

This sheet summarizes what sort of content will appear on the second midterm. **Calculators are not permitted** and would be useless anyhow.

## Possible topics

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The second midterm may include material through lecture 13 (“congruences”) through lecture 23 (“strong induction”). This means that you should work through section four, five, six, and seven of the textbook.

- Induction
- Complete induction
- Least elements
- Divisibility
- Prime numbers
- Proof that there are infinitely many prime numbers
- Sums of  $n^{\text{th}}$  powers
- Telescoping sums
- Differences between successive terms in a sequence
- Fibonacci numbers
- Pascal’s triangle
- Patterns in Pascal’s triangle
- Binomial theorem
- Proof of Binomial theorem
- $\binom{n+1}{k} = \binom{n}{k-1} + \binom{n}{k}$
- Congruences (“mod” arithmetic)

## Proof that there are infinitely many primes

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The exam will definitely ask you to provide a proof that there are infinitely many prime numbers, so you should be prepared to write up a nice proof of this fact for the midterm.

## Problems

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There will again be five problems on the midterm, each worth **360 points**, for a total of **1800 points**. The **fake midterm** will give you an idea of the sorts of problems you might expect, but the fake midterm is longer than the real midterm.