Prof. Susan Rodger

Note: thanks to Wanda Dann and Steve Cooper for slide ideas
Announcements

• Read Chapter 9, Section 1 and 2 for next time
• Note: We will NOT cover Chap 8, Sec 2
• Reading Quizzes, will be out of ? pts
What we will do today

• Lecture on Chap 8 Section 1
  – Recursion
• Classwork
Repetition

• Sometimes don’t know exactly how many times a block of instructions should be repeated
  – Repeat until some condition is true
  – Repetition gets closer to condition being true

• Example – Chess, don’t know when in advance how many moves til game ends
Indefinite Repetition

- When number of repetitions is indefinite
  - While statement – last time
  - Recursion - today
Recursion

• Many times a structure is identified by a special word
  – Do in order
  – Do Together
  – If/Else
  – Loop

• Recursion
  – Is NOT a program statement with a special word
  – Recursion means a method (or function) calls a clone of itself
Example – horse race

- Horse race
- One horse randomly selected to move forward, repeatedly
- First horse to finish line is winner
Storyboard

race

if one of the horses has won
  winner says “I won”
else
  randomly choose horse and move
do everything again

• “do everything again” means the entire method should be repeated – this is recursion
“Do everything again” - Call race method

```python
race

if one of the horses has won
    winner says “I won”
else
    randomly choose horse and move
call the race method

- Recursion means that a method calls a “copy of itself”
```
Stepwise Refinement

race

if one of the horses has won
  winner says “I won”
else
  randomly choose horse and move
call the race method

isGameOver?

whichHorseWon?

moveRandomHorseForward
isGameOver and WhichHorseWon

• isGameOver
  – Is the finish line $< 0.5$ meters in front of any horse? If so, game is over
  – Returns true if game is over

• WhichHorseWon
  – Which horse is within $0.5$ meters of finish line?
  – - returns the horse that won
moveRandomHorseForward

- To choose horse to move forward, use built-in random selection function
race method

- Uses recursion
- Where is the “way out”?
Classwork today

- Written: raceHorse move recursive statement
- Write recursive method BunnysMeet
  - Two bunnys repeatedly hop towards each other at the same time, as long as they are $> 3$ meters apart.
  - When bunnys are close ($\leq 3$ meters apart but still at least 2 meters apart, 1 bunny hops once.
  - When bunnys are too close to jump any more, they bow to each other once at the same time.
- Download file: BunnysInGarden