03/19/15

Spring 2015 MATH 160 Exam #2 Form C (chapters 4 - 6) 200 points

Name: [redacted]

Instruc [redacted] ck/front, typed/written) and calculator

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1) Last year a local newspaper reported that 55% of all registered voters in a certain area favor a seven-day waiting period before the purchase of a handgun. Among 50 randomly selected registered voters, what is the probability that $n=50$ $P=.55$ $q=1-P=.45$

a) exactly 20 favor a seven-day waiting period before the purchase of a handgun. (round to 3 places after the decimal)

$X=20$

Binom pdf(n,p,x) => Binom pdf$(50,.55,20)=.012$ ✓

b) at least 20 favor a seven-day waiting period before the purchase of a handgun. (round to 3 places after the decimal)

$X=20,21\ldots50$

$1-$Binom cdf(n,p,x) => $1-$Binom cdf$(50,.55,19)=.988$ ✓

2) Last year a local newspaper reported that 55% of all registered voters in a certain area favor a seven-day waiting period before the purchase of a handgun. Among 50 randomly selected registered voters, what is the probability that less than 30 favor such a waiting period? (Round final answer to 4 places)

Approximate the probability that that less than 30 favor such a waiting period using the NORMAL DISTRIBUTION. (round final answer to 4 places after the decimal)

$n=50$ $P=.55$ $q=1-p=.45$

CLEARLY write all your steps for credit.

step 1: $np\geq 5$ and $nq\geq 5$

step 2: $\mu=np=50.(.55)$

$\mu=27.5$

$\sigma=\sqrt{npq}=\sqrt{50.(.55).(.45)}$

$\sigma=3.51781182$

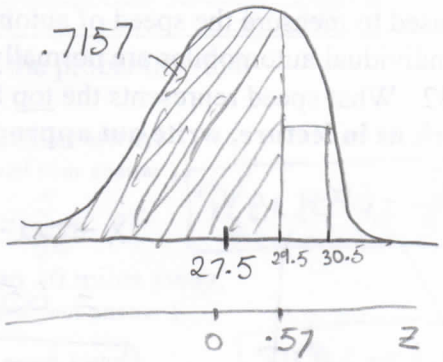
step 3: $X=30$

step 4: $X-.5=30-.5=29.5$

$X+.5=30+.5=30.5$

step 5: $z=\frac{X-\mu}{\sigma}=\frac{(29.5-27.5)}{3.51781182}$

$z=.57$



$P(X<30)=.7157$ ✓

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3) In the North Carolina Pick 5 Lottery a player selects a set of five (5) single-digit numbers between 0 and 9 (no repeats). In order to be a winner, the numbers may be selected in any order. Find the probability of winning the North Carolina Pick 5 Lottery.
Leave your answer in fraction form.

$nCr \Rightarrow {}_{10}C_5 = 252$

$P(W) = \frac{1}{252}$ ✓

4) A fundraiser at a local church involves paying $2.00 at a chance of winning at the following game;

The player randomly selects a marble from a bowl containing 20 marbles of different colors. There are 11 red marbles, 5 blue marbles, 3 yellow marbles and 1 green marble. The player is blindfolded and cannot see the marble he or she is selecting.

The winnings for selecting a green marble is $40, selecting a yellow marble is $10, selecting a blue marble is $4 and there are no winnings for selecting a red marble.

a. Find the **expected value** for this game. Round to the nearest cent.
(Show your work as in lecture, write out appropriate formulas or calculator command)

$E = \Sigma[x \cdot P(x)] \Rightarrow E = 2.5$ ✓

	x	P(x)
G	38	1/20
Y	8	3/20
B	2	5/20
R	-2	11/20

You will only get credit for the following questions if you answered part a.

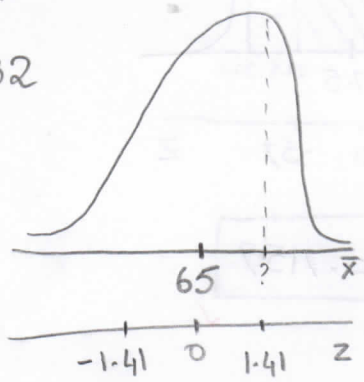
b. Does the game favor the player or the church? Favor the Player ✓
because $E > 0$

c. Is the church making a profit? Yes (NO)

$\$paid + E \Rightarrow 2 + 2.5 = 4.5$ −1

5) A radar unit is used to measure the speed of automobiles on an expressway during rush-hour traffic. The speeds of individual automobiles are normally distributed with a mean of 65 mph and a standard deviation of 5.32 What speed represents the top 8% ? Round your answer to the nearest integer and **Show your work as in lecture, write out appropriate formulas, draw appropriate graphs.**

