

CS1800

Fall 2025

Homework 6

Assigned: November 4, 2025

Deadline: November 13, 2025 at 9pm eastern <==== extra time b/c of holiday! :)

Late Deadline: November 15, 2025 at 9pm eastern

Submission Format

CS1800 Homeworks must be neatly handwritten, on physical paper or a tablet. **Typed submissions will not be accepted.**

Submit a PDF or images to Gradescope. If you submit images, make sure they are JPEG, JPG, or PNG. (Don't submit iPhone HEIC images!) Each problem starts on a new page. Problem 1 is on a different page than Problem 2. Problems 1A and 1B can be on the same page.

Collaboration and Academic Integrity

We encourage you to work with classmates on these problems; list all collaborators on the first page of your submission. You may also consult outside sources, including generative AI; list all outside sources you referenced and how you used them on the first page of your submission.

However, **you must write all your solutions yourself, in your own words.** Do not submit anything you can't explain. Copying solutions from another person or an outside source is a violation of our academic integrity policy.

Deadline and Late Submissions

You can submit any/all homeworks up to 48 hours late with no penalty. However, **once the late deadline has passed, no submissions will be accepted.** This policy exists so you take extra time when you're especially busy, not feeling well, tending to your family, etc.; we won't make any exceptions to this policy.

Second-Chance Homework: You will have an opportunity at the end of the semester to submit one homework (HWs 1-6 only) for a new grade. If you miss both the deadline *and* the late deadline on a homework, use the Second-Chance to submit it.

For full credit

- select which pages go with which questions on Gradescope, and
- show ALL your work including intermediate steps.

Your Name

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Your Collaborators (Classmates)

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Outside References and How You Used Them

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Problem #1 - Types of Sequences ($3+3+3=9$ points)

For each sequence below, do the following:

- Identify the sequence type (arithmetic, geometric, quadratic, or none of the above)
- If applicable, find a closed-form formula for a_k , the k th term (assume we count from one so the first term would be a_1)

1A $1/3, -1/9, 1/27, -1/81, \dots$

Sequence type:

Formula for a_k :

1B $-3, 3, 13, 27, 45, \dots$

Sequence type:

Formula for a_k :

1C $-8, -12, -16, -20, \dots$

Sequence type:

Formula for a_k :

Problem #2 - Term of the Sequence (4+4=8 points)

Consider these initial terms of a sequence: $a_1 = 1$, $a_2 = 5$, $a_3 = 14$, $a_4 = 30$, $a_5 = 55$, ...

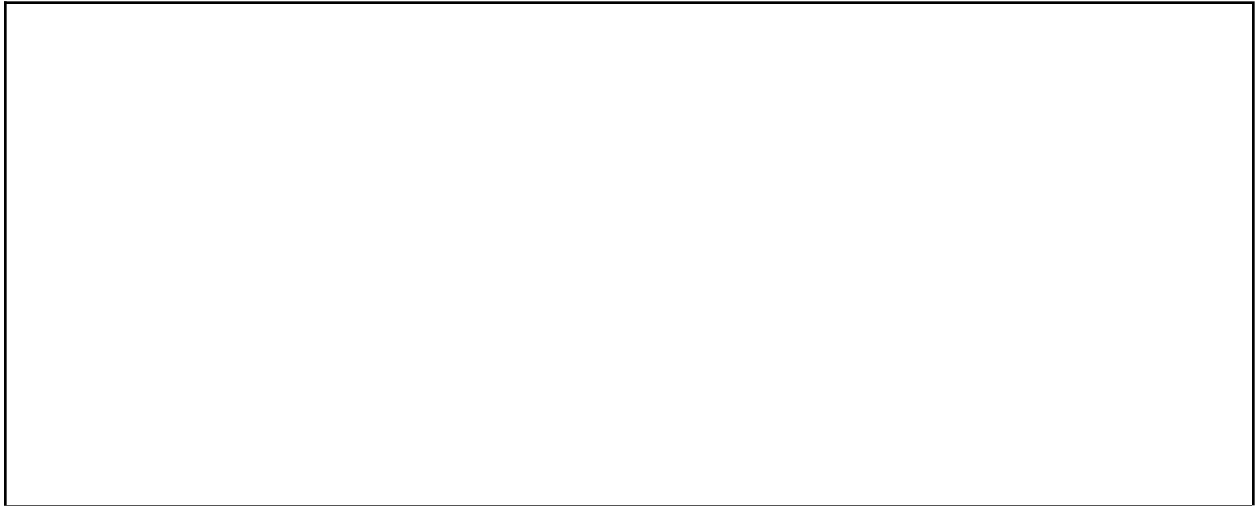
2A Each term is actually the value of a summation. For a given a_k , fill in the summation formula below. Show all of your work.

