

NAME AND NETID:

Angner Ky.

Instructions:

1. You may use one of the approved calculators for the course. Besides this calculator, no other electronic device is allowed (unless explicit permission). These unauthorized electronic devices should be turned off and placed in your bag. Failure to do so will result in a loss of points and/or further penalties.
2. The first part of the exam consists of multiple choice questions, each of which is worth 4 points. The second part of the exam consists of long answer questions, where you need to present all your work neatly in the space provided, and box the final answer(s). You will be graded on both your final answer and the quality and detail of your work.

Aggie Code of Honor: An Aggie does not lie, cheat or steal or tolerate those who do.

SIGNED:

The signature in the box above certifies that you have thoroughly read the instructions and agree to abide by them.

Helpful Information:

- (a) The alphabet has 26 letters; a through z.
- (b) Standard Deck of Cards: 13 ranks (ace, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, J, Q, K) and 4 suits (diamonds, hearts, clubs, spades)

A	2	3	4	5	6	7	8	9	10	J	Q	K
◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇
A	2	3	4	5	6	7	8	9	10	J	Q	K
♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥	♥
A	2	3	4	5	6	7	8	9	10	J	Q	K
♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣
A	2	3	4	5	6	7	8	9	10	J	Q	K
♠	♠	♠	♠	♠	♠	♠	♠	♠	♠	♠	♠	♠

Work Space (if needed)

Question	Points
1-9	/36
10	/9
11	/9
12	/10
13	/10
14	/10
15	/8
15	/8
Total	/100

Question 1. Let X denote the random variable measuring the number of rolls taken of a single 21-sided dice until a 9 is obtained. Let Y denote the random variable measuring the possible diameter of the lily pads at the George H. W. Bush Presidential Library Lake. Examine the following statements about X and Y and determine which are true.

- I. X is continuous. II. X is binomially distributed.
 III. X and Y are infinite. IV. Y is continuous.

- A. I, II, III, and IV
 B. III and IV only
 C. III only
 D. IV only
 E. II, III, and IV only

Question 2. A box contains ten red balls, ten green balls, and ten blue balls. If three balls are taken, calculate the probability of at least two red balls being chosen.

- A. $36/127$
 B. $51/203$
 C. $51/27$
 D. $4/5$
 E. $3/27$

$$\frac{\overbrace{C(10,2)}^{2 \text{ red}} \cdot \overbrace{C(20,1)}^{1 \text{ other}} + \overbrace{C(10,3)}^{3 \text{ red}} \cdot \overbrace{C(20,0)}^{0 \text{ other}}}{C(30,3)}$$

Question 3. The profit for a car rental company during the first nine weeks of the Fall semester is as follows: \$4000, \$8000, \$2000, \$7000, \$5000, \$13000, \$2000, \$4000, \$2000. Determine the mode and the median of this data.

- A. Mode: 4000. Median: 2000.
 B. Mode: 2000. Median: 5000.
 C. Mode: 4000. Median: 13000.
 D. Mode: 2000. Median: 4500.
 E. Mode: 2000. Median: 4000.

Question 4. Carmen, a computer sales representative, believes that the odds are 7 to 4 that she will clinch the sale of a minicomputer to a certain company. What is the probability that Carmen will NOT make the sale?

- A. $\frac{4}{7}$
- B. $\frac{3}{28}$
- C. $\frac{7}{11}$
- D. $\frac{4}{11}$
- E. $\frac{3}{7}$

$$P(E^c) = 1 - P(E) = 1 - \frac{7}{7+4} = \frac{4}{11}$$

Question 5. Let S is a finite sample space, let A and B be independent events satisfying $P(B) = 0.4$ and $P(A) = 0.8$. Determine which of the following is true.

- A. $A \cap B = \emptyset$.
- B. $B \subseteq A$.
- C. $A \cup B = S$.
- D. $P(B) = P(B|A)$.
- E. $P((A \cap B)^c) = 0.68$.

$$P(A \cap B) = P(A) \cdot P(B) = 0.32$$

$$P((A \cap B)^c) = 0.68$$

Question 6. The probability of a Texas A&M student of going to a football game depends on how long they have been at the University and if they have homework for Math 141. Let F denote the event of a freshman going to a football game, and let H denote the event of having homework in Math 141. Given:

$$P(F) = 0.35 \quad P(H) = 0.17 \quad P(F^c \cup H) = 0.81$$

calculate $P(F^c \cap H)$.

