SIMULATION STEPS
- ASSIGN
- RANDOMIZE
- SELECT include Record + EXCLUDE
- STOP
- CALCULATE

HOMEWORK:
COMPLETE THESE SIMULATIONS AND READ/TAKE NOTES ON SECTION 5.2

1) **Law of large numbers - Tossing Coins (pages 284-288):** "What is the probability of Heads?"

STEP 1: *Clearly describe a process using your graphing calculator to simulate tossing a coin.*

1) ASSIGN NUMBERS 0-4 TO HEADS AND NUMBERS 5-9 TO TAILS
2) USE TI84 RAND INT(0,9) TO SIMULATE EACH COIN TOSS
3) RECORD H OR T
4) REPEAT 10 times, then 25 times, then 100 times
5) CALCULATE THE % HEADS AND NUMBER FOR THE LONGEST STREAK OF HEADS. FOR EACH SAMPLE,

STEP 2: *Complete the following simulations:*

randInt(0,9,10)

1) Toss a coin 10 times and record your tosses (e.g. HTTHT...).
   The % heads was 3/10 (30%)   What was the longest streak of heads? __2__

   TTH H TTH TTT   H TT TT H H T H T   40%

randInt(0,9,25)

2) Toss a coin 25 times and record your tosses (e.g. HTTHT...).
   The % heads was 11/25 (44%)   What was the longest streak of heads? __5__

   H T H H H H H TTTTT H T H T H T T
   H TTHTT

randINT(0,9,100)

3) Toss a coin 100 times and record your tosses (e.g. HTTHT...).
   The % heads was 50/100 = 50%   What was the longest streak of heads? __8__

   T H TTTT H TTT H H T H H H H H H H H
   T H TT H H H T H T H H H T H H H TT H T
   H T TT H TT H H H T H H H TTT H T H H
   T H TT H H T TTTT H TTT H H H H H H TT
   H H T H TTT H H T H TTT

STEP 3: *Conclusions:*

a) What is the law of large numbers? IF WE OBSERVE MORE OR MORE **AND** REPITITIONS OF ANY CHANCE PROCESS, THE PROPORTION OF TIMES THAT A SPECIFIC OUTCOME OCCURS APPROACHES A SINGLE VALUE, WHICH WE CALL THE PROBABILITY OF THAT OUTCOME.

b) How do you interpret a probability? ① OUTCOME OF A CHANCE PROCESS
② PROPORTION OF TIMES THE OUTCOME OCCURS IN A VERY LONG SERIES OF REPETITIONS.
③ NUMBER BETWEEN 0 (Never occurs) and 1 (always occurs)
✳ BEWARE OF SCIENTIFIC NOTATION ON CALCULATORS!

$$.10 E-3 = .0001$$

2) Simulations – NASCAR Cards and Cereal Boxes (page 291):

STEP 1: *Clearly describe a simulation process using your graphing calculator to answer:*

QUESTION: What is the probability that it will take 23 or more boxes of cereal to get a full set of 5 NASCAR collectible cards?

THERE CAN BE REPEATS

TECHNOLOGY: You need to decide whether to use RANDINT() or RANDINTNOREP()?

SIMULATION:

① ASSIGN: THERE ARE 5 TYPES OF CARDS SO DEFINE NUMBERS 1-5.

1 = GORDON	4 = PATRICK
2 = EARN HARDT JR	5 = JOHNSON
3 = STEWART	

LOWEST# HIGHEST#

a. large number

② RANDOMIZE: USE RandINT (1, 5, 100) TO SIMULATE BUYING THE BOXES OF CEREAL. NUMBERS 1-5 represent the cards and 0, 6-9 are IGNORED

③ STOP & RECORD THE Number of boxes UNTIL YOU GET ALL 5 CARDS

④ Repeat the simulation 20 times

EXAMPLE: ③ ⑤ ④ ② 3 5 5 2 4 3 3 2 ①   13 BOXES

STEP 2: *Complete the simulation 20 times. Hint: circle winning cards & count number of cereal boxes.*

