ACSL Contest Topics

Dr. Baldassano

chrisb@princeton.edu

Yu's Elite Education

Next week

- Next week we are going to have two quizzes:
  - First half: ACSL Programming Contest
  - Second half: Final quiz for the class

- Today: review ACSL topics and the class

ACSL

- ACSL = “American Computer Science League”
- Runs programming and computer science competitions each year
- Yu’s is starting to compete next week – you will be the first competitors!

- Let’s review some things that will be on the ACSL contest:

“What does this program do?”

- You’ll be given a program with a bunch of if statements
- You will have to keep track of all the variables and what gets printed out at the end
- Symbols to know:
  - Relational operators: <, >, <=, >=, ==, <>
  - Logical operators: and, or
  - Math operators: +, -, *, /, ^
  - Functions: int() and print()
  - GOTO

Program example

```
a = 4: b = 1: c = 3: d = 1: e = 0
if (a >= e) or (d < b) then a = e else b = d
if (b >= c) and (d <= e) then c = b - c else d = a - e
if b ^ d = 2 then d = d + 1 else b = b + 1
if int(a / c) = a / c then a = a / c else a = a - c
print b + a * e / d
```

Binary numbers

- Let’s remember:
  - What are binary numbers?
  - How can we convert to and from decimal numbers?

Binary numbers

Octal and hexidecimal

- What are octal and hexidecimal numbers?
- How can we convert between oct/hex and decimal?
- How can we convert between binary and oct/hex?

Octal and hexidecimal

Adding binary numbers

Multiplying by powers of 2

Number systems example

- Convert BED from hexidecimal to octal

Number systems example

Solve for X_2

$$X_2 = A12_{16} - 567_8$$

Functions

- What is a (math) function?
  - Takes a number as input, gives a number as output
  - Might do different things to different numbers

Recursive Functions

- Recursive function: Defined in terms of itself!

$$f(x) = \begin{cases} f(x-2)+2 & \text{if } x > 2 \\ x+2 & \text{otherwise} \end{cases}$$

Recursive example

- f(x) = {f(x-20) + 10 if x > 100
  {3x if x <= 100
- f(150) =

Recursive example

- f(x) = {f(x+4)+2 if x < 10
  {x-8 else
- f(f(5)) =

Practice quiz

Class review

- How do we store information in programs?
  - Variables
  - Creating a variable: somename = 10
  - Types of variables

Class review

- List variables
  - Creating and adding to lists
  - Accessing single elements of lists
  - Accessing ranges of lists
- Strings: like read-only lists of characters

Class review

- If statements
  - Execute some statements only if a condition is true
  - Logical operators: not, and, or

Class review

- Loops
  - Repeat statements over and over
  - while loop: repeats until condition is false
  - for loop: repeats loop for some range of variable values

Class review

- Random numbers
  - random.randint(a,b)
  - random.uniform(a,b)

Next week

- Remember, next week (last class) we have two quizzes: ACSL and a final quiz for the class