15-110: Principles of Computing, Spring 2018

Problem Set 1 (PS1)

Due: Friday, January 26 by 2:30PM on Gradescope

HANDIN INSTRUCTIONS

Download a copy of this PDF file. You have two ways to fill in your answers:

1. **Just edit (preferred) - Use any PDF editor (e.g., Preview on Mac, iAnnotate on mobile, Acrobat Pro on pretty much anything) to typeset your answers in the given spaces. You can even draw pictures or take a picture of a drawing and import it in the correct place in the document. That's it. (Acrobat Pro is available on all cluster machines.)**

2. **Print and Scan - Alternatively, print this file, write your answers neatly by hand, and then scan it into a PDF file. This is labor-intensive and must be done by the deadline.**

Once you have prepared your submission, submit it on Gradescope. A link to Gradescope is provided in our course website. DO NOT SUBMIT TO AUTOLAB!

Fill in your answers ONLY in the spaces provided. Any answers entered outside of the spaces provided may not be graded. Do not add additional pages. We will only score answers in the given answer spaces provided. If we cannot read your answer or it contains ambiguous information, you will not receive credit for that answer.

Be sure to enter your full name below along with your section letter (A, B, C, etc.) and your Andrew ID. Submit your work on Gradescope by 2:30PM on the Friday given above.

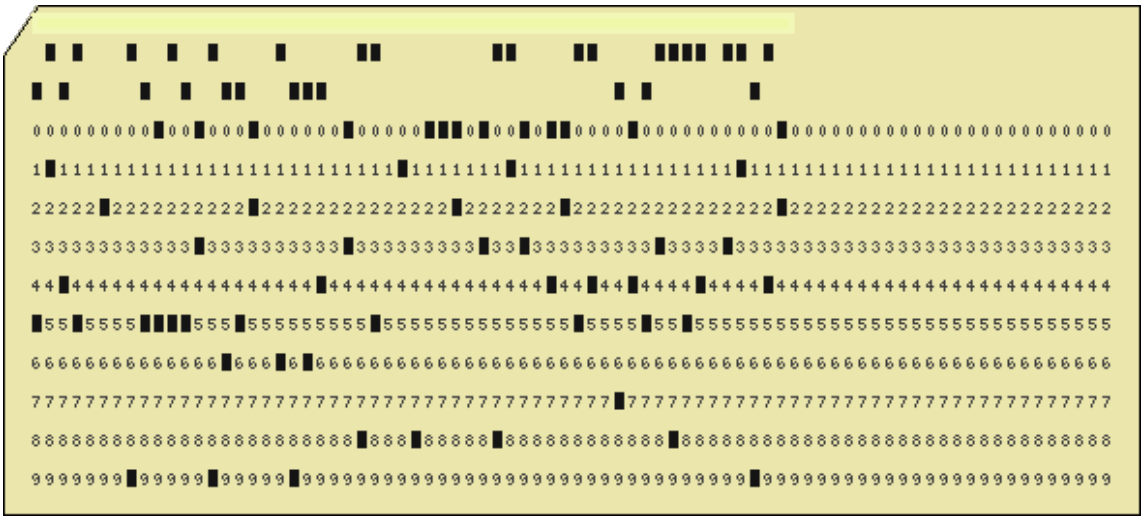
REMINDER: Sharing your answers with another student who is completing the assignment, even in another semester, is a violation of the academic integrity policies of this course. Please keep these answers to yourself.

Name (First Last) _____

Section _____ Andrew ID _____

1. (2 pts) In the history of computing, punched cards were invented to store information so that machines could read the information as instructions or data. Based on the brief history of computing presented in class:

(a) A punched card sold by IBM in the 1900s stores one character of information (i.e. letter, digit or punctuation) per column. Decode the question stored on the following punched card. (HINT: Refer to the course slides for a sample IBM punched card.)



Answer: _____

_____

_____

(b) Write the answer to the question posed on the card based on what was covered in lecture.

Answer: _____

_____

_____

_____

2. (3 pts) Charles Babbage wants to program his Difference Engine (assuming he actually built the entire thing) to compute the values of some polynomials f(x) for a book of numerical tables he wants to publish.

a. He wants to compute all the values of the quadratic polynomial $f(x) = x^2 + 7x + 6$ for integer values of x starting at x = 0. What initial values does he set in his machine for f(x), $\Delta f(x)$ and $\Delta^2 f(x)$ when x = 0? (HINT: You will need to derive the functions $\Delta f(x)$ and $\Delta^2 f(x)$ and then plug in x = 0 to get your three initial values.)

Answers:

$\Delta f(x)$ = _____

$\Delta^2 f(x)$ = _____

$\Delta^2 f(0)$ = _____ $\Delta f(0)$ = _____ f(0) = _____

b. For a cubic polynomial (i.e. highest power of x is 3), he has the machine set for x = 0 as follows:

x	$\Delta^3 f(x)$	$\Delta^2 f(x)$	$\Delta f(x)$	f(x)
0	5	2	6	10
1				
2				
3				
4				

If he runs his machine through 4 cycles, what does he compute for f(4)? Use the table above to help you compute the answer. (NOTE: You don't know what polynomial he's computing because he's already set up the machine for you!)

Answer: f(4) = _____

3. (2 pts) The following question deals with powers of 2 and how they relate to the processing power and memory of computers today.

   a. Moore's Law states that the processing power of a computer doubles approximately every 2 years. Using Moore's Law, how many years will it take to have a computer that is approximately 64 times more powerful than today's computer? Show your work for full credit.

      Show your work here:

      Answer: _____ years

   b. Suppose you wanted to create a computer with 4 GB of memory using memory units that could store 16 MB each. How many 16 MB memory units would you need to create your 4 GB of computer memory? Show your work for full credit.

      Show your work here:

      Answer: _____ memory units

4. (3 pts) Read Chapter 1 of *Blown To Bits*. Based on your reading, briefly answer the following questions in your own words.

   a. Technology grows in an exponential way so that you don't notice its impact until it's sometimes too late. Briefly describe how Kodak experienced this situation.

      Answer: _____

      _____

      _____

      _____

      _____

   b. Briefly explain why people were not charged with copyright infringement when they made copies of music in the 1970s and 1980s, but today many such complaints are filed each year.

      Answer: _____

      _____

      _____

      _____

      _____

   c. Is it true that in cyberspace, all people are interconnected and can say whatever they want, since cyberspace has no borders? Why or why not?

      Answer: _____

      _____

      _____

      _____

      _____