1) ③ ⑤ ④ ② 3 5 5 2 4 3 3 2 ① | 13 Boxes |

2) ② ④ ① 4 ③ 2 1⑤ | 9 Boxes |

3) ⑤ ② ④ 2 ① 4 2 ③ | 8 BOXES |

4) ④ ② ⑤ ① 5 ③ | 6 BOXES |

5) ② ③ 3 2①④⑤ 7 Boxes

6) ⑤ ③ 5 5 ④ ① 1 4 ② 9 boxes

7) ① .1 1 ③ 3 ②④ 3 ⑤ 9 boxes

8) ③ ⑤ ④ ② 2 3 4 4 5 2 3 ① 12 boxes

9) ② ① ③ ⑤ 3 1 ④ 7 boxes

10) ④ ② ① 2 ⑤ 5 2 1 1 1 4 4 1 ③ 13 boxes

11) ④ ② 2 ⑤ ③ 2 3 2 2 ① 10 boxes

12) ④ 4 ③ ⑤② 4 3 ① 8 boxes

13) ② ⑤ ④ ① 5 4 4 1 4 2 5 5 4 5 1 5 ③ 17 boxes

14) ① ② ③ ④ 2 1 2 ⑤ 8 boxes

15) ⑤ 5 ② ④ 4 ① 2 4 4 2 5 2 4 ③ 14 boxes

16) ② ① 2 1 1 ④③ ⑤ 8 boxes

17) ⑤ ③ 5 ④ 4 ② 3 3 5 3 2 3 3 4 5 2 5 5 2 2 1 21 boxes

18) ③ ④ 3 ①② 1 4 1 4 3 ⑤ 11 boxes

19) ① ⑤ ③ 3 3 ④ ② 7 boxes

20) ④ ② 4 4 2 2 4 4 ③ 3 4 4 ⑤ 3 ① 15 boxes
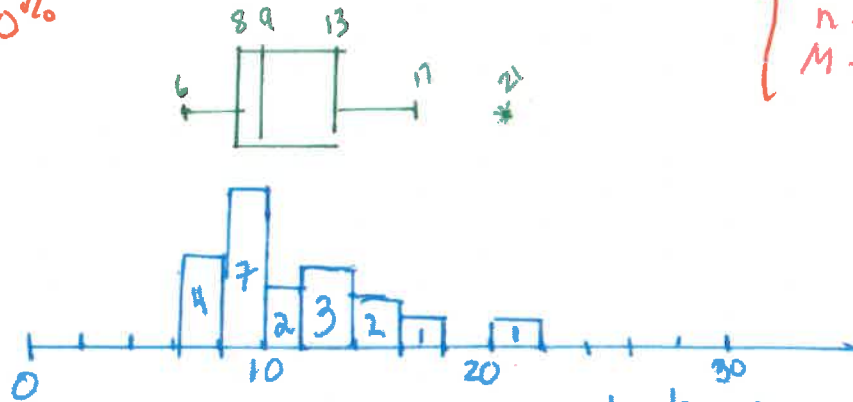
6 7 8 9 10 11 12 13 14 15 16 17   21

STEP 3: *Create a graph of your results.*

P(23 or more boxes)

$= \dfrac{0}{20} = 0\%$

Descriptive STATS

$\bar{x} = 10.6$
$S_x = 3.9$
$n = 20$
$M = 9$

Number of Cereal boxes
bought to Get all 5 NASCAR cards

STEP 3: *Clearly explain your conclusion.*

Remember!
Hedging
Word!

BASED ON THIS SIMULATION IT IS
VERY ~~UNLIKELY~~ IT WOULD TAKE BUYING
23 BOXES TO GET THE 5 CARS.
IN THIS SIMULATION, WE NEVER HAD TO
BUY MORE THAN 21 BOXES. SO OUR ESTIMATE
OF THE PROBABILITY OF TAKING 23
OR MORE BOXES TO GET THE FULL SET
IS ~~ROUGHLY~~ 0.

THEREFORE, the NASCAR fan should be
surprised about how many boxes she
had to buy.

AP COMMON ERROR

Hedging Words

WHEN STUDENTS MAKE CONCLUSIONS, THEY OFTEN LOSE
CREDIT FOR A CLAIM, IS STATED DEFINITELY TRUE
OR THE EVIDENCE PROVES THE CLAIM.

A BETTER RESPONSE WOULD BE TO SAY THERE IS
SUFFICIENT EVIDENCE (OR THERE IS NOT SUFFICIENT
EVIDENCE) TO SUPPORT A PARTICULAR CLAIM.