$$a_k = \sum_{i=1}^k [??]$$

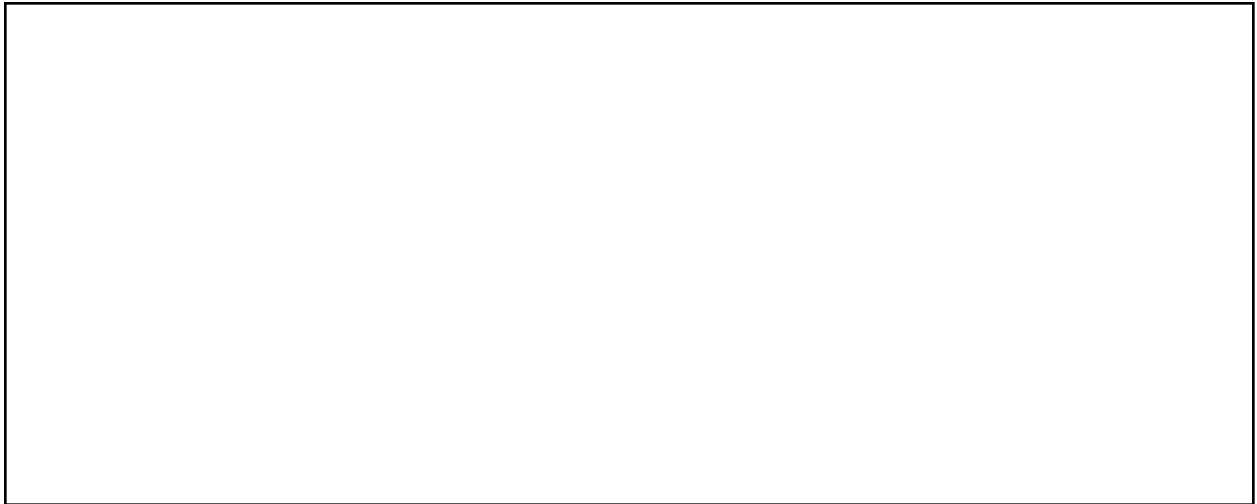
2B For the sequence in Part A, we can express an arbitrary term a_k **recursively**, by referring to previous term(s). Come up with a recursive formula for a_k . For full credit, your recursive formula must include a base case.

Problem #3 - Summations ($4+4+4=12$)

