Statistics 2 Spring 2002 Midterm 2

Statistics 2
Second Midterm Exam
Spring 2002

Printed Name _____
(Please also p ›p of each page)

Signature ___

Student ID # _____

Circle your T. Carse Pawel Lasieki Gang Liang

James Van Campen

1	tal
5	4

Show your work. A correct answer with no justification or incorrect reasoning will receive no credit. Use the normal table at the end of this exam as needed.

AM 24
SD 1.5

Rossan Chen

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1. [5] A six-sided die is rolled ten times. What is the chance of a "two" appearing 9 or 10 times?

9 times: $\frac{10!}{9!1!}\left(\frac{1}{6}\right)^9\left(\frac{5}{6}\right)^1 = 8.269\times10^{-7}$

10 times: $\frac{10!}{10!0!}\left(\frac{1}{6}\right)^{10}\left(\frac{5}{6}\right)^0 = 1.65\times10^{-8}$

chance that a "two" appears 9 or 10 times =

$8.269\times10^{-7} + 1.65\times10^{-8} = 8.43\times10^{-7}$

or 0.0000843 %

2. [5] A box contains three apples and two oranges. Three fruits are drawn without replacement. What is the chance of getting at least one orange?

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1 − chance of no oranges = chance of getting at least one orange

chance of no oranges = $\frac{3}{5}\times\frac{2}{4}\times\frac{1}{3} = \frac{1}{10}$ (or all apples)

A A A O O

chance of at least one orange = $1-\frac{1}{10} = \frac{9}{10}$ or 90%

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3. [5] Two fair coins are tossed simultaneously. You do this three times and if you always get one head and one tail appearing, you win a prize. What is the chance of winning the prize?

(H) (T)

HH
HT] win
TH
TT

50% chance of winning on one toss

$(50\%)^3$ = chance of winning on three tosses

= 12.5%

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4. [5] A box contains three oranges and four apples. Approximately, what is the chance that more apples than oranges are drawn in 25 draws with replacement?

O O O A A A A ⇒ 0, 0, 0, 1, 1, 1, 1 for apples

SD of box = $|1-0|\sqrt{\frac{4}{7}\cdot\frac{3}{7}} = 0.49487$

Avg of box = $\frac{4}{7}\times 1 + \frac{3}{7}\times 0 = \frac{4}{7}$

EV = 25 × Avg = 14.2857

SE of sum = $\sqrt{25}\times SD = 2.4743$

continuity correction for discrete numbers

P(apples) > P(oranges)

If more apples than oranges, we have sum of 13 or more from our box. But According to our continuity correction, we start at 12.5 when # apples > # oranges.

$\frac{12.5 - 14.2857}{2.4743} = -0.7217$ $\quad Z = 0.72,\ A = 53$

Shaded Area = chance that there will be more apples than oranges

$= 53 + \left(\frac{100-53}{2}\right) =$ 76.5%

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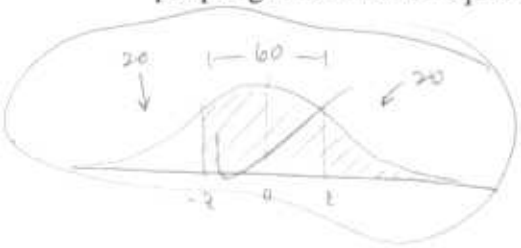
4 pts

5. [5] A simple random sample of 100 people is taken from a large population. 30% of the population are married. Fill in the blank and show your work: There is approximately an 80% chance that the sample contains a percentage of married people greater than or equal to 26.1%.



If A = 60, z = 0.85

wrong S.E.

SE for % form = SD / √100 = 0.85 → SD = 8.5

1 pt

Let x be the % at which there will be 80% or more chance that sample contains married people

$\frac{x - 30}{8.5} = -0.85$ → $x = (-0.85 \times 8.5) + 30$ 2 pts.

= 22.475

1 pt

There is an 80% chance that the sample contains a percentage of Married people greater than or equal to 22.8%.

EV = 0.3 = 30%

SE for % form = $\frac{SD}{\sqrt{100}} = \frac{\sqrt{0.21}}{\sqrt{100}} = 4.58\%$

$SD = \sqrt{0.7 \times 0.3} = \sqrt{0.21}$

$SD = \frac{x - 30\%}{4.58\%} = -0.85$ → $x = (-0.85 \times 4.58\%) + 30\%$

$= 26.1\%$

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6. A simple random sample was taken of 1600 residential houses in a large city. The average number of residents per household under the age of 21 was 1.5 with an SD equal to 1.0.