- A. $P(F^c \cap H) = 0.01$
- B. $P(F^c \cap H) = 0.65$
- C. $P(F^c \cap H) = 0.16$
- D. $P(F^c \cap H) = 0.19$
- E. $P(F^c \cap H) = 0.82$

$$P(F^c \cup H) = P(F^c) + P(H) - P(F^c \cap H)$$

So

$$\begin{aligned} P(F^c \cap H) &= \text{[scribble]} \\ &= 1 - P(F) + P(H) - P(F^c \cup H) \\ &= +0.01 \end{aligned}$$

Use the table below to answer Questions 7 & Question 8.

The table below show the results from a survey taken at a local grocery store regarding the manufacturer and type of motorized vehicle the customer owned.

	Truck	Car	SUV	Total
Chevrolet	86	19	39	144
Ford	79	21	41	141
Nissan	21	36	21	78
Toyota	18	42	23	83
Total	204	118	124	446

Question 7. What is the probability that a customer who participated in the survey owned a Nissan?

A. $\frac{21}{446}$

B. $\frac{39}{223}$

C. $\frac{1}{4}$

D. $\frac{7}{68}$

D. $\frac{19}{26}$

$$\frac{78}{446}$$

Question 8. What is the probability that a customer owned a Chevrolet given they owned a truck?

A. $\frac{43}{72}$

B. $\frac{43}{223}$

C. $\frac{102}{223}$

D. $\frac{72}{223}$

E. $\frac{43}{102}$

$$\frac{86}{204}$$

Question 9. The following table shows the probability that x months after January 1st (i.e., $x = 0$ represents January) a one-way fare on the Greyhound bus from Houston to Bryan exceeds \$7.53.

X	0	1	2	3	4	5	6
$\mathbb{P}(X = x)$	0.15	0.10	0.15	0.10	0.10	0.15	0.25

During which month is it expected that the Greyhound one way bus fare from Houston to Bryan exceeds \$7.53?

A. April

B. February

C. March

D. May

E. June

$$E(X) = 3.35$$

Question 10. (9 points) Over the last football season, it was found that for every 20 passes made by the New England Patriots quarterback, Tom Brady, 16 were ruled as completed passes. If Tom Brady makes 50 passes in a game, what is the probability that he completes at least 42 passes but no more than 44? Round your answer to two decimal places.

binomial experiment

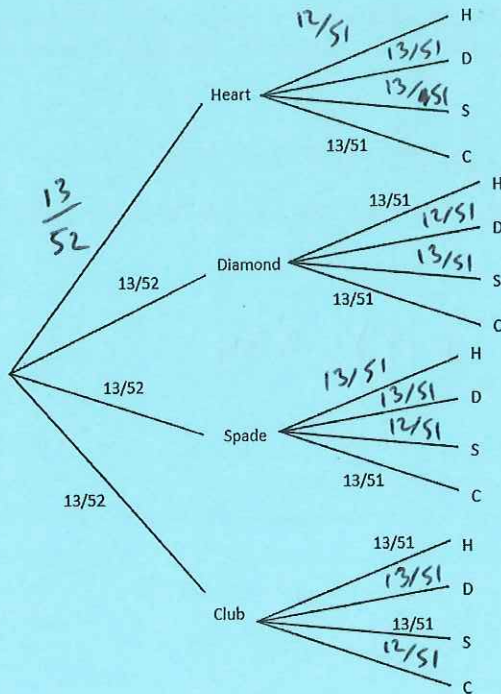
$$p = \frac{16}{20} = 0.8$$

$$n = 50$$

we look at 42, 43, 44 passes:

$$C(50, 42) \cdot p^{42} (1-p)^8 + C(50, 43) p^{43} (1-p)^7 + C(50, 44) \cdot p^{44} \cdot (1-p)^6 = \boxed{0.26}$$

Question 11. (9 points) Let S be the uniform sample space of all possible pairs of suits obtained when two cards are drawn in succession from a standard deck of cards without replacement. The tree diagram below represents this scenario. Fill in the missing probabilities on the tree diagram and use it to determine the probability that a pair of cards are both red, if we know that the first card drawn was a heart. (H=hearts, S=spades, D=diamonds, C=clubs)



the first card is a heart, so for two reds we need to draw:

$$HH \text{ or } HD$$

$$\frac{13}{52} \cdot \frac{12}{51} + \frac{13}{52} \cdot \frac{13}{51} = \boxed{\frac{25}{204}}$$

$$\approx 0.1225$$

Question 12. (10 points) A bag contains three maroon balls and five white balls. Carla picks two balls from the bag. Calculate the probability that Carla selects no more than one maroon ball from the bag. Round your answers to two decimal places.

$$\frac{\overbrace{C(3,0)}^{0 \text{ maroon}} \cdot \overbrace{C(5,2)}^{2 \text{ white}} + \overbrace{C(3,1)}^{1 \text{ maroon}} \cdot \overbrace{C(5,1)}^{1 \text{ white}}}{C(8,2)} = \frac{25}{28} \approx 0.89$$

Question 13. (10 points) The mobile company AT&T currently holds eight rolls of fiber optic cable in storage.

