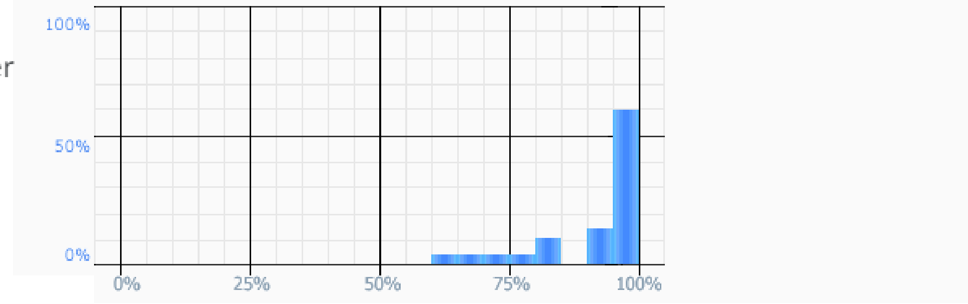
Standard Deviation: 12.41 %

Grade Distribution

Number of Users (%)



- Friday 17 September:
  - Mobius Quiz 3
- Sunday 19 September:
  - Complete reading up to the end of Section 0.2 (Polynomials)
  - There's a question on next MQ based on the polynomials reading!
- Monday 20 September:
  - Mobius Quiz 4
- **Wednesday 22 September:**
  - **Complete Written Assignment 2: WA2**
- Wednesday 22 September:
  - Mobius Quiz 5
- Thursday 23 September:
  - WA02 solutions will be posted, hopefully before 12pm: Check the solutions in detail!
- Friday 24 September before class:
  - Complete reading Chapter 2 of the course notes
- Friday 24 September before class:
  - Mobius Quiz 6

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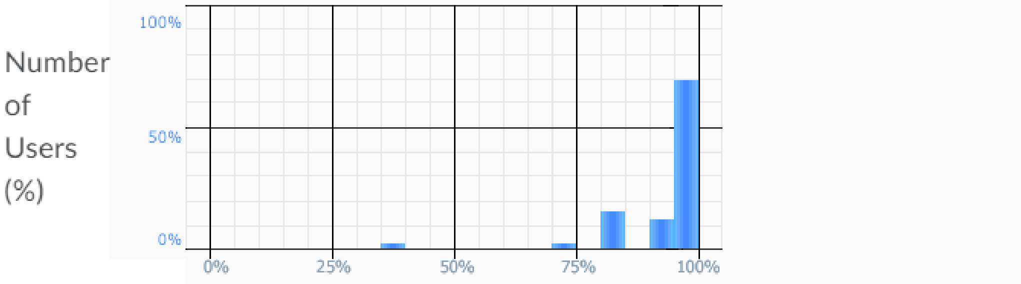

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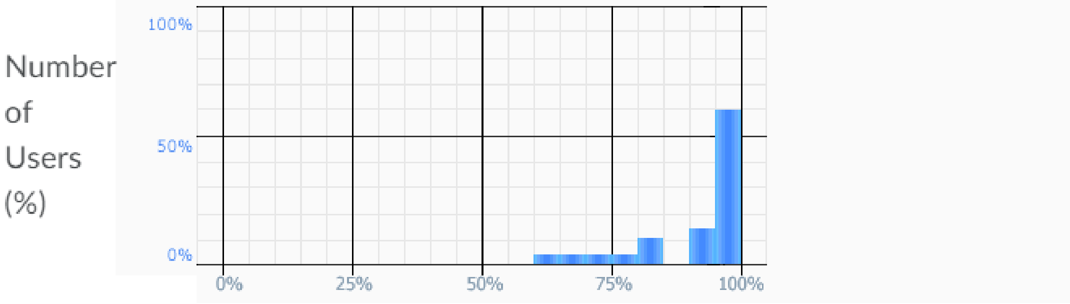

Number of submitted grades: 1,206 / 1,269

Minimum: 0 %

Maximum: 100 %

Average: 92.31 %

Mode: 100 %

Median: 100 %

MATH 135: Lecture 5

Dr. Nike Dattani

17 September 2021

A	B	$A \wedge B$	$A \vee B$	$\neg A$	$\neg B$	$(\neg A) \wedge (\neg B)$	$(\neg A) \vee (\neg B)$
T	T	T	T	F	F	F	F
T	F	F	T	F	T	F	T
F	T	F	T	T	F	F	T
F	F	F	F	T	T	T	T

$$\neg(A \wedge B) \equiv (\neg A) \vee (\neg B)$$

$$\neg(A \vee B) \equiv (\neg A) \wedge (\neg B)$$

De Morgan’s laws!

