5.1 HW #'s 1, 3, 9, 13, 17, 23, 25, 31-36

(1) [A] POLYGRAPH WITH PROBABILITY OF FALSE POSITIVE IS .08. MEANS THAT IF THE MACHINE IS USED ON LOTS AND LOTS OF PEOPLE WHO ARE TELLING THE TRUTH, ABOUT 8% OF THE TIME, THE MACHINE WILL SAY THAT THE PEOPLE ARE LYING

[B] ANSWERS WILL VERY.

* A FALSE POSITIVE WOULD MEAN THAT A PERSON TELLING THE TRUTH, THE POLYGRAPH WOULD SAY THEY ARE LYING.
* A FALSE NEGATIVE WOULD MEAN THAT A PERSON LYING, THE POLYGRAPH WOULD SAY THEY ARE TELLING THE TRUTH

THE US JUDICAL SYSTEM IS SET UP THAT A FALSE POSITIVE IS WORSE - THAT IS FINDING SOMEONE GUILTY (LYING) WHO IS NOT IS WORSE THAN FINDING SOMEONE NOT GUILTY (NOT LYING) WHEN FACT THEY ARE GUILTY (LYING), "SIMPLY - IT IS WORSE TO CONVICT AN INNOCENT PERSON THAN FREEING A GUILTY ONE"

(3) (A) IF WE LOOK AT MANY FAMILIES WHEN BOTH THE HUSBAND AND WIFE CARRY THE GENE, IN APPROXIMATELY 25% OF THEM THE 1ST BORN CHILD WILL DEVELOP CYSTIC FIBROSIS.

(B) IF THE FAMILY HAS FOUR (4) CHILDREN THIS IS A SMALL SAMPLE THERE IS NO GUARANTEE ONE of THEM WILL DEVELOP CYSTIC FIBROSIS. IN ORDER FOR THE PROBABILITY TO BE CLOSELY REFLECTED, THE SAMPLE MUST BE VERY LARGE.

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(9) NO, THE TV COMMENTATOR IS INCORRECTLY APPLYING THE LAW OF LARGE NUMBERS TO A SMALL NUMBER OF AT BATS FOR THE PLAYER

(13) SIMULATING A .75 BASKET BALL FREE THROW PLAYER

(a) A DICE – LET 1, 2, 3 = MAKE FREE THROW
4 = MISS FREE THROW
5, 6 = IGNORE AND ROLL AGAIN

(b) TABLE D "Random digits"
LET 2-DIGIT NUMERS 01-75 = MAKE FREE THROW
AND 00, 76-99 = MISS FREE THROW
THEN READ 2-DIGIT NUMBERS FROM TABLE D

(c) DECK OF CARDS –
LET DIAMONDS, HEARTS AND SPADES = MAKE FREE THROW
CLUBS = MISS FREE THROW
DEAL ONE CARD FROM THE DECK.

(17) (a) THIS IS A LEGITIMATE SIMULATION.
THE CHANCE OF ROLLING A 1, 2, 3 IS 75%
AND THE ROLLS ARE INDEPENDENT OF EACH OTHER.

(b) THIS IS NOT A VALID SIMULATION.
THE CHANCE OF HEAD USING A FAIR COIN IS 50% AND NOT 60% FOR THE ARCHER. THIS WILL UNDER ESTIMATE HER PERCENT OF HITTING THE TARGET.

(19) (a) QUESTION: WHAT IS THE PROBABILITY THAT IN A RANDOM SELECTION OF 10 PASSENGERS NONE FROM 1ST CLASS ARE CHOSEN?

(b)
- NUMBER THE 76 PASSENGERS
  ASSIGN FIRST CLASS NUMBERS 01-12
  ASSIGN THE OTHERS NUMBERS 13-76
- IGNORE 00, 77-99 AND REPEATS
- FIND 10 UNIQUE 2 DIGIT NUMBERS FROM THE GIVEN RANDOM TABLE
- COUNT THE NUMBERS BETWEEN 01-12

(c) 71 48 ~~70 99~~ ~~84~~ 29 07 ~~71~~ ~~48~~ 63 61 68
repeat repeat

34 ~~70~~ 52
repeat

Numbers Selected – 1ST Class: 07
OTHER 71, 48, 70, 29, 63, 61, 68, 34, 52

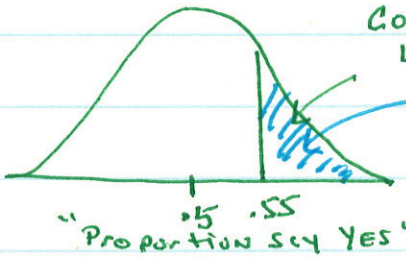
Conclusion: Based on this simulation, we found 1 out of the 10 were in 1ST class.

(d) Based on 100 repetition of the simulation, we found 15 times when none of the 10 passengers were from 1ST class. Since 15% of the samples have NO 1st class passengers, it seems plausible that this can occur and find it was reasonable that the actual selection was random.

(23) DO TEENS RECYCLE?

- AP CLASS TOOK AN SRS OF 100 STUDENTS
- THEN USED A SIMULATION SOFTWARE CALLED FATHOM TO DO 200 SRS OF 100 STUDENTS AND THAT IS A GRAPH EACH SRS sample proportion.
- YOU ARE TOLD THE TRUE PROPORTION IS .50.

