AEP 6: Counting memory allocations

Overview

In this AEP, you'll apply our principles of counting complex arrangements to a problem involving computer memory.

Learning Targets associated with this AEP:

- **C.1 (Core)**: I can use the additive and multiplicative principles and the Principle of Inclusion and Exclusion to formulate and solve counting problems.
- **C.2**: I can calculate a binomial coefficient and correctly apply the binomial coefficient to formulate and solve counting problems.
- **C.3 (Core)**: I can compute combinations and permutations and apply these to formulate and solve counting problems.

Remember, AEPs do not have fixed deadlines; simply work on this item until you are ready to submit it. But remember the **Two Items Per Week Rule.**

Technology Background

No particular tech skills needed for this AEP.

Tasks for this AEP

1. Suppose we have an ordered array of ten memory cells in a computer, labelled $c_1, c_2, \ldots, c_{10}$; and suppose we have a list of seven data items labelled $d_1, d_2, \ldots, d_7$ to be put into the cells. Assume that the data items are all different, and each will be stored only once. In how many ways can all seven data items be assigned to the ten memory cells, assuming each cell can hold only one item?
2. Now assume that each memory cell can hold any number of the data items. That is, suppose we have seven data items to be stored and ten cells in which to store them, where each of the cells can store any number of the items. Assume that the order of items *within* each cell is not significant. How many ways are there of assigning the seven data items to the ten memory cells?
3. Suppose we again have of ten memory cells $c_1, c_2, \ldots, c_{10}$ and seven data items labelled $d_1, d_2, \ldots, d_7$ to be stored in the cells. But now suppose that we want the data items to be stored in *ascending order* in the cells. For example if item d_3 is stored in cell c_8, then item d_4 must be stored either in c_9 or c_{10}. How many different ways can the seven data items be assigned to the ten cells subject to this constraint?

Assignment Expectations and Grading Criteria

AEPs are graded using the "EMRN" rubric found in the syllabus. Please note, it is the case with all AEP's that **your grade is primarily based on your explanations and writing, and only secondarily on the precision and correctness of your computations.** Correct computations with insufficient explanation will need to be revised and may receive an "N" grade.

Also, **significant incompleteness will result in a grade of "N".** This includes the following:

- **Giving answers with no explanations.** As mentioned above, you are being graded on explanations and writing, not so much on answers. Submissions that contain items where there is an answer with no explanation or insufficient explanation, will be graded "N" and returned without comment.
- Leaving items blank (even accidentally)
- Leaving large gaps in computations (skipping important steps)
- Giving only partial attempts at tasks (for example, working down to a certain point in a solution and then stopping because you need help)

A grade of "E" is given if all of the above expectations are met, and the work is of superior quality in terms of the clarity of explanations and work, appearance of the writeup, and precision of the mathematics.

On AEP 6, it is especially important to explain your thought processes clearly and completely. Your actual computations will likely be short, but the logic behind how you set those computations up will definitely need explanation. **Computations without any description or explanation accompanying it, or with descriptions/explanations that don't make sense or are irrelevant to the solution, will be graded "N" and your work returned without comment.**

Submitting your work

AEP submissions must be typewritten and saved as either a PDF or MS Word file. No part of your submission may involve handwriting; work that is submitted that contains handwriting will be graded N and returned without feedback. This includes electronic handwritten documents, for example using a stylus and a note-taking app. To type up your work, you can use MS Word or Google Docs (both of which have equation editors for mathematical notation) or any other computer-based math typesetting tool. Just make sure you save your work as a Word document or PDF (no `.odt`, `.rtf`, or other file extensions are allowed).

When you have your work typed up, double-check it for neatness, correctness, and clarity. Then, go to Blackboard, then **Assignments**, then **AEP**, then **AEP 6**. Clicking on the text "AEP 5" will take you to a place on Blackboard where you can upload your work. All grading and revisions of labs are done entirely on Blackboard. **Do not email your work to the professor** – only Blackboard submissions are accepted.

Getting Help

Please note that according to the syllabus, for AEP's **"no interactions at all with another person or with unauthorized sources on the internet is allowed."** Violations of this rule include *any* consultation with other students or former students, including Math Center tutors; using work from another student or former student; submitting the problem set to an online help site such as Chegg or Coursehero; or asking for help in an online forum. All such violations will be treated as academic dishonesty and will result in a grade of "N" and being banned from revising the work.

You **may** ask me (Talbert) for help on this assignment in the form of **specific mathematical or technical questions**. If I cannot answer a question because it would give too much away, I'll tell you so. **However please note: I will not "look over your work" before you submit it to give you feedback on the overall submission**; the expectations are clearly laid out above, so just follow those directions and submit your best work, and you'll be allowed to revise it if needed.

You can ask technology related questions to anyone at any time. For example if you need help with Desmos, or with figuring out how to type up your work, there are no restrictions on that. I recommend the `#tech` channel on Campuswire so that you'll reach a large audience.