**Exam**

Name _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

**Write the converse, inverse, or contrapositive of the statement as requested.**

1) If you like me, then I like you. 1) _____

Converse

A) I don't like you if you don't like me.

B) If I like you, then you like me.

C) If you don't like me, I don't like you.

D) I like you if you don't like me.

2) If I pass, I'll party. 2) _____

Contrapositive

A) If I party, then I passed.

B) If I don't pass, I won't party.

C) If I don't party, I didn't pass.

D) I'll party if I pass.

3) All Border Collies are dogs. 3) _____

Inverse

A) If it's a dog, it's a Border Collie.

B) If it's not a dog, it's not a Border Collie.

C) If it's not a Border Collie, it's not a dog.

D) If it's a Border Collie, it's not a dog

**Solve the problem.**

4) If two fair dice are rolled, find the probability of a sum of 6 given that the roll is a double. 4) _____

A) $\frac{1}{5}$ B) $\frac{1}{3}$ C) $\frac{1}{4}$ D) $\frac{1}{6}$

5) Awards are to be presented to seven people: Jeff, Karen, Lyle, Maria, Norm, Olivia, and Paul. How many different orders are possible for the awards if Karen is to receive the first award and Lyle the last? 5) _____

A) 120 B) 24 C) 360 D) 840

6) From a group of 17 women and 14 men, a researcher wants to randomly select 7 women and 7 men for a study. In how many ways can the study group be selected? 6) _____

A) 22,880 B) 115,315,200 C) 66,745,536 D) 265,182,525

7) A survey revealed that 27% of people are entertained by reading books, 48% are entertained by watching TV, and 25% are entertained by both books and TV. What is the probability that a person will be entertained by either books or TV? Express the answer as a percentage. 7) _____

A) 46% B) 50% C) 75% D) 100%

8) An elevator has 4 passengers and 8 floors. Find the probability that no 2 passengers get off on the same floor considering that it is equally likely that a person will get off at any floor. 8) _____

A) .410 B) .910 C) .500 D) .610

9) A classical music concert is to consist of 2 cello pieces, 4 choral works, and 4 pieces for piano. In how many ways can the program be arranged if a piano piece must come first? 9) _____

A) 3,628,800 B) 2880 C) 362,880 D) 1,451,520

**Construct a truth table for the statement.**

10) $(p \wedge r) \wedge (\sim r \vee t)$ 10) _____

A)

| p | r | t | $(p \wedge r) \wedge (\sim r \vee t)$ |
|---|---|---|---|
| T | T | T | F |
| T | T | F | T |
| T | F | T | T |
| T | F | F | T |
| F | T | T | T |
| F | T | F | F |
| F | F | T | T |
| F | F | F | T |

B)

| p | r | t | $(p \wedge r) \wedge (\sim r \vee t)$ |
|---|---|---|---|
| T | T | T | T |
| T | T | F | F |
| T | F | T | F |
| T | F | F | F |
| F | T | T | F |
| F | T | F | F |
| F | F | T | F |
| F | F | F | F |

11) $\sim(\sim(s \vee p))$ 11) _____

A)

| S | P | $\sim(\sim(s \vee p))$ |
|---|---|---|
| T | T | T |
| T | F | T |
| F | T | T |
| F | F | F |

B)

| S | P | $\sim(\sim(s \vee p))$ |
|---|---|---|
| T | F | T |
| F | T | F |

C)

| S | P | $\sim(\sim(s \vee p))$ |
|---|---|---|
| T | T | T |
| T | F | T |
| F | T | F |
| F | F | F |

D)

| S | P | $\sim(\sim(s \vee p))$ |
|---|---|---|
| T | T | F |
| T | F | F |
| F | T | F |
| F | F | T |

12) $s \vee \sim(q \wedge p)$ 12) _____

A)

| s | q | p | $s \vee \sim(q \wedge p)$ |
|---|---|---|---|
| T | T | T | T |
| T | T | F | T |
| T | F | T | T |
| T | F | F | T |
| F | T | T | F |
| F | T | F | T |
| F | F | T | T |
| F | F | F | F |

B)

| s | q | p | $s \vee \sim(q \wedge p)$ |
|---|---|---|---|
| T | T | T | T |
| T | T | F | T |
| T | F | T | T |
| T | F | F | T |
| F | T | T | F |
| F | T | F | T |
| F | F | T | T |
| F | F | F | T |

**Given p is true, q is true, and r is false, find the truth value of the statement.**

13) $\sim q \wedge (p \wedge \sim r)$ 13) _____

A) True B) False

**Find the requested probability.**

14) A child rolls a 6-sided die 6 times. What is the probability of the child rolling exactly four fives? 14) _____

A) .5360 B) .0080 C) .9688 D) .3125

**Find the probability.**

15) A basketball player hits her shot 41% of the time. If she takes four shots during a game, what is the probability that she hits all four? Express the answer as a percentage, and round to the nearest tenth (if necessary). You may assume the shots are independent events. 15) _____

A) 2.8% B) 82% C) 10.3% D) 41%

**Write the negation of the conditional.**

16) If you give your jacket to the doorman, he will give you a dirty look. 16) _____

A) If you give your jacket to the doorman he will not give you a dirty look.
B) You do not give your jacket to the doorman and he will not give you a dirty look.
C) You give your jacket to the doorman and he will not give you a dirty look.
D) You do not give your jacket to the doorman and he will give you a dirty look.