- a. Compute the population's mean and standard deviation of the cable lengths to two decimal places, given that the lengths (in meters) are: 670, 635, 661, 698, 658, 671, 682, and 659.

$$\bar{x} = 666.75 \quad \sigma = 17.376$$

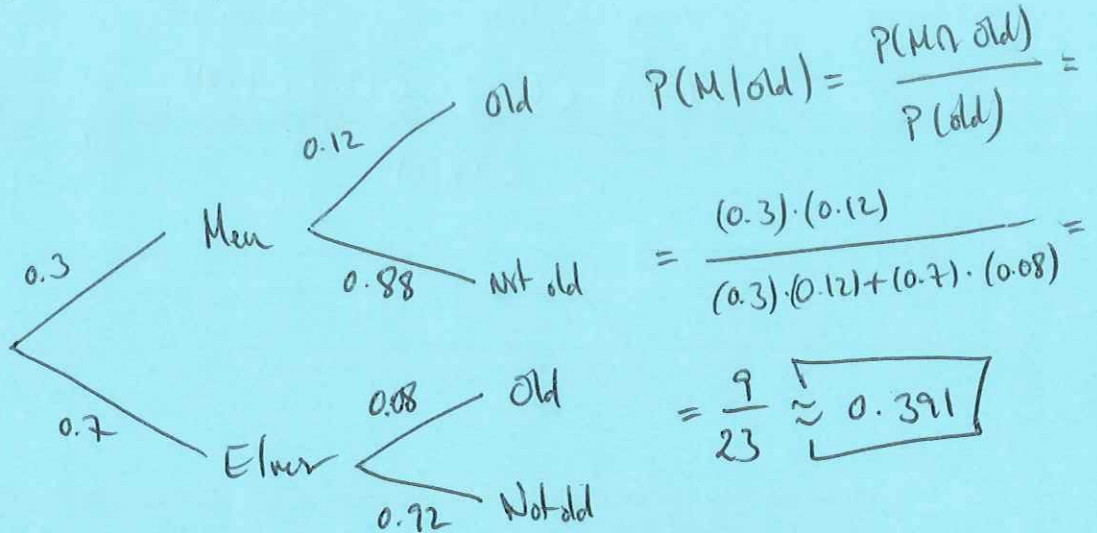
- b. By adding a ninth roll of cable, the mean of the lengths is 668 meters. Determine, to the nearest meter, the length of the ninth roll.

$$668 = \frac{y + 670 + 635 + 661 + 698 + 658 + 671 + 682 + 659}{9}$$

$y = \text{length 9th cable.}$

$$y = 678$$

Question 14. (10 points) When looking for the account of Isildur in the Minas Tirith library, Gandalf the Grey found a collection of 30 books by the Men and 70 books by the Elves. Gandalf noticed that 12% of the books by the Men were over twenty generations old, and 8% of the books by the Elves were over twenty generations old. Given that Gandalf chose a book over twenty generations old, calculate the probability that it was a book by the Men. Round your answer to three decimal places.



Question 15. (8 points)

(a) Fill in blank for the following probability distribution table.

Simple Event	s_1	s_2	s_3	s_4
Probability	0.13	0.22	0.31	0.34

(b) What is the probability of the event $\{s_3, s_4\}$?

$$P(\{s_3, s_4\}) = P(s_3) + P(s_4) = 0.65$$

Question 16. (8 points) Two fair 4-sided dice are rolled and the numbers that land uppermost is recorded. Let X be the random variable that denotes the sum of the two die. Draw a probability distribution table that represents this scenario.

X	2	3	4	5	6	7	8
$\mathbb{P}(X = 0)$	$\frac{1}{16}$	$\frac{2}{16}$	$\frac{3}{16}$	$\frac{4}{16}$	$\frac{3}{16}$	$\frac{2}{16}$	$\frac{1}{16}$

Circle your multiple choice answers underneath.

1. A B C D E
2. A B C D E
3. A B C D E
4. A B C D E
5. A B C D E
6. A B C D E
7. A B C D E
8. A B C D E
9. A B C D E