Assignment 2!

- Do not skip steps!
  - How many columns will you have in the truth table for proving this:

$$(P \Rightarrow Q) \ \wedge \ (\neg Q \Rightarrow R) \quad \equiv \quad Q \ \vee \ \neg(R \Rightarrow P)$$

- ¬(a < b < c)?

- ¬((a < b) ^ (b < c))

How is this simplified?

Hint: 

De Morgan's Laws!

"I come to campus ***only if*** I have to teach MATH 135"

Do I come to campus if there's no MATH 135?

If there's MATH 135 then do I come to campus?

If I have to teach MATH 135 ***then*** I come to campus: A => B

I come to campus ***only if*** I have to teach MATH 135: B => A

I come to campus ***iff*** I have to teach MATH 135: B => A (***if*** is from ***only if***)
B <= A (only ***if*** is from ***if/then***)

I have to teach MATH 135 ***iff*** I come to campus: A <= B (***if*** is from ***only if***)
A => B (only ***if*** is from ***if/then***)

<u>Assignment 2!</u>

"The ***<u>only</u>*** positive integers ***<u>are</u>*** those in $\mathbb{Q}$."

- Is this ***<u>iff</u>*** ?

- Positive integer => $\mathbb{Q}$ (it's the ***<u>only</u>*** way something can be a positive integer)
- $\mathbb{Q}$ => Positive integer? (Some $\mathbb{Q}$ are not integers)

- Q2c on WA02 had a typo.
  - It was written as only A => B, but should be A <=> B.

- Remember that: A <=> B can be turned into: (A => B) ^ (B => A).

Assignment 2!

Prove ***without using a truth table***:

¬ (A ^ (¬B)) ≡ B v (¬A)

For statement variables A and B, prove that

$$\neg(A \wedge (\neg B)) \equiv (B \vee (\neg A))$$

without using a truth table.

Solution: Starting with the logical expression to the left of the $\equiv$ sign, we have

$$\begin{aligned}
\neg(A \wedge (\neg B)) &\equiv (\neg A) \vee (\neg(\neg B)), && \text{using De Morgan's Laws,} \\
&\equiv (\neg A) \vee B, && \text{using double negation,} \\
&\equiv B \vee (\neg A), && \text{using Commutative Laws.}
\end{aligned}$$

Prove ***without using a truth table***

What are some of the properties you can use?

- De Morgan’s laws!
- Double negation
- Commutativity
- Associativity
- Distributivity
- Negation of an implication: $\neg$ (A => B)
- Negation of an ***iff***: $\neg$ (A => B) = $\neg$(A => B ^ B => A)

Do not skip any steps !!!

If x and y are in Z, then x is in Z and y is not in Z

Hypothesis?
Conclusion?
Converse?
Contrapositive?
Negation?

$\neg(A \wedge B) = \neg A \vee \neg B$

$\rightarrow$ What's the last one called?

Q5: Justification is necessary!

Given ***x,y***, there exists some ***r*** that has a certain relation to ***x,y***

- How would you justify that it's true?
- An easy way is often to just find the ***r***!

- How would you justify that it's ***not*** true?
- An easy way is to find an (***x,y***) pair for which it's impossible to have such an ***r***

Review of last lecture

- If the hypothesis A is false, is B true?

- No!   Only (A => B) is true!

Hypothesis FALSE, but Conclusion also FALSE

Hypothesis (A) Conclusion (B)

$$\forall x \in \mathbb{R}, ((x > 2) \Rightarrow (x^2 \geq 4)).$$

Implication always TRUE if Hypothesis is FALSE

Implication (A => B)

x	$x > 2$	$x^2 \geq 4$	$(x > 2) \Rightarrow (x^2 \geq 4)$
$x > 2$	T	T	T
$x = 2$	F	T	T
$-2 < x < 2$	F	F	T
$x \leq -2$	F	T	T

- We will use the convention that (A => B) is ***true*** if A is ***false***. In this case we say it's "***vacuously true***".
- This way we don't have to spend time checking cases that ***do not impact*** the open sentence.

- This convention *might* not be followed in some types of non-classical logic (click for link to Wikipedia page!).