CompSci 18S
Recursion
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Prof. Susan Rodger
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 – previously
  – 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

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 “clone 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”?

```plaintext
racehorseGame.race   No parameters

No variables

If racehorseGame.isGameOver
racehorseGame.whichHorseWon say I won!!! more...

Else
racehorseGame.moveRandomHorseForward
racehorseGame.race
```
Classwork today

- Written: raceHorse move recursive statement
- Write recursive method BunnysMeet
- More info on Recursion: See Chap. 8, Sec 1