(A) • AP STUDENTS IN THIS CASE SAID THAT 55 STUDENTS WOULD RECYLE.
• THEREFORE THIS SAMPLE PROPORTION IS .55
• LOOK AT THE GRAPH



COUNT THE SRS'S
43 SRS HAVE A sample proportion of .55+

$\text{AREA} = \frac{43 \text{ samples}}{200 \text{ SRS's}} = .215$

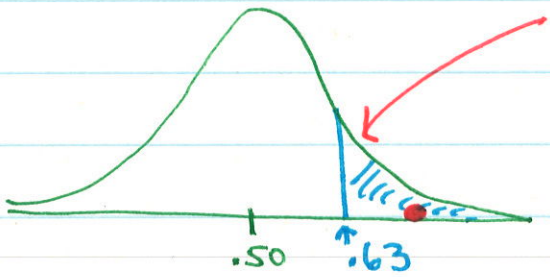
≈ 22%

CONCLUSION: BASED ON THIS SIMULCTION, WE DO NOT HAVE CONVINCING EVIDENCE THAT THE CLASS SAMPLE PROPORTION .55 (55% Recycle) IS UNUSUAL. BASED ON THE SIMULATION WE CAN SEE THAT ABOUT 22% (43/200) OF THE SRS HAVE A SAMPLE PROPORTION OF .55 STUDENTS SAY THEY RECYCLE.
∴ 22% IS NOT PARTICULARLY UNUSUAL

23 CONT

(B) Now we are told the AP Stats class had 63 STUDENTS SAY THEY RECYCLE.

- THE SAMPLE PROPORTION IS NOW .63
- LOOK AT THE SIMULATION GRAPH



COUNT THE SRS's
1 SRS has a sample proportion of .63+

Area = $\frac{1 \text{ sample}}{200 \text{ SRS's}} = .005$

≈ 0.5%

CONCLUSION BASED ON THE SIMULATION WE DO HAVE CONVINCING EVIDENCE that a sample proportion of .63 agree they recycle is UNUSUAL.

ONLY 1 OF THE 200 Samples (SRS's) YIELD A RESULT THAT SAY 63% of students recycle. THIS WOULD HAPPEN IN ABOUT 0.5% (less than 1%) WHICH SEEMS RATHER UNUSUAL

(25) QUESTION TO ANSWER

CREATE A SIMULATION TO ESTIMATE "HOW MANY MEN WOULD YOU EXPECT TO HAVE TO CHOOSE TO FIND ONE WHO IS RED-GREEN COLOR BLIND?"

Simulation:

1. USE TECHWOLOGY TO SIMULATE FINDING THE FIRST MALE THAT IS COLOR BLIND.
2. TO SIMULATE THE 7% COLOR BLINDNESS (WHICH MEAN 7 OUT OF 100 men are color blind).
   - ASSIGN NUMBERS 1-7 AS COLOR BLIND
   - ASSIGN NUMBERS 8-100 AS NON COLOR BLIND
3. USE THE GRAPHING CALCULATOR Random COMMAND randINT NO REP (1, 100) TO GENERATE NUMBERS TO REPRESENT SELECTING MEN. EXCLUDE REPEATS AND ONLY INCLUDE NUMBERS 1-100.
4. FROM THIS LIST OF RANDOM NUMBERS, COUNT THE NUMBERS UNTIL YOU GET A NUMBER BETWEEN 1 and 7 (INCLUDE COLOR BLIND IN COUNT) CREATE A STEM PLOT TO RECORD THIS NUMBER "WHICH REPRESENTS THE # OF MEN UNTIL THE 1ST COLOR BLIND MALE IS FOUND.
5. REPEAT THIS PROCESS AT LEAST 25 TIMES

EVERY STUDENTS RESULTS WILL BE DIFFERENT!

→

25 CONT STEM PLOT "NUMBER OF MEN UNTIL FOUND THE FIRST COLOR BLIND"

0	1 3 3 3 4 4 5 5 7 8
1	0 0 1 2 2 3 3 4 6 7
2	3 6
3	3
4	2
5	7

KEY 3|3 = 33

THE MEDIAN NUMBER OF MEN IS 11 AND $\bar{x}$ = 14.08.

CONCLUSION

BASED ON THIS SIMULATION, WE WOULD SUGGEST THAT WE WOULD HAVE TO SAMPLE ABOUT 14 MEN ON AVERAGE. THAT IS WE WOULD CHOOSE ABOUT 13 MEN BEFORE GETTING A COLOR BLIND MAN.

I REPEATED THIS SIMULATION:

0	2 3 5 7 7 8 8 8 9
1	0 1 2 3 4 6 7 8
2	0 1 3 4
3	1 4
4	4
5	2

MEDIAN = 13
$\bar{x} \approx 16$

KEY 5|2 = 52

BASED ON THIS SIMULATION, WE WOULD HAVE TO SAMPLE ABOUT 16 MEN TO FIND THE FIRST MALE THAT IS COLOR BLIND.

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(31) C

(32) A

(33) D 00-46 = HIT (47%) 47-99 = MISS

(34) C 82734 71490 20467 47511 4 OUT OF 10
m m m H m H H m m H

(35) C COUNT THE NUMBERS 5^{+} = 12 TIMES OUT OF 25 SIMULATIONS

(36) E
a = ODD/EVEN ~50%
b = 1 OUT OF 10 ~10% ✓
c = 1 OUT OF 10 ~10% ✓