CS 125 - Lecture 5

Objectives:

- problem decomposition and refinement
- algorithms, identify variables, conditions, looping

To do for next week: Types, Variables, Expressions, Turn in HW0 for community participation points next week in lab section

2. You hold 12 playing cards of the same suite in your hand. Write down the steps required to sort them in numerical order. Check your neighbor's algorithm for clarity and correctness. Together, can you think of an alternative sort algorithm?

3. Your startup, 'YouTube Inc' has N online videos. Describe a **two-pass** algorithm to print the # views of the most popular video and also the number of videos that achieved at least 5% of that viewing popularity.

Why do you need two passes through the data?

Use 'viewed[0]' to mean the # views of the first online video, 'viewed[i]' for the number of views of the i^{th} online video.

1. Computer Science Terminology – did your neighbor do the readings?

What is the difference between a program and an algorithm?

What is meant by stepwise refinement?

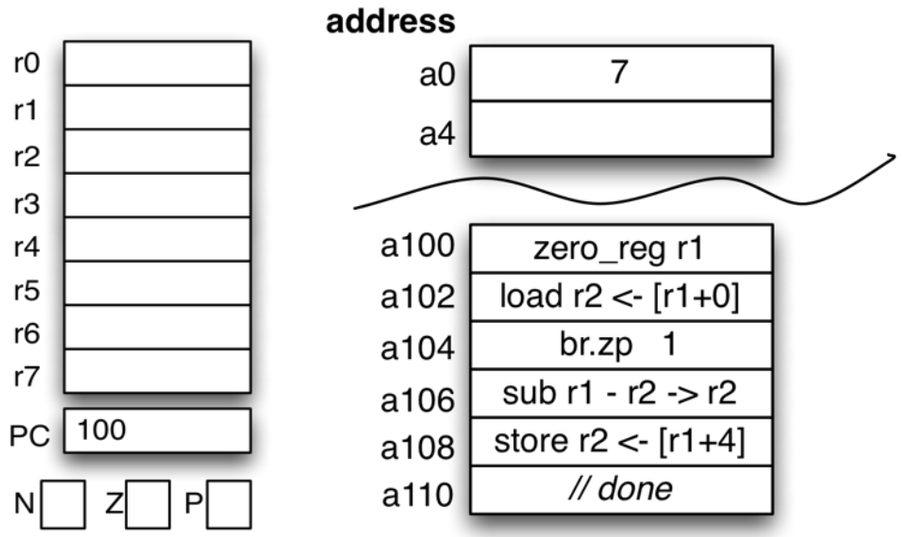
4. Complete the **Java source code** below for a program that displays the following message: Boing! followed by a newline. Your code must compile and work exactly as described.

Pseudo code: Print “Boing!” to the screen, followed by a newline

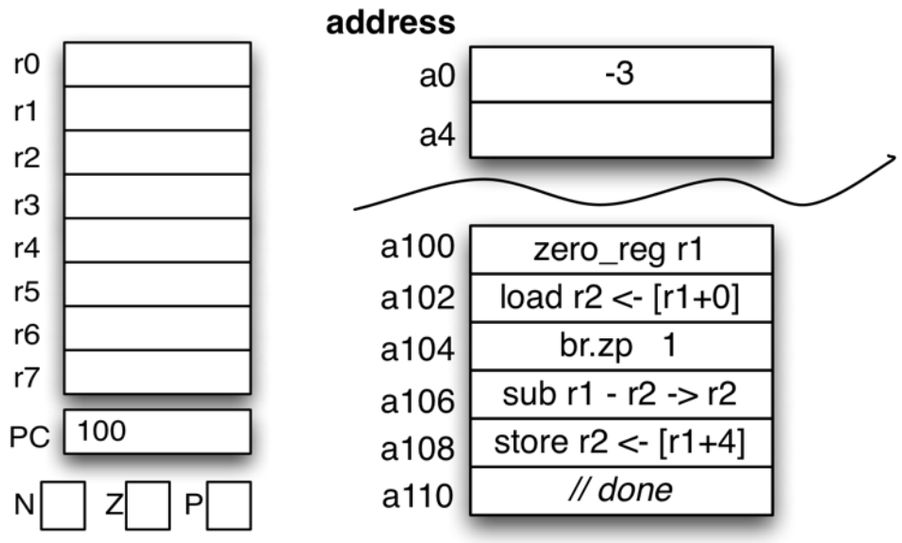
Java Code:

```
public class BoingPrinter {
```

6. Execute a machine code program - me:



7. Execute a machine code program - you:



9. What does this code do?

5. All about that branch, 'bout that branch, 'bout that branch …

PC 122

Condition codes N 1 Z 0 P 0

BR.N 6 PC =

BR.NZ -6 PC =

PC 108

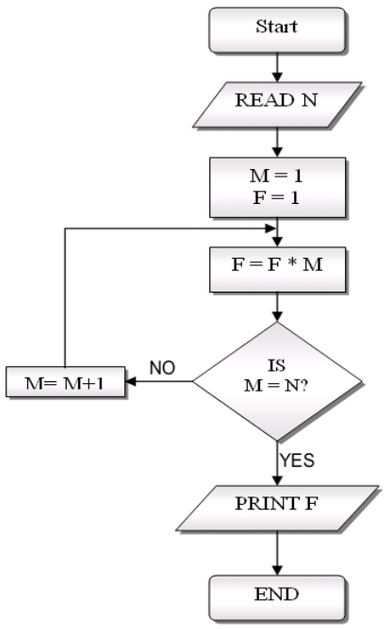
Condition codes N 0 Z 1 P 0

BR.NZP 22 PC =

BR.ZP -10 PC =

Workspace:

6. Describe an algorithm using a flowchart that calculates N! i.e. 1x2x3x...N. A proposed solution is included below.



i) What is the purpose of the three variables, N,M,F
N:_____ M:_____ F: _____

Which variable is unchanged by the loop? (A "Loop Invariant")

ii) Will the algorithm terminate for all values of N? If no, provide a counter-example: N = _____

iii) Create a new algorithm that only uses two variables - Draw your flowchart above and check your neighbor's answer.

7. Java as a high-level language: What happens 'under the covers' in the following code? How often do we read 'score' ? ____,
write to score? ___
How many bytes are used to hold the value of score?

```
int score=0;
score = score + 1;
if(score>0) ...
```

5. Wooden toy abstraction demo:

8. Why is the list in a residential telephone book sorted by name?

If the number of residents doubled why does it *not* take twice as long to lookup a number for a given name?

Why must you use a different search algorithm to find a name given a number?

If the number of residents doubled why does it take twice as long to lookup a name?

Why are some algorithms more efficient than others? When and why is this efficiency important? How should we measure or describe efficiency?

insertion sort

6 5 3 1 8 7 2 4

source : "Insertion-sort-example-300px" by Swfung8 - Own work. Licensed under Creative Commons Attribution-Share Alike 3.0 via Wikimedia Commons - http://commons.wikimedia.org/wiki/File:Insertion-sort-example-300px.gif#mediaviewer/File:Insertion-sort-example-300px.gif

CS 125 Doyen Help:

Sign up at:

chara.cs.illinois.edu