ECON 2140 STAT1
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Spring 2022

Your Name

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Homework 2

Total 70 pts + 6 Bonus pts
Section I (60 pts). Multiple Choices. Please select **only one** out of all the options.

1. Determine whether each distribution is **not** a probability distribution

a.

X	4	6	8	10
P(X)	0.6	0.2	0.2	0

b.

X	1	2	3	4
P(X)	1/4	1/4	1/4	1/4

c.

X	8	9	12
P(X)	2/3	1/6	1/6

d.

X	1	3	5	7
P(X)	0.3	0.1	0.2	-0.7

2. The baseball World Series is played by the winner of the National League and the American League. The first team to win four games wins the World Series. In other words, the series will consist of four to seven games, depending on the individual victories. The data shown consist of 40 World Series events. The number of games played in each series is represented by the variable *X*. Find the probability $P(X)$ for $X = 5$, construct a probability distribution, and draw a graph for the data.

X	Number of games played
4	8
5	7
6	9
7	16
	40

a.	0.200
b.	0.225
c.	0.175
d.	0.400

3. Represent graphically the probability distribution for the sample space for tossing three coins.

a.

Heads	0	1	2	3
P(X)	3/8	1/8	3/8	1/8

b.

Heads	0	1	2	3
P(X)	3/8	1/8	1/8	3/8

c.

Heads	0	1	2	3
P(X)	1/4	1/4	1/4	1/4

d.

Heads	0	1	2	3
P(X)	1/8	3/8	3/8	1/8

4. **Medical Tests** The probabilities that a patient will have 0, 1, 2, or 3 medical tests performed on entering a hospital are 5/15, 6/15, 3/15, and 1/15, respectively. What is the probability that a patient will have test(s)

a.	10/15
b.	6/15
c.	9/15
d.	5/15

5. **Student Classes** The probabilities that a student is registered for 2, 3, 4, or 5 classes are 0.01, 0.34, 0.62, and 0.03, respectively. What is the probability that a student is registered for at least 3 classes

a.	0.35
b.	0.99
c.	0.01
d.	0.65

6. Following question 5, what is the probability that a student is registered no more than 4 classes

a.	0.35
b.	0.97
c.	0.99
d.	0.01

7. Determine which event is mutually exclusive when a single die is rolled.

a. Getting an odd number and getting an even number
b. Getting a 3 and getting an odd number
c. Getting an odd number and getting a number less than 4
d. Getting a number at least 4 and getting a number not greater than 4.

8. A single card is drawn at random from an ordinary deck of cards. Find the probability that it is either an ace or a black card.

a.	7/13
b.	1/13
c.	1/26
d.	3/13

9. If A and B are mutually exclusive, we should follow which addition rule

a.	$P(A\ or\ B) = P(A) + P(B)$
b.	$P(A\ or\ B) = P(A) + P(B) - P(A\ and\ B)$
c.	$P(A\ or\ B) = P(A) + P(B) - 2P(A\ and\ B)$
d.	$P(A\ or\ B) = P(A) + P(B) - P(A) \times P(B)$

10. Which of the following is **not** correct?

a.	Mutually exclusive events are not independent
b.	Independent events cannot be mutually exclusive
c.	Not mutually exclusive events are independent
d.	Independent events can be either be mutually exclusive or not

11. An urn contains 3 red balls, 2 blue balls, and 5 white balls. A ball is selected and its color noted. Then it is replaced. A second ball is selected and its color noted. Find the probability of selecting 1 blue ball and then 1 white ball

a.	1/25
b.	1/10
c.	3/50
d.	2/25

12. A card is drawn from a deck and replaced; then a second card is drawn. Find the probability of getting a queen and then an ace.

a.	1/13
b.	2/13
c.	1/169
d.	4/169

13. At a university in western Pennsylvania, there were 5 burglaries reported in 2003, 16 in 2004, and 32 in 2005. If a researcher wishes to select at random two burglaries to further investigate, find the probability that both will have occurred in 2004.

a.	16/53
b.	15/52
c.	1/26
d.	60/689

14. In World Wide Insurance Company found that 53% of the residents of a city had homeowner's insurance (H) with the company. Of these clients, 27% also had automobile insurance (A) with the company. If a resident is selected at random, find the probability that the resident has both homeowner's and automobile insurance with World Wide Insurance Company.

a.	0.1431
b.	0.5300
c.	0.2700
d.	0.2599

15. Three cards are drawn from an ordinary deck and not replaced. Find the probability of these events.
Getting 3 jacks.

a.	11/850
b.	1/5525
c.	8/16575
d.	169/850

16. Three cards are drawn from an ordinary deck and not replaced. Find the probability of these events.
Getting an ace, a king, and a queen in order.

a.	11/850
b.	1/5525
c.	8/16575
d.	169/850

17. Three cards are drawn from an ordinary deck and not replaced. Find the probability of these events.
Getting 3 clubs.

a.	11/850
b.	1/5525
c.	8/16575
d.	169/850

18. A game is played by drawing 4 cards from an ordinary deck and replacing each card after it is drawn. Find the probability that at least 1 ace is drawn.

a.	0.15
b.	0.27
c.	0.36
d.	0.39

19. A coin is tossed 5 times. Find the probability of getting at least 1 tail

a.	7/8
b.	15/16
c.	31/32
d.	63/64

20. The Neckware Association of America reported that 3% of ties sold in the United States are bow ties. If 4 customers who purchased a tie are randomly selected, find the probability that at least 1 purchased a bow tie.

a.	0.115
b.	0.885
c.	0.97
d.	0.03

21. A paint manufacturer wishes to manufacture several different paints. The categories include

Color	Red, blue, white, black, green, brown, yellow
Type	Latex, oil
Texture	Flat, semigloss, high gloss
Use	Outdoor, indoor

