Overview:

- Hand out Exam 1 Review
- Wrap-up Number Golf Discussion.
- Sec. 12.6 - Simulations.

For tonight:

1. Do Sec. 12.6 #6-8.
2. Begin working through review sheet.
3. Email me with questions / topics you'd like to discuss during our review tomorrow.

(Please use "126" in subject line).

For *Monday*, read Sec. 13.1 and do #3, 5, 7, 9, 11-23 all, 29-31 all.

Sep 23-9:25 AM

Number Golf: Two Dice

1. Players take turns rolling dice.
2. On your turn, you may choose to either add or subtract the sum from your cumulative total.
3. Your "score" for each hole is the number of turns it takes you to get to the goal number.

Sum of Dice / Tee off #	Cumulative #
	0 (Goal = 18)
+6	6
+6	12
+7	19
-4	15
+3	18

/5

0-0
1-0
2-1
3-2
4-3
5-4
6-5
7-6
8-5
9-4
10-3
11-2
12-1

...Last time

Number Golf:

1. What is your *strategy* for winning this game?

(?) Are all outcomes of summing two dice equally likely?

E.g. 22 + 5 = 27 (no way to win) is not better than 22-5 = 17 (2 ways to win).

E.g. 24 +3 = 27 (no way to win) is much worse than 24-3 = 21 (6 ways to win).

Try to stay towards the "middle numbers" (e.g 4,5,6,7,8) away from the goal because you are more likely to roll those numbers.

2. Will the player with the best strategy always win?

3. How would your strategy change if there was only one die involved?

In this case... stay within 6.

Say we're at 14 and roll a 1. Look ahead one move, it makes no difference whether you add or subtract to get to 15 or 13 -- you still have a 1/6 chance of winning on the next move.

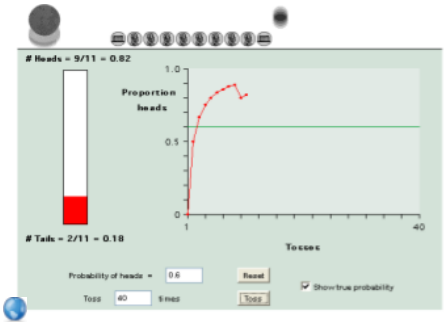
Sep 23-8:42 AM

Probability Simulations
(a.k.a. Monty Carlo Methods)

In many cases, complex phenomena are best studied by use of simulations.

Computers allow us to perform huge numbers of trials fairly quickly.

Run the following simulation of a coin toss and use the results to predict whether or not the coin is "fair".



http://bcs.whfreeman.com/ips4e/cat_010/applets/Probability.html

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Simulations can be done without using computers as well.

Random number generators (or random number tables) can be used to simulate random events. So can other common items.

Ex. 1. Craig is a great free throw shooter. He makes 80% of the free throws he attempts. Devise a method of simulating Craig shooting two free throws using:

a) A random number table (containing a string of random digits 0-9)

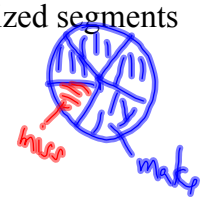
0-7: make, 8-9: miss

0- 1-11 2-11 etc.

Part of a Table of Random Numbers

61424	20419	86546	00517
90222	27993	04952	66762
50349	71146	97668	86523
85676	10005	08216	25906
02429	19761	15370	43882
90519	61988	40164	15815
20631	88967	19660	89624
89990	78733	16447	27932

b) A spinner with 5 equal-sized segments



c) A standard deck of cards

Procedure:

Select four black cards (make) and one red card (miss).
Then each trip to the line is modeled as:

1. Draw a card, put it back, shuffle, draw another.
   That represents the two consecutive free throw shots.
2. Each black card drawn counts as one point.

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Ex. 2. Jessica tends to speed on her way home. She figures there is a 20% chance of seeing a cop on the way home, and that there's a 50% chance that s/he will pull her over if she is speeding, and that if she is pulled over, she has a 25% chance of talking her way out of a ticket.

P(getting a ticket) = (.20)×(.50)×(.75) = .075

Devise a method of *simulating* the probability that Jessica will get a speeding ticket on the way home.

1. Sees a cop: use a spinner with 5 slices. (shade 1 to represent cop)

2. Gets pulled over | sees a cop: Flip a coin. H = pulled over.

3. Gets a ticket | gets pulled over: Use a random number table.
   - Option 1: Use 0-3 only.
     - 0 = talks way out. 1-3 = gets ticket. Ignore all others.
   - Option 2: Use 0-7 only.
     - 0-1 = talks way out. 2-7 = gets ticket. Ignore 8-9.
   - Option 3: Look at blocks of 2 digits.
     - 00-24 = talks way out. 25-99 = gets ticket.

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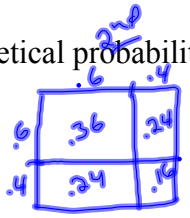
Example 3: Gina is a 60% free throw shooter, meaning she makes 60% of her free throws attempted.

Gina is fouled and will shoot two free throws.

1. Calculate the theoretical probability of Gina making
   - 0 points - .16
   - 1 point - .48
   - 2 points - .36



2. Devise a method for using a fair *six*-sided die to simulate the probability of Gina making 0 points, 1 point, 2 points.

   One roll of die = one free throw shot.
   (Roll twice in a row to represent the two shots).
   - If you roll a 1-3, that counts as a make.
   - If you roll a 4-5, that counts as a miss.
   - If you roll a 6, it doesn't count and you will roll again.

3. Use your method to perform the simulation 10 times. What is your empirical probability?

#0 pt trips:	
1 pt trips:	
2 pt trips:	

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Results (Sec. 2):

	A	B	C	D
1	**30**	**96**	**84**	210
2	**14%**	**46%**	**40%**	
3	0 point	1 point	2 points	
4	1	8	1	
5	7	14	9	
6	2	8	10	
7	3	14	12	
8	3	14	13	
9	3	22	16	
10	1	4	5	
11	7	9	14	
12	3	3	4	

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Sep 23-9:11 AM