Math 110, Exam Review

1. True or False
   a. _____ $a \in \{a, e, i, o, u\}$
   b. _____ $\{a\} \subseteq \{a, e, i, o, u\}$
   c. _____ $\{3, 4\} \subseteq \{4, 3\}$
   d. _____ $\{y\} \in \{x, y, z\}$
   e. _____ $\emptyset \subseteq \{w, x, y, z\}$

2. Let U = {a, b, c, d, e, f, g }, K = {c, d, f, g}, R = {a, c, d, e, g} and S = {c, d, e}.
   Find the following:
   a. K∪R
   b. K∩R'
   c. R∩(K∪S)'
   d. the number of subsets of S

3. Television Viewing Habits.

A telephone survey of television viewers revealed the following information.

20 watch situation comedies
19 watch game shows
27 watch movies
5 watch both situation comedies and game shows
8 watch both game shows and movies
10 watch movies and situation comedies
3 watch all three
6 watch none of these

How many viewers
   a. were interviewed?
   b. watch comedies and movies but not game shows?
   c. watch only game shows?
   d. watch comedies or game shows but not movies?
   e. watch movies or game shows?

4. A die is rolled and a card is drawn from a deck of 52. What is the probability of getting an even number and a diamond?

5. Two cards are drawn from a deck of 52 without replacement. Find the probability
   a. they are both aces.
   b. a king is first and an ace is second

6. One card is drawn from a deck of 52. Find the probability of getting

a. a 5 or a 6

b. a diamond or a 7

7. a. If the probability that a team will win their next game is $\frac{5}{7}$, find the odds that they will win their next game.

b. If the odds that Joel will get a job offer are 7:2, what is the probability that he will get a job offer?

8. Complete the following:

a. The sum of the probabilities of all possible outcomes is _____.

b. The probability of an event that must occur is _____.

c. The probability of an impossible event is _____.

d. P(E') = _____

e. All probabilities lie between _____.

9. The following table is the result of a survey of 400 customers at a restaurant that serves hamburgers and chicken sandwiches.

	Satisfied	Not Satisfied	Totals
Hamburgers	220	35	255
Chicken	135	20	145
Totals	345	55	400

One customer is randomly selected. Find the probability the customer

a. is satisfied.

b. ordered a hamburger.

c. was satisfied given the customer ordered a hamburger.

d. was satisfied and ordered a hamburger.

e. ordered chicken given the customer was satisfied.

10. a. Complete the probability distribution.

X	0	1	2	3	4	5	6
P(X)	.12	.15	.26	.11	.09		.13

Use the completed distribution to find the following:

b. probability x is 1

c. probability x is at least one

d. probability x is at least 2

e. the probability x is 5 or 6

e. Find the expected value of x.

11. A jar contains 3 black and 2 white balls. If you roll a single die and select a ball, find the probability that you roll a 4 and select a black ball.

12. Sally can choose 3 activities for her "free time" program at camp. She must choose one activity from each of the following categories.

Outdoor skills: canoeing, archery, rappelling
Crafts: weaving, painting, photography, wood carving
Survival Sills: First Aid, orienteering, water safety

How many different "free time" programs are possible?

13. Find the number of distinguishable permutations of the word "opinion".

14. In a certain state, license plates consist of 2 letters followed by 4 digits.

a. How many license plates are possible if repetition is allowed?

b. How many license plates are possible is the first letter must be A, B, or C, the first digit cannot be zero and repetition is not allowed?

15. There are 12 contestants in the talent show. The winner will receive a $1000 prize, second place will receive a $500 prize and the third place will receive $100. How many ways can the 3 prizes be awarded?

16. A group of 12 pictures consists of 3 landscapes, 5 ships at sea and 4 portraits. How many ways can they be arranged if

a. like types are kept together?

b. the first must be a portrait?

17. The bookstore is having a sale on books by Mark Twain and Sinclair Lewis. There are 7 books by Twain and 5 by Lewis. George would like to select 2 books by each author. How many ways can he make his selection?

18. There are 14 second graders in Mr. Brown's room. He will select 3 students to help clean the white boards. How many ways can he make his selection?

19. A basket contains 4 black, 2 blue and 5 green balls. A sample of 3 balls is drawn. Find the probability the sample will contain the following

a. all black balls.

b. 2 black and 1 green ball.

c. If you select only one ball from the basket, find the probability the ball is not green.

20. A bucket contains 15 water guns. Ten of the water guns have water in them and 5 are empty. If you select 3 water guns at random, find the probability that none of them will be empty.

21. A bag of marbles contains 5 red, 4 blue, 5 green marbles. If two marble are selected at random, what is the probability that the two marbles are the same color?

22. a. Given P(A) = 0.42, P(B) = 0.83 and P(A or B) = .91, find P(A and B).

b. A discount box store sells frozen food. Sixty percent of the customers buy steaks, 42% buy seafood, and 12% buy seafood and steaks. What is the probability that a customer will buy steaks or seafood?

23. A survey in the student union gave the following results. Forty-two percent of those surveyed played a sport and 35% played a musical instrument. Seventeen percent played a sport and played a musical instrument. If a student is chosen at random find the probability

a. the student plays a musical instrument but does not play a sport.

b. the student played neither.