How many different kinds of paint can be made if you can select one color, one type, one texture, and one use?

a.	64
b.	84
c.	42
d.	28

22. Suppose a business owner has a choice of 5 locations in which to establish her business. She decides to rank each location according to certain criteria, such as price of the store and parking facilities. How many different ways can she rank the 5 locations?

a.	100
b.	24
c.	108
d.	120

23. The advertising director for a television show has 7 ads to use on the program. If she selects 1 of them for the opening of the show, 2 for the middle of the show, and 1 for the ending of the show, how many possible ways can this be accomplished?

a.	42
b.	210
c.	120
d.	840

24. A school musical director can select 2 musical plays to present next year. One will be presented in the fall, and one will be presented in the spring. If she has 10 to pick from, how many different possibilities are there?

a.	90

b.	100
c.	20
d.	72

25. A journal editor has received 8 papers to review. He decides that he can use 3 reviews in his journal. How many different ways can these 3 reviews be selected?

a.	56
b.	64
c.	84
d.	96

26. A journal editor has received 8 papers to review. He decides that he can use 3 reviews in his journal. How many different ways can these 4 reviews be selected?

a.	48
b.	64
c.	84
d.	70

27. In a club there are 7 women and 5 men. A committee of 2 women and 2 men is to be chosen. How many different possibilities are there?

a.	108
b.	210
c.	256
d.	360

28. In a club there are 7 women and 5 men. A committee of 5 women and 2 men is to be chosen. How many different possibilities are there?

a.	108
b.	210
c.	256
d.	360

29. A box contains 24 transistors, 4 of which are defective. If 4 are sold at random, find the following probability that at least 1 is defective.

a.	190/1771

b.	1615/3542
c.	1/10626
d.	1927/3542

30. A box contains 24 transistors, 4 of which are defective. If 4 are sold at random, find the following probability that exactly 2 defectives.

a.	190/1771
b.	1615/3542
c.	1/10626
d.	1927/3542

31. A combination lock consists of the 26 letters of the alphabet. If a 3-letter combination is needed, find the probability that the combination will consist of the letters ABC in that order. The same letter can be used more than once. (*Note:* A combination lock is really a permutation lock.)

a.	1/26
b.	1/676
c.	1/17676
d.	1/15600

32. In a family with two children, find the mean of the number of children who will be girls.

a.	0.5
b.	1
c.	1.5
d.	2

33. The probability distribution shown represents the number of trips of five nights or more that American adults take per year. (That is, 6% do not take any trips lasting five nights or more, 70% take one trip lasting five nights or more per year, etc.) Find the mean.

Number of trips X	0	1	2	3	4
Probability $P(X)$	0.06	0.70	0.20	0.03	0.01

a.	0.8
b.	1.2
c.	1.5
d.	2.4

34. A special six-sided die is made in which 3 sides have 6 spots, 2 sides have 4 spots, and 1 side has 1 spot. If the die is rolled, find the expected value of the number of spots that will occur.

a.	2
b.	3.6
c.	4
d.	4.5

35. One thousand tickets are sold at $1 each for a LED TV valued at $2000. What is the expected value of the gain if you purchase one ticket?

a.	-0.65
b.	0.00
c.	0.69
d.	1.00

36. A survey found that one out of five Americans say he or she has visited a doctor in any given month. If 10 people are selected at random, find the probability that exactly 3 will have visited a doctor last month

a.	0.156
b.	0.201
c.	0.245
d.	0.279

37. A survey from Teenage Research Unlimited (Northbrook, Illinois) found that 30% of teenage consumers receive their spending money from part-time jobs. If 5 teenagers are selected at random, find the probability that at least 3 of them will have part-time jobs.

a.	0.162
b.	0.222
c.	0.232
d.	0.272

38. *Public Opinion* reported that 5% of Americans are afraid of being alone in a house at night. If a random sample of 20 Americans is selected, find these probabilities that there are at least 3 people in the sample who are afraid of being alone at night.

a.	0.062
b.	0.072
c.	0.076
d.	0.089

39. 80% of a garage with capacity of 60 parking is averagely filled up during the daytime, find the probability that the garage is full

a.	0.0564
b.	0.0396
c.	0.0128
d.	0.0103

40. If approximately 2% of the people in a room of 200 people are left-handed, find the probability that exactly 5 people there are left-handed (choose the most closed number)

a.	0.1563
b.	0.1842
c.	0.2105
d.	0.2564

Section II (10 pts). Manually Computation

1. (4 pts) A talk radio station has four telephone lines. If the host is unable to talk (i.e., during a commercial) or is talking to a person, the other callers are placed on hold. When all lines are in use, others who are trying to call in get a busy signal. The probability that 0, 1, 2, 3, or 4 people will get through is shown in the distribution. Find the variance and standard deviation for the distribution.

X	0	1	2	3	4
$P(X)$	0.18	0.34	0.23	0.21	0.04

2. (6 pts) The *Statistical Bulletin* published by Metropolitan Life Insurance Co. reported that 2% of all American births result in twins. If a random sample of 8000 births is taken, find the mean, variance, and standard deviation of the number of births that would result in twins.

Bonus (6 pts)

1. A recent study found that 2 out of every 10 houses in a neighborhood have no insurance. If 5 houses are selected from 10 houses, find the probability that exactly 1 will be uninsured.

2. A lot of 12 compressor tanks is checked to see whether there are any defective tanks. Three tanks are checked for leaks. If 1 or more of the 3 is defective, the lot is rejected. Find the probability that the lot will be rejected if there are actually 3 defective tanks in the lot.

3. **Defective Calculators** In a batch of 2000 calculators, there are, on average, 8 defective ones. If a random sample of 150 is selected, find the probability of 5 defective ones.