(a) [4] An approximate 90% confidence interval for the average number of residents per household in the city under the age of 21 is ____ to ____.

SE of avg $= \frac{\sqrt{1600} \times 1.0}{1600} = 0.025$

90% confidence interval

$z = 1.65$

$0.025 \times 1.65 = 0.04125$

Range = Avg ± (z for 90% × SE of avg)

$= 1.5 \pm 0.04125$

$= 1.54125 - 1.45875$

1.54 to 1.46

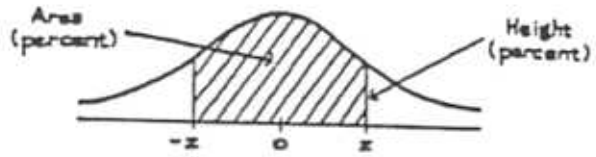
(b) [3] Copy the larger of your two answers from (a) into the blank in the following statement: There is approximately a 95% chance that the average number of residents per household under the age of 21 in the city is less than 1.54. Is this statement *True* or *False*, and why?

False. Chance does not apply to the population. Its percentages are fixed. Chance only applies to the sample.

(c) [3] Copy your answers from (a) into the blanks in the following statement: Approximately 90% of the households in the city have between 1.46 and 1.54 residents under the age of 21. *True* or *False* and why?

False. We are dealing with averages here. What should be said is: given the range 1.46 to 1.54, there is a 90% chance that the average of the city's residents per household under 21 will fall in that range

Table



A NORMAL TABLE

z	Height	Area	z	Height	Area	z	Height	Area
0.00	39.89	0	1.50	12.95	86.64	3.00	0.443	99.730
0.05	39.84	3.99	1.55	12.00	87.89	3.05	0.381	99.771
0.10	39.69	7.97	1.60	11.09	89.04	3.10	0.327	99.806
0.15	39.45	11.92	1.65	10.23	90.11	3.15	0.279	99.837
0.20	39.10	15.85	1.70	9.40	91.09	3.20	0.238	99.863
0.25	38.67	19.74	1.75	8.63	91.99	3.25	0.203	99.885
0.30	38.14	23.58	1.80	7.90	92.81	3.30	0.172	99.903
0.35	37.52	27.37	1.85	7.21	93.57	3.35	0.146	99.919
0.40	36.83	31.08	1.90	6.56	94.26	3.40	0.123	99.933
0.45	36.05	34.73	1.95	5.96	94.88	3.45	0.104	99.944
0.50	35.21	38.29	2.00	5.40	95.45	3.50	0.087	99.953
0.55	34.29	41.77	2.05	4.88	95.96	3.55	0.073	99.961
0.60	33.32	45.15	2.10	4.40	96.43	3.60	0.061	99.968
0.65	32.30	48.43	2.15	3.96	96.84	3.65	0.051	99.974
0.70	31.23	51.61	2.20	3.55	97.22	3.70	0.042	99.978
0.75	30.11	54.67	2.25	3.17	97.56	3.75	0.035	99.982
0.80	28.97	57.63	2.30	2.83	97.86	3.80	0.029	99.986
0.85	27.80	60.47	2.35	2.52	98.12	3.85	0.024	99.988
0.90	26.61	63.19	2.40	2.24	98.36	3.90	0.020	99.990
0.95	25.41	65.79	2.45	1.98	98.57	3.95	0.016	99.992
1.00	24.20	68.27	2.50	1.75	98.76	4.00	0.013	99.9937
1.05	22.99	70.63	2.55	1.54	98.92	4.05	0.011	99.9949
1.10	21.79	72.87	2.60	1.36	99.07	4.10	0.009	99.9959
1.15	20.59	74.99	2.65	1.19	99.20	4.15	0.007	99.9967
1.20	19.42	76.99	2.70	1.04	99.31	4.20	0.006	99.9973
1.25	18.26	78.87	2.75	0.91	99.40	4.25	0.005	99.9979
1.30	17.14	80.64	2.80	0.79	99.49	4.30	0.004	99.9983
1.35	16.04	82.30	2.85	0.69	99.56	4.35	0.003	99.9986
1.40	14.97	83.85	2.90	0.60	99.63	4.40	0.002	99.9989
1.45	13.94	85.29	2.95	0.51	99.68	4.45	0.002	99.9991