$\mu = 65$
$\sigma = 5.32$

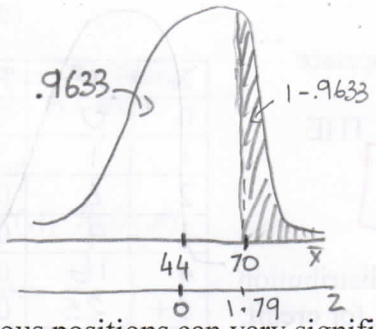


$X = \mu + (z \cdot \sigma)$
$= 65 + (1.41)(5.32)$
$X = 72.5 \text{ mph}$ ✓

6) Based on a report by USA today, 25 to 34-year-olds spend the most each week on fast food with a weekly mean amount of $44. Assuming that weekly fast food expenditures are normally distributed with a standard deviation of $14.50, what is the probability that a 25 to 34-year-old will spend more than $70 a week on fast food? Round your final answer to 4 decimal places. **Show your work as in lecture, write appropriate formulas, draw appropriate graphs, do not use calculator commands.**

$\mu = 44$

$\sigma = 14.50$



$$z = \frac{\bar{x} - \mu}{\sigma}$$

$$z = \frac{(70 - 44)}{14.50}$$

$$z = 1.79$$

$P(x > 70) = 1 - .9633$

$P(x > 70) = .0367$ ✓

7) Salaries for various positions can vary significantly, depending on whether or not the company is in the public or private sector. According to the U.S. Department of Labor, the mean annual salary for managers employed by the federal government is $ 76,503. Assume that annual salaries for this type of job are normally distributed and that the standard deviation is $8850. In a sample of 20 managers, what is the probability that the sample mean annual salary is less than $78,000? (Round final answer to 4 places) **Show your work as in lecture, write appropriate formulas, draw appropriate graphs, do not use calculator commands.**

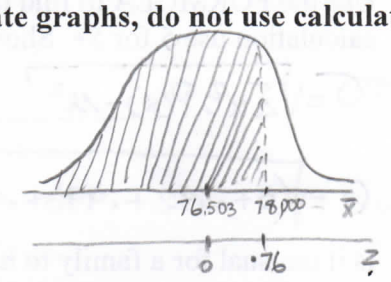
$\mu = 76{,}503$ $\sigma = 8850$ $n = 20$

$$z = \frac{x - \mu}{\sigma/\sqrt{n}}$$

$$= \frac{(78{,}000 - 76{,}503)}{(8850/\sqrt{20})}$$

$z = .76$

$P(x < 78{,}000) = .7764$ ✓



On a survey I asked students if they bring their lunch, buy lunch or go home to eat lunch. Here are the results of that survey matched up with how far they live away from campus.

	Less than 5 miles	5 to 10 miles	More than 10 miles	Total
Bring lunch	5	15	25	45
Buy lunch	15	26	10	51
Go home to eat lunch	30	15	2	47
Total	50	56	37	143

If one of the 143 subjects is randomly selected, find the probability that

8) The student brings lunch **given** lives less than 5 miles away.
(Keep your answers in fraction form and **show how you obtained your answer**)

$$P(BL|L5) = \frac{P(L5 \text{ and } BL)}{P(L5)} = \frac{5/143}{50/143} = \frac{5}{50} \Rightarrow$$

$P(BL|L5) = \frac{5}{50}$ ✓

9) The student buys lunch **or** he/she lives more than 10 miles away.
(Keep your answers in fraction form and **show how you obtained your answer**)

$$P(BL \text{ or } L10) = P(BL) + P(L10) - P(BL \text{ and } L10) \Rightarrow$$

$$= \frac{51}{143} + \frac{37}{143} - \frac{10}{143}$$

$P(BL \text{ or } L10) = \frac{78}{143}$ ✓

10) The student buys lunch **and** he/she lives more than 10 miles away.
(Keep your answers in fraction form and **show how you obtained your answer**)

$P(BL \text{ and } L10) = \frac{10}{143}$ ✓

11) Census data are often used to create probability distributions for various random variables. Census data for families in 2008 shows the number of children per household. The accompanying table shows the probability distribution for x, which is the number of children per household. (**Fill in the missing probability and answer the questions below**)

Round your answers to the thousandths place when appropriate

X	X^2	P(X)
0	0	0.111
1	1	? .482
2	4	0.249
3	9	0.106
4	16	0.032
5 +	25	0.020

a) What is the probability that a family, has one child? USE THE TABLE.

$x=1 \rightarrow .482$

b) Use the FORMULA to find the **mean** of the probability distribution above. In your calculation use 5 for 5+ Show your work for credit.

$\mu = \sum x \cdot p(x) = 1.526$ ✓

c) Use the FORMULA to find the **standard deviation** of the probability distribution above. In your calculation use 5 for 5+ Show your work for credit.

$\sigma = \sqrt{\sum x^2 \cdot p(x) - \mu^2}$

$x^2(p(x))$: 0, .482, .996, .954, .512, 5

$3.444 - 1.526^2 = \sqrt{1.1153}$

$3.444 - 2.328676 = 1.056$ ✓

d) Is it unusual for a family to have 3 children? **For credit** you must explain using the appropriate rule.

$\pm 2\sigma$: $1.526 + (1.056)2 =$ $1.526 - (1.056)2 =$ no, it is not unusual because 3 is within 2σ from the mean

e) Is it unlikely for a family to have 4 children? **For credit** you must explain using the appropriate rule.

yes it is unlikely because P(4 children) is < 0.05

12) Which of the following Quantile Plot represents data that is normally distributed? B ✓