AP Exam Review
Ch 11-13 Simulation
Practice for April

Key

Free Response Question

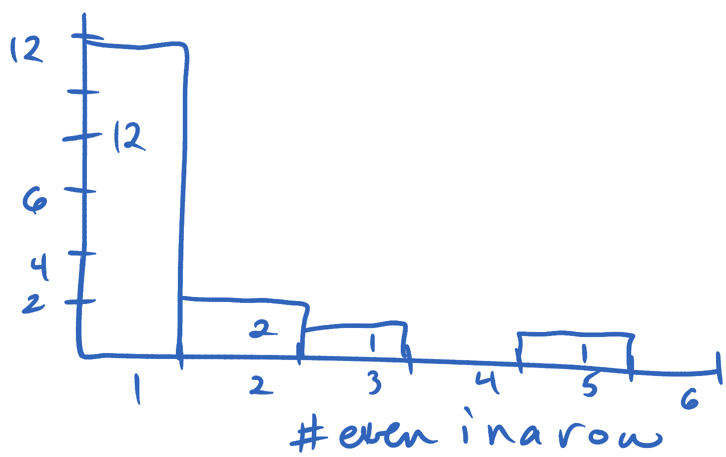
George is interested in how many times in a row even numbers can come up with repeated rolls of the dice. He would like to know if he rolled one die 60 times, what the average # of evens in a row would be. Design an simulation of rolling a dice 60 times and find out the mean number of evens in a row.
Use the random number table below. Indicate the row where you started and how you used these numbers. Show your results in a table or graph and state the mean # of evens.

Rolls
36
24

[redacted]41[redacted]6[redacted]5[redacted]	1[redacted]61315 5[redacted]2	515[redacted]6[redacted]1435	41[redacted]5[redacted]2[redacted]31	[redacted]644[redacted]5[redacted]5[redacted]	5[redacted]4311[redacted]
53115[redacted]446[redacted]	[redacted]4[redacted]6[redacted]5[redacted]6[redacted]	[redacted]5[redacted]11[redacted]4514	[redacted]5[redacted]1113[redacted]6	633[redacted]555[redacted]41	15[redacted]66[redacted]65[redacted]
1311[redacted]1[redacted]2[redacted]	[redacted]5[redacted]4[redacted]1[redacted]32	[redacted]64[redacted]4[redacted]	5435552[redacted]4	[redacted]35[redacted]264[redacted]	4[redacted]4[redacted]6[redacted]156[redacted]
[redacted]33[redacted]5	2[redacted]35[redacted]23[redacted]3[redacted]	6[redacted]1[redacted]366[redacted]	33[redacted]635[redacted]41	52[redacted]6[redacted]23114	15[redacted]643[redacted]42
[redacted]426[redacted]44	262[redacted]464[redacted]5[redacted]	[redacted]5[redacted]24	[redacted]2[redacted]4[redacted]63[redacted]	[redacted]2[redacted]3[redacted]3514	5[redacted]1[redacted]5[redacted]635

Each one digit number will be looked at, using 1–6, ignoring 0, 7–9. I will mark a vertical line when the numbers shift from even 2,4,6 to odd 1,3,5. I will continue Left to right until I get sixty.

# of evens	frequency of evens
1	12
2	2
3	1
4	0
5	1
6	0
	16



$$\mu = E(x) = \frac{12(1) + 2(2) + 1(3) + 1(5)}{16} = \frac{24}{16} = 1.5$$ # of evens in a row

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Every Monday a local radio station gives coupons away to 50 people who correctly answer a question about a news fact from the previous day's newspaper. The coupons given away are numbered from1 to 50, with the first person receiving coupon 1, the second person receiving coupon 2, and so on, until all 50 coupons are given away. On the following Saturday, the radio station randomly draws numbers from 1 to 50 and awards cash prizes to the holders of the coupons with these numbers. Numbers continue to be drawn without replacement until the total amount awarded first equals or exceeds $300. If selected, coupons 1 through 5 each have a cash value of $200, coupons 6 through 20 each have a cash value of $100, and coupon 21 through 50 each have a cash value of $50.

a. Explain how you would conduct a simulation using the random number table provided below to estimate the distribution of the number of prize winners each week.

b. Perform your simulation 3 times. (That is, run 3 trials of your simulation.) Start at the leftmost digit in the first row of the table and move across. Make your procedure clear so that someone can follow what you did. You must do this by marking directly on or above the table. Report the number of winners in each of your 3 trials.

72749	13347	65030	26128	49067	02904	49953	74674	94617	13317	300
81638	36566	42709	33717	59943	12027	46547	61303	46699	76423	350
38449	46438	91579	01907	72146	05764	22400	94490	49833	09258	300

Per the prompt, two digit numbers 01-05 are worth $200, 06-20 are worth $100, and 21-50 are worth $50. Numbers 51-99 and 00 are worth nothing.
I read two digits at a time circling winners, and SKIPPING repeats. When I have given away $300 or more I stop.

The winnings each week are
3 people for $300
5 people for $350
4 people for $300

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Boys vs Girls: Free Response Question
Two women meet at the obstetrician's office waiting for an ultrasound to determine the sex of their second child. Beth and Laura already have one boy. Beth said, "I heard that it is more likely to have both children the same sex rather than one of each." "Nonsense," replied Laura, "you have the same odds of having two different sex children or two children the same." Who is correct, Beth or Laura?

Π is the proportion of families who have two same sex children.

Conduct a simulation with the random number table below for sixty (60) families to determine if Beth or Laura is correct. Conduct a test of interference for Ho: π = .50 Ha: π > .50

S S S S S S S S S S S S	8417706757	1761315582	5150681435	4105092031	0644905059	5988431180	19/30
S S S S S S S S S S S S	5311584469	9486857967	0581184514	7501113006	6339555041	1586606589	13/30
	1311971020	8594091932	0648874987	5435552704	9035902649	4749671567	
	9426808844	2629464759	0898957024	9728400637	8928303514	5919507635	
	0330972605	2935723737	6788103668	3387635841	5286923114	1586438942	

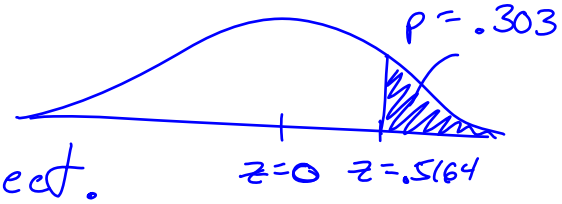
odd = boys even = girl I read off every two numbers which represent a 2 child family. I will mark S = same = both odd or even. I mark D = different = one odd/one even.

same = 32 = p_s = $\frac{32}{60}$ = .5333
different = 28 = p_d =

$H_o: \pi_s = .5$
$H_a: \pi_s > .5$

$$z = \frac{p_s - \pi_s}{\sqrt{\frac{\pi_s(1-\pi_s)}{n}}} = \frac{.5333 - .5}{\sqrt{\frac{(.5)(.5)}{60}}} = .5164$$

conditions
① random sample yes
② $np \geq 10$ $n(1-p) \geq 10$
$60(.533) \geq 10$ $60(.467) \geq 10$
③ $n < 10\%$ population yes



I fail to reject.
p > all alpha. The prob of a family getting same sex = .5.