24. In the sophomore class at Winston University, 45% of the students are taking a math class, 57% of the students are taking a geography class and 63% of the students are taking math or geography classes. Find the probability that a student is taking math and geography.

25. The probability a student goes to the soccer game is .35 and the probability a student goes to the football game is .42. Suppose the probability the student goes to the soccer game and the football game is .147. Are the events "going to the soccer game" and "going to the football game" independent?

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26. According to a recent study of American voters, 27% of women and 36% of men are Republican. In recent elections 51% of the voters were women and 49% were men. If a voter is selected at random, find the probability the voter is

a. a Republican man

b. a Republican

c. a women given the voter is Republican

27. Data on the incoming freshman class at Winston College shows that 38% come from single-parent homes and 62% come from two-parent homes. The financial aid office reports that 65% of the freshman students from single parent homes receive financial aid and 42% of those from two-parent homes receive financial aid. Find the probability the freshman student is from a two-parent home, given the freshman received financial aid.

28. Six mice from the same litter, all suffering from a vitamin A deficiency are fed a certain dose of carrots. If the probability of recovery under such treatment is .70, find the probabilities of the following results.

a. Exactly 3 of the 6 recover.

b. At least one mouse recovers.

29. A recent study of minimum wage earners found that 55% of them are 16 to 24 years old. Suppose a random sample of 12 minimum wage earners is selected. What is the probability that exactly 7 of them are 16 to 24 years old.

30. A raffle has a first prize of $400, two second prizes of $75 each and 10 third prizes of $20 each. One thousand tickets are sold at $1.00 each. Find the expected winnings of a person buying one ticket.

31. For the following list of test scores 98, 70, 32, 48, 80, 50, 46, 72, find the following:

a. mean
b. median
c. mode
d. range
e. standard deviation

32. If the mean of the given data is 13, find the value of X.

9, 12, 15, 21, X

33. Use the following frequency distribution to find a. mean b. median c. mode d. range

x	f
7	12
8	9
9	6
10	3

34. For the following distribution find the mean.

Interval	Frequency
40 - 44	2
45 - 49	5
50 - 54	7
55 - 59	10
60 - 64	4
65 - 69	1

35. Find the percent of the area under the normal curve between $z = -.94$ and $z = -1.52$.

36. Find the z-score satisfying the following condition: 27% of the area is left of z.

37. A machine produces items having a mean length of 11.8 centimeters with a standard deviation of 0.75 centimeters. The lengths are normally distributed. Find the probability that an item will have a length

a. less than 11.4 centimeters.
b. between 10.8 and 11.9 centimeters.
c. at least 11.5 centimeters.
d. If the shortest 10% are to be discarded, what is the cut off length of the bottom 10%?

38. The mean weight of an adult male brown bear is 250 pounds with a standard deviation of approximately 120 pounds. If the brown bear in the City Zoo is in the 57^{th} percentile for his weight, how much does the bear weigh?

39. The average weight of a UNA squirrel is 1.3 pounds with a standard deviation of 0.7 pounds. If the squirrel raiding the trash can at the math building is caught and weighted, find the probability it will weigh more than 1.8 pounds.

Answers

1. a. T
   b. T
   c. T
   d. F
   e. T

2. a. {a, c, d, e, f, g}
   b. {f}
   c. {a}
   d. 8

3. a. 52
   b. 7
   c. 9
   d. 19
   e. 38

4. $\frac{1}{8}$

5. a $\frac{1}{221}$ b. $\frac{4}{663}$

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6. a. $\frac{2}{13}$
   b. $\frac{4}{13}$

7. a. 5:2
   b. $\frac{7}{9}$

8. a. 1
   b. 1
   c. 0
   d. 1-P(E)
   e. 0 and 1 inclusive

9. a. 0.8625
   b. 0.6375
   c. 0.8627
   d. 0.55
   e. 0.3913

10. a. P(x=5) = .14
    b. 0.15
    c. 0.88
    d. 0.73
    e. 0.27
    f. 2.84

11. $\frac{1}{10}$

12. 36

13. 630

14. a. 6,760, 000
    b. 340,200

15. 1,320

16. a. 103,680
    b. 159,667,200

17. 210

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18. 364

19. a. 0.0242
    b. 0.1818
    c. 0.5454 or $\frac{6}{11}$

20. 0.2637

21. 0.2857

22. a. 0.34
    b. 0.9

23. a. 0.18
    b. 0.4

24. 0.39

25. Independent

26. a. 0.1764
    b. 0.3141
    c. 0.4384

27. 0.5132

28. a. 0.1852
    b. 0.9993

29. 0.2225

30. -$0.25

31. a. 62
    b. 60
    c. none
    d. 66
    e. 21.65

32. 8

33. a. 8
    b. 8
    c. 7
    d. 3

34. 54.07

35. 10.93%

36. -.61

37. a. 0.2981
    b. 0.4599
    c. 0.6554
    d. 10.84 cm.

38. 271.6 pounds

39. 0.2389