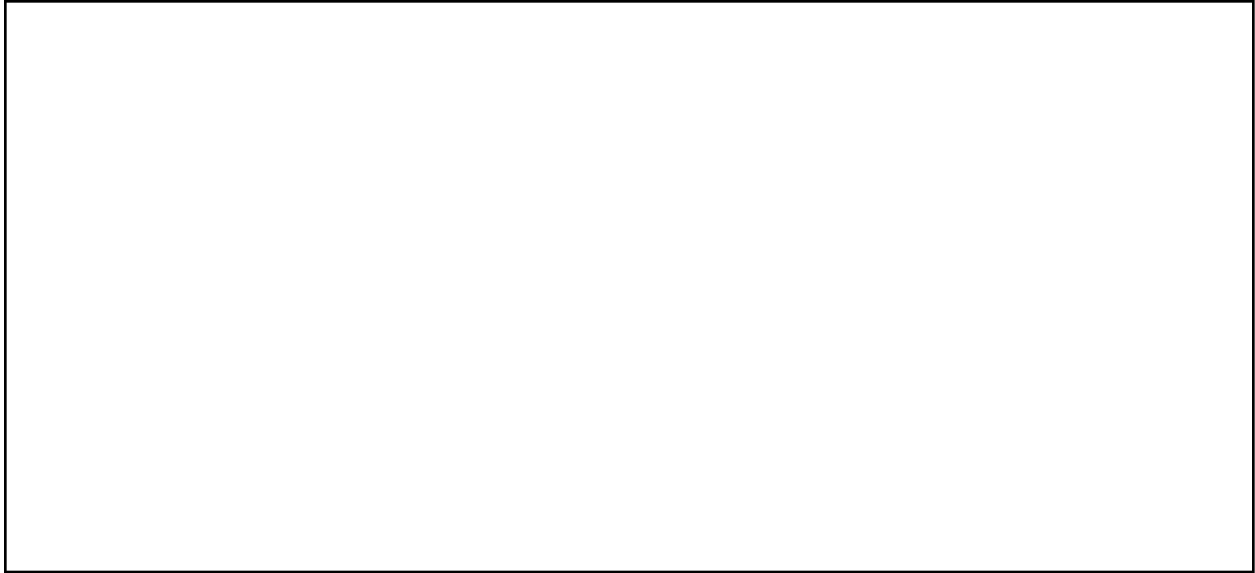
- 3A** Give a formula, simplified as much as possible, for the sum of the first n terms of the sequence 48, 96, 192, 384 ...



- 3B** What is the sum of the first 20 values of the sequence beginning with $-3, 3, 13, 27, 45, \dots$? Give your answer as a whole number and show all your work.

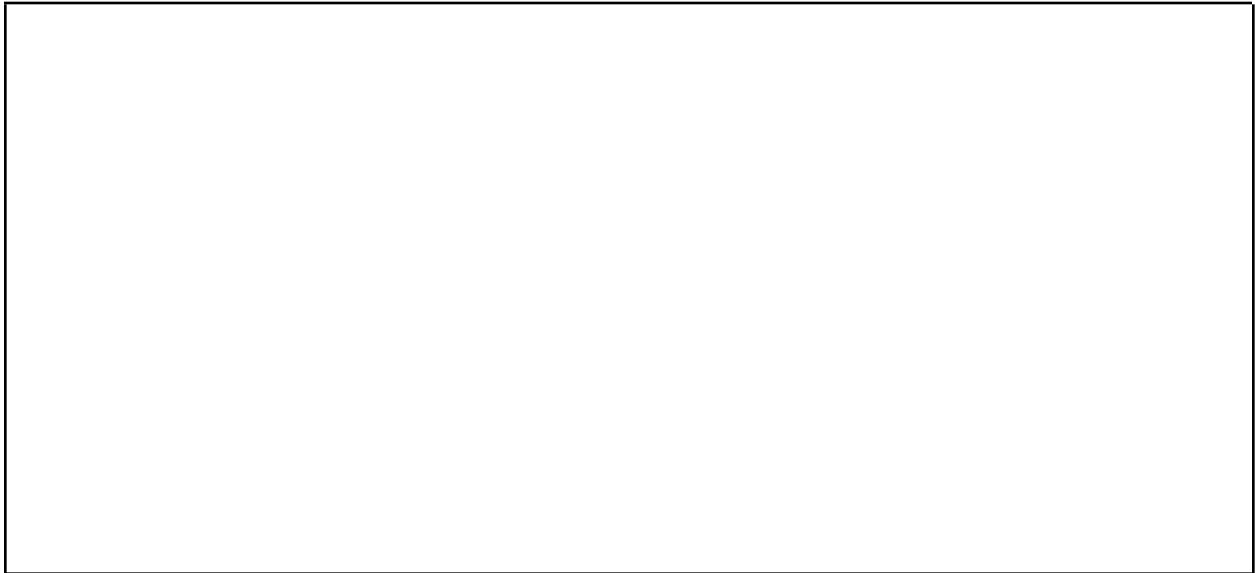


3C What is $3 + 6 + 12 + 24 + \dots + 12288$? Give your answer as a whole number and show all your work.

A large empty rectangular box with a black border, intended for the student to show their work for solving the problem.

Problem #4 - Combining Summations (3+3+3=9 points)

4A Write the expression $3x + 6x^2 + 9x^3 + 12x^4 + \dots + 60x^{20}$ in sigma notation.



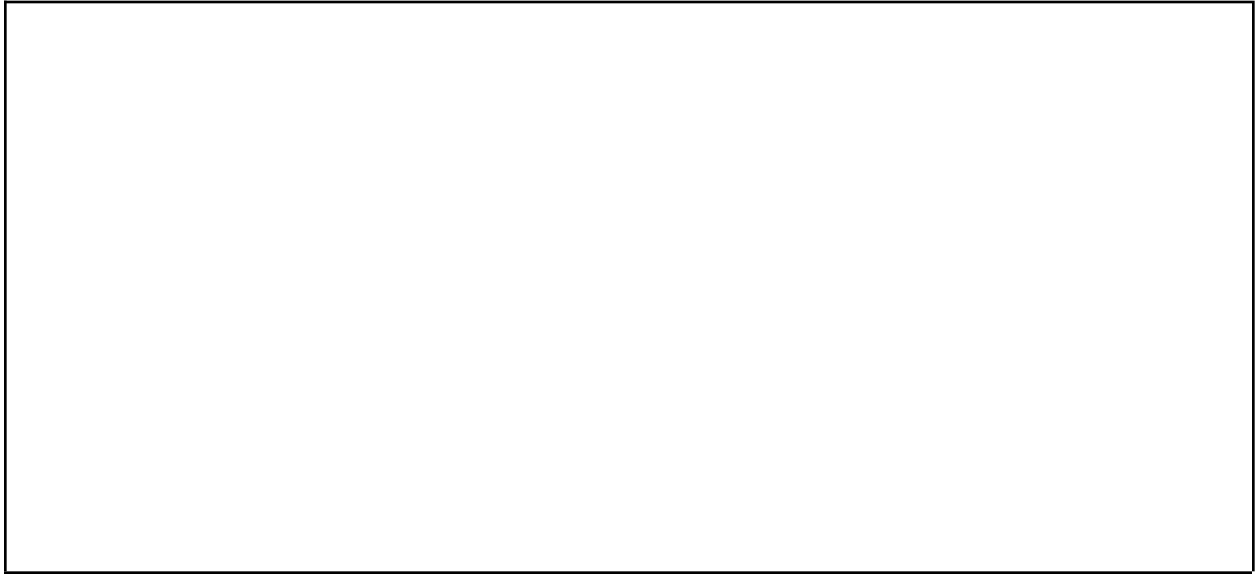
We'll prove this next week, but for now you can assume the following is true: $\sum_{i=1}^x i^2 = \frac{x(x+1)(2x+1)}{6}$

It'll be helpful in solving the problems below, but note that the formula given here starts with $i=1$.

4B Find $\sum_{i=50}^{100} i^2$. Give your answer as a whole number and show all of your work.



4C Find $\sum_{i=22}^{59} i^2$. Give your answer as a whole number and show all your work.



Problem #5 - Real-Life Sequences (8 points)

During a month with 30 days, a baseball team plays at least one game per day, but no more than 45 games total. Prove that there must be a period of some number of consecutive days during which the team is **guaranteed** to play exactly 14 games.

Hint: Create a 30-term sequence where each a_i represents the number of games played on or before the i th day of the month.