**Find the median.**

17) 3, 3, 27, 23, 39, 49 17) _____

A) 23 B ) 25 C) 24.5 D) 27

18) The normal monthly precipitation (in inches) for August is listed for 20 different U.S. cities. Find the median of the data. Round to the nearest hundredth. 18) _____

| | | | | |
|---|---|---|---|---|
| 3.5 | 1.6 | 2.4 | 3.7 | 4.1 |
| 3.9 | 1.0 | 3.6 | 4.2 | 3.4 |
| 3.7 | 2.2 | 1.5 | 4.2 | 3.4 |
| 2.7 | 0.4 | 3.7 | 2.0 | 3.6 |

A) 3.40 in. B) 3.50 in. C) 3.45 in. D) 2.94 in.

**Use an Euler diagram to determine whether the argument is valid or invalid.**

19) Some cars are considered sporty. 19) _____

Some cars are safe at high speeds.

$\therefore$ Some sports cars are safe at high speeds.

A) Valid B) Invalid

**Find the probability of the given event.**

20) A bag contains 5 red marbles, 3 blue marbles, and 1 green marble. A randomly drawn marble is not blue. 20) _____

A) 6 B) $\frac{1}{3}$ C) $\frac{2}{3}$ D) $\frac{3}{2}$

**Determine if the argument is valid or invalid.**

21) $\sim q \wedge \sim p$ 21) _____

$p \vee \sim q$

$\sim q$

A) Invalid B) Valid

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

**Decide whether the statement is true or false.**

22) $\{9, 1, 5\} \cup \{9, 1, 5\} = \emptyset$ 22) _____

23) $\{0\} \cap \emptyset = \{0\}$ 23) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

**Find the expected value for the random variable.**

24) A business bureau gets complaints as shown in the following table. Find the expected number of complaints per day. 24) _____

| Complaints per Day | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Probability | .04 | .11 | .26 | .33 | .19 | .07 |

A) 2.85 B) 3.01 C) 2.98 D) 2.73

**Determine whether the argument is valid or invalid.**

25) The Rams will be in the playoffs if and only if Ozzie is an all-star. Mark loves the Rams or Ozzie is an all-star. Mark does not love the Rams. Therefore, the Rams will not be in the playoffs. 25) _____

A) Valid B) Invalid

**Use the method of writing each premise in symbols in order to write a conclusion that yields a valid argument.**

26) All birds have wings. None of my pets are birds. All animals with wings can flap them. 26) _____

A) None of my pets can flap their wings.
B) All my pets can flap their wings.
C) No birds can flap their wings.
D) All birds can flap their wings.

**Find the expected value of the random variable in the experiment.**

27) Five rats are inoculated against a disease. The number contracting the disease is noted and the experiment is repeated 20 times. Find the probability distribution and give the expected number of rats contracting the disease. 27) _____

| Number with Disease | Frequency |
|---|---|
| 0 | 2 |
| 1 | 4 |
| 2 | 7 |
| 3 | 3 |
| 4 | 1 |
| 5 | 3 |
| | Total: 20 |

A) 2.4 B) 2.3 C) 1 D) .9

**Let p represent a true statement, while q and r represent false statements. Find the truth value of the compound statement.**

28) $(p \wedge \sim q) \wedge r$ 28) _____

A) False B) True

29) $\sim p \vee (q \wedge \sim r)$ 29) _____

A) False B) True

**Assume the distribution is normal. Use the area of the normal curve to answer the question. Round to the nearest whole percent.**

30) The average size of the fish in a lake is 11.4 inches, with a standard deviation of 3.2 inches. Find the probability of catching a fish longer than 17 inches. 30) _____

A) 8% B) 4% C) 96% D) 5%

31) A machine produces bolts with an average diameter of .30 inches and a standard deviation of .01 inches. What is the probability that a bolt will have a diameter greater than .32 inches? 31) _____

A) 3% B) 2% C) 1% D) 98%

**Use the given table to find the indicated probability.**

32) The following table contains data from a study of two airlines which fly to Smalltown, USA. 32) _____

| | Number of flights arrived on time | Number of flights arrived late |
|---|---|---|
| Podunk Airlines | 33 | 6 |
| Upstate Airlines | 43 | 5 |

P(flight was on Upstate Airlines | flight arrived late)?

A) $\frac{5}{87}$ B) $\frac{5}{48}$ C) $\frac{5}{11}$ D) None of the above

33) People were given three choices of soft drinks and asked to choose one favorite. The following table shows the results. 33) _____

| | cola | root beer | lemon-lime |
|---|---|---|---|
| under 21 years of age | 45 | 25 | 20 |
| between 21 and 40 | 35 | 20 | 30 |
| over 40 years of age | 20 | 30 | 35 |

P(person is over 40 ∩ person drinks cola)?

