Ma	ath 247: Test 2 (Fall, 2019		Name:	KEY		
Test/70 points		ts Take Home _		30 points		
	ow work where necessary in d a percent Round all answer		probabilities	and express each as a	fraction, a decimal,	
1.	(2 pts) Which of the following numbers could be probabilities? Circle all correct answers.					
	a) 2.051 b) 0	c) 0.325	d) -0.732	(e) 1		
2.	(2 pts) If 28 of 40 people in the class will not have brow		s, what is the pr	robability a randomly Alternat B = brow	r selected student in	
3.	(4 pts) (a) Assuming it is having a boy?	equally likely for a woman	to have a boy			
	P (Be	was and the buy	me Con Con of			
	What type of probabili	y is this? (circle one)	Empirical	Theoretical		
(b) The births in a large city in one year revealed that out of 100 births, 46 of them were boys. According to this result, what is the probability that a woman had a boy in that city?						
	P(boy) = 10	5 = .46 = 46°	/.			
	What type of probability is	this? (circle one)	Empirical	Theoretical		
4.	(2 pts) Use your knowledge associated:	of the world to determine	whether the fo	llowing events are in	dependent or	
(a)	Being a basketball player in	the NBA; being taller tha	an average.	INDEPENDENT	ASSOCIATED	
(b)	The outcomes (heads or tail	s) on the flip of two separa	te coins:	INDEPENDENT	ASSOCIATED	

5. (3 pts) Suppose Event A is that a person is taking a statistics exam. Give an example of another event, Event B, that is mutually exclusive to Event A.

Event B=The person is sleeping (answers will vary)

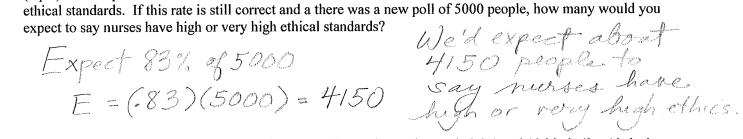
Favorite student answers: Riding a cow, surfing at the Rock,

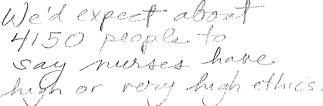
in a coma (!), swimming in a pool

hiking Bishop's Peak, dancing on a stage,

playing a guitor...

6.	(4 pts) The probability that a fair coin lands heads is 0.5. Therefore, we can be sure that if we toss a coin a large number of times (say, 10,000 times), the proportion of times it lands heads will (circle your answer)								
2	(a) be close to 0.5 (b) be equal to 0.5 (c) be greater than 0.5 (d) can't tell								
	What is the name of the Law that supports your answer above?								
2	The Law of Large Numbers								
7.	7. (12 pts) This year, (2019), Pew Research found that 90% of all U.S. adults use the internet.								
	(a) If two unrelated U.S. adults are randomly selected, what is the probability that both of them use the internet?  P(I_1 and I_2)  = P(I_1) • P(I_2)  = (9)(.9) = .8/ = 81%  (b) What is the probability that pointer of them use the internet?								
(b) What is the probability that neither of them use the internet? $P(I^{C}) = ./$ $P(I, C) = P(I, C) \cdot P(I_{C})$ $= P(I, C) \cdot P(I_{C})$									
4	(c) What is the probability that exactly one of them use the internet? $P(I, \text{ and } I_2 \cap \mathcal{C}, I_1 \cap \mathcal{C}, I_2)$								
	= (.9)(.1) + (.1)(.9) = $.09 + .09 = .18 = 18\%$								
(d) ]	In the same study, Pew Research found that only 75% of adults in rural areas use the internet. This tells us								
	internet use and the area a US adult lives are most likely (circle one) INDEPENDENT ASSOCIATED								
8.	(6 pts) Let's define "I" to be the event that a person uses Instagram.  (a) What does P(I) mean? The probability that a randomly selected person uses								
	Instagram								
	(b) What is the <u>complement</u> , for event I?								
	Ic= the event someone does not use Instagram.								
•	(c) If $P(I) = .78$ for college students, what is $P(I^{C})$ and what does it mean?								
	P(IC)=178=.22=22%. This means the probability a college student does not use Instagram is 22%.								





10. (7 pts) A deck of cards has 52 cards, 4 suits (heart, diamonds, spades, and clubs) and 13 kinds (2 - 10, jack queen, king, ace). If you pick one card at random from the deck, find the following:

(a) The probability the card is a queen. 
$$P(queen) = \frac{4}{52} = .077 = 7.7\%$$

(3 pts) A Gallup Poll from 2009 estimated that 83% of all US adults thought that nurses had high or very high

(b) The probability the card is a heart. 
$$P(\heartsuit) = \frac{13}{52} = .25 = 25\%$$

(c) The probability the card is a queen or a heart. 
$$Q = gueen$$

$$P(Q \circ R \circ P) = P(Q) + P(\circ P) - P(Q \text{ and } P)$$

$$= \frac{4}{52} + \frac{13}{52} - \frac{1}{52}$$

$$= \frac{16}{52} = .308 = 30.8\%$$
10. (10 pts) Suppose you have a bag with 5 yellow marbles, 11 red marbles, and 4 blue marbles. Find the

Total = 20 marbles

following.

P(blue) = 
$$\frac{4}{20} = .2 = 20\%$$

(b) If you choose two marbles with replacement, what is the probability both will be yellow?

$$Y = yellow$$
  $P(Y_1 \text{ and } Y_2)$   
=  $\frac{5}{20} \cdot \frac{5}{20} = .0625 = 6.25\%$ 

(c) If you choose two marbles without replacement, what is the probability both will be yellow?

$$P(Y_1 \text{ and } Y_2)$$
  
=  $\frac{5}{20} \cdot \frac{4}{19} = .0526 = 5.26\%$ 

11. (15 pts) A 2019 study investigating vaping and sleep disturbance (not sleeping well) used a sample of 274 women who responded to the questions of "Do you vape (yes/no)", and "Do you have sleep disturbances (yes/no)". A summary of their answers is given in the table below:

S=sleep disturb.
V= vape
VC = no vape

		ер	
	Distur	10	
Vape?	No	Yes	lotax
No	104	60	164
Yes	32	78	110
Total	136	138	274

1 (a) What type of study is this (circle one)?

**OBSERVATIONAL** 

CONTROLLED EXPERIMENT

(b) What is the <u>research question</u> for this study?

Note: The guestion is NOT does vaping CAUSE sleep disturbance.

3 (c) What is the probability a randomly chosen person from the study has sleep disturbances?

(d) What is the probability a person has sleep disturbances, given that she vapes?

$$P(S|V) = \frac{78}{110} = .709 = 70.9\%$$

$$(Wow), much higher rate of sleep disturbance in the vaping group!)$$

3 (e) What is the probability a person has sleep disturbances, given that she doesn't vape?

$$P(S/V^{c}) = \frac{60}{164} = .366 = 366$$
 %

3 (f) Are vaping and sleep disturbances associated or independent in this group? Explain, and include the YES, Vaping and sleep disturbance are definitely associated.

The percentage of vapers with troubled sleep was much frigher than for the overall group (70.9% vs. 50.4%) while the non-vapers had a lower percent of women while the non-vapers had a lower percent of women percentages you found in the answers above in your explanation. while the sold with sleep disturbance (36.9% vs 50.4%).

Note that anxiety is a major confounder here: Vape > Bad

Note that anxiety is a major confounder here: