Fall 2013 MATH 160 **(chapters 4 - 6)**

Name: Key

SHOW YOUR WORK. Answers alone are not sufficient. If you are using your calculator, WRITE DOWN THE COMMAND USED. If you are working with a normal distribution, draw the normal curve, shading the appropriate area.

In a random sample of a recent U.S. census the following information was obtained. Below is a table that shows education and marital status for 665 randomly selected U.S. residents.

Education Level	Single	Married	Divorced	Widow/Widower	Total
Less than HS	17	70	10	28	125
ONLY High School (HS)	68	240	59	30	397
College Or Higher	27	98	15	3	143
Total	112	408	84	61	665

If one of the 665 subjects is randomly selected, find the probability that

(Keep your answers in fraction form and **show how you obtained your answer**)

1) The person graduated ONLY High School **or** is divorced.

OHS D

$P(\text{OHS or D}) = P(\text{OHS}) + P(\text{D}) - P(\text{OHS and D})$

$\frac{397}{665} + \frac{84}{665} - \frac{59}{665} = \boxed{\frac{422}{665}}$

2) The person completed a college degree or higher **given** that they are married. (m)

C

$P(C|m) = \frac{P(C \text{ and } m)}{P(m)} = \frac{98/665}{408/665} = \frac{98}{408}$

Reduces to $\boxed{\frac{49}{204}}$

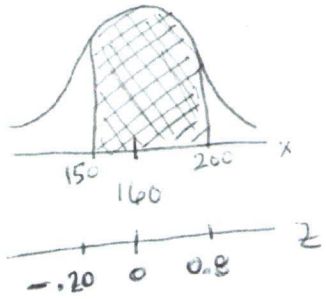
3) How many ways can 1st, 2nd, and 3rd place prizes be awarded in a local science fair, if there are 25 participants?

$25 \times 24 \times 23 = \boxed{13{,}800}$

OR

$_nP_r$ where $n = 25$, $r = 3$

4) The serum cholesterol levels in milligrams/deciliter (mg/dL) in a certain Mediterranean population are found to be normally distributed with a **mean of 160** and a **standard deviation of 50**. Scientists of the national Heart, Lung and Blood Institute consider this pattern ideal for a minimal risk of heart attacks. If one person from this population is randomly selected, **find the probability** that his/her blood cholesterol levels are between 150 and 200 mg/DL (round your answer to 4 decimal places).



$\mu = 160$

$\sigma = 50$

$P(150 < x < 200) = P(-0.20 < z < 0.80)$

$= 0.7881 - 0.4207$

$= \boxed{0.3674}$

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

$z = \frac{150 - 160}{50} = -0.20 \rightarrow$ Table A2 0.4207

$z = \frac{200 - 160}{50} = 0.80 \rightarrow 0.7881$

Subtract

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

5) Airlines routinely overbook their flights anticipating that passengers will not show up for the flight they are booked on. The number of people who do not show up for their flight is normally distributed with a mean of 10 "no shows" and a standard deviation of 3.4 What is the **probability** that a randomly selected sample of 15 flights has an average of more than 12 "no shows" ? (Round to 4 decimal places)

$\mu = 10, \sigma = 3.4, \bar{x} = 12, n = 15$

$z = \frac{(12 - 10)}{(3.4/\sqrt{15})} = 2.28$

$P(x > 12) =$

$P(z > 2.28) = \boxed{0.0113}$

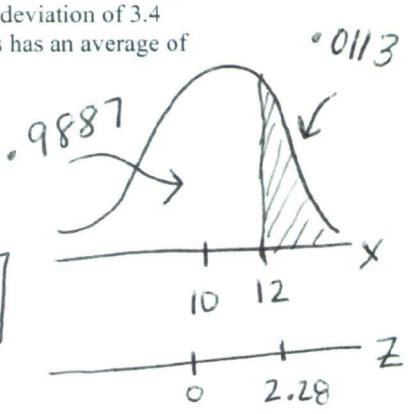
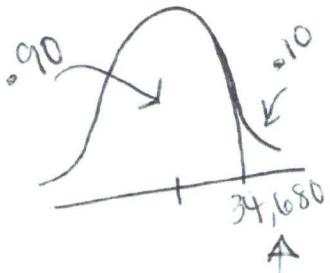


Table A2

Left area = 0.9887

Right area = $1 - .9887 = 0.0113$

6) The salaries of elementary school teachers in the United States are normally distributed with a mean of \$27,000 and a standard deviation of \$6,000. What is the cutoff salary for teachers in the top 10% (Round your answer to the nearest dollar)



$\mu = 27{,}000$

$\sigma = 6{,}000$

$z = \text{invnorm}(.90)$ ← left area

$z = 1.28$

$x = \mu + z\sigma$

$x = 27000 + 1.28(6000)$

$\boxed{x = \$34{,}680}$

7) Find the **probability** of winning a lottery with the following rule.
Select the six winning numbers from 1,2,…, 30 (The numbers DO NOT have to be drawn in the same order that they were selected. No repeats)

(You may leave your answer in fraction form)

nCr

$$P(w) = \frac{1}{nCr} = \frac{1}{30C_6} = \frac{1}{593,775}$$

8) The accompanying table shows the probability distribution for x, the number that shows up when a loaded die is rolled (**Fill in the missing probability and answer the questions below**)

"A loaded die means that it is not a fair die" so we can't assume that all sides have an equal chance of rolling face up.

(Round your answers to the hundredths place)

$\Sigma P(x) = 1$

X	P(X)
1	0.01
2	0.21
3	0.14
4	0.10
5	? 0.39
6	0.15

a) What is the probability that a 5 is rolled? USE THE TABLE

$P(5) = 1 - 0.61 = 0.39$

b) Find the **mean** and the **standard deviation** of the probability distribution above. (Round answer to the tenths place)

1-VarStats L_1, L_2 $\mu = 4.1$ $\sigma = 1.4$

c) Is it unusual to roll a 1? EXPLAIN. Do not just give a yes/no answer. (Use the rule for unusual probabilities)

Yes, Since $0.01 < 0.05$

9) At a pediatrician's office 10% of the patients do not show up for their appointment. Find the probability that out of 18 appointments $n = 18$ $P = 0.10$

a) Two patients do not show up. (round to the thousandths place)

$X = 2$ binompdf(18, 0.10, 2) = **0.284**

b) At least two patients do not show up.

1 − binomcdf(18, 0.10, 1) = **0.550**

c) At most two patients do not show up.

binomcdf(18, 0.10, 2) = **0.734**

d) In 18 appointments, where 10% of patients do not show up, find the **mean** and **standard deviation** of "no shows"

$n = 18$
$P = 0.1$
$q = 0.9$

$\mu = np$ **$\mu = 1.8$**

$\sigma = \sqrt{npq}$ **$\sigma = 1.3$**

one Queen ◊ = $10-2 three Other Queen = $5-2 12 Other ◊ = $1-2

10) A local casino charges players $2.00 to play a card game. A person selects a card from a well-shuffled deck of 52 cards. If the queen of diamonds is selected, the player wins $10. If a queen card is selected (excluding the queen of diamonds) the player wins $5, If a "diamond" card is selected (excluding the queen of diamonds) the player wins $1. There are no winnings if the player selects other cards.

36 Other Cards left

L_1 X	L_2 P(X)	
8	1/52	Q◊
3	3/52	Q
-1	12/52	◊
-2	36/52	other

a) Find the **expected value** for this game. 1-varstats L_1, L_2

$E = \sum x \cdot P(x)$

$E = -1.29$ $-0.2

b) Does the game favor the player or the casino?

Since $E < 0$ favors casino

c) If the casino was not interested in making a profit (E = 0) what should it charge the player?

$ amt Paid + E

$2 + (-1.29) \rightarrow$ $0.71

11) A card is drawn from a well-shuffled deck of 52 cards. What is the probability of drawing a *"three"* **or** *a face card (king, queen, jack)*? (Round answer to the thousandths place)

3×4 4 suits

3 of ◊, 3 of ♣
3 of ♡, 3 of ♠

$P(3 \text{ or } f) = P(3) + P(f)$

$= \frac{4}{52} + \frac{12}{52}$

$= 16/52 \rightarrow 4/13$ or 0.308

12) Based on your answer **is it unusual** that you will draw a "three" or a face card? Explain using the rule for unusual probabilities.

NO

NO, Since $0.308 > .05$

13) Are the two events disjoint (in other words are the two events mutually exclusive)?

Yes Since P(3 and f) = 0 can't have a card that's a 3 and a face card.