A) $\frac{4}{51}$ B) $\frac{4}{17}$ C) $\frac{4}{19}$ D) $\frac{1}{13}$

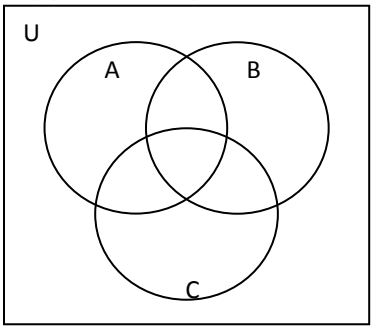
**A die is rolled 20 times and the number of twos that come up is tallied. Find the probability of getting the given result.**

34) More than one two 34) _____

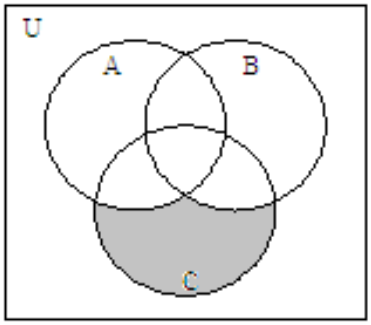
A) .982 B) .482 C) .005 D) .870

**Shade the Venn diagram to represent the set.**

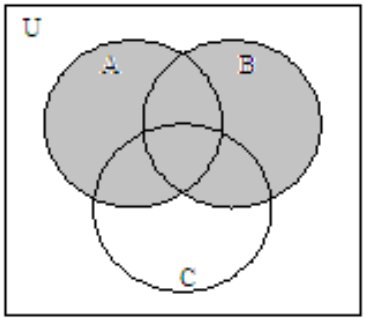
35) **( A** ∪ **B** ∪ **C' )'** 35) _____




a)




B)




**Find the probability of the event.**

36) On a hospital floor, 16 patients have a disease with a mortality rate of .1. Two of them die. 36) _____

A) .666 B) .275 C) .163 D) .170

**Find the range for the set of data numbers.**

37) 28, 40, 20, 50, 52 37) _____

A) 52 B) 20 C) 32 D) 12

**Find the mean.**

38) Frank's Furniture employees earned $201.10, $537.76, $221.17, $247.10, $287.60, and $150.28 for last week. Find the mean wage. 38) _____

A) $317.00 B) $274.17 C) $329.00 D) $411.25

**The lists below show five agricultural crops in Alabama, Arkansas, and Louisiana.**

| Alabama | Arkansas | Louisiana |
|---|---|---|
| soybeans (s) | soybeans (s) | soybeans (s) |
| peanuts (p) | rice (r) | sugarcane (n) |
| corn (c) | cotton (t) | rice (r) |
| hay (h) | hay (h) | corn (c) |
| wheat (w) | wheat (w) | cotton (t) |

**Let U be the smallest possible universal set that includes all of the crops listed; and let A, K, and L be the sets of five crops in Alabama, Arkansas, and Louisiana, respectively. Find the indicated set.**

39) A ∩ K ∩ L 39) _____

A) {c, h, n, p, r, s, t, w} B) {n, p, s} C) {n, p} D) {s}

**At one high school, students can run the 100-yard dash in an average of 15.2 seconds with a standard deviation of .9 seconds. The times are very closely approximated by a normal curve. Find the percent of times that are:**

40) Less than 15.2 seconds 40) _____

A) 68% B) 16% C) 50% D) 34%

**Use a Venn diagram to answer the question.**

41) A local television station sends out questionnaires to determine if viewers would rather see a documentary, an interview show, or reruns of a game show. There were 800 responses with the following results: 41) _____

240 were interested in an interview show and a documentary, but not reruns;
32 were interested in an interview show and reruns, but not a documentary;
112 were interested in reruns but not an interview show;
192 were interested in an interview show but not a documentary;
80 were interested in a documentary and reruns;
48 were interested in an interview show and reruns;
64 were interested in none of the three.

How many are interested in exactly one kind of show?

A) 374 B) 394 C) 364 D) 384

**Assume that two marbles are drawn without replacement from a box with 1 blue, 3 white, 2 green, and 2 red marbles. Find the probability of the indicated result.**

42) Both marbles are green. 42) _____

A) $\frac{1}{28}$ B) $\frac{1}{4}$ C) $\frac{1}{14}$ D) $\frac{1}{16}$

**Find the mean for the frequency distribution. Round to the nearest tenth.**

43) 43) _____

| Value | Frequency |
|---|---|
| 16 | 1 |
| 17 | 4 |
| 23 | 5 |
| 31 | 5 |
| 36 | 2 |

A) 28.4 B) 25.1 C) 7.2 D) 23.3

**A company installs 5000 light bulbs, each with an average life of 500 hours, standard deviation of 100 hours, and distribution approximated by a normal curve. Find the approximate number of bulbs that can be expected to last the specified period of time.**

44) Between 290 hours and 500 hours 44) _____

A) 2911 B) 2913 C) 2413 D) 2410

**Write a negation for the statement.**

45) Everyone is asleep. 45) _____

A) Not everyone is asleep.
B) Nobody is awake.
C) Everyone is awake.
D) Nobody is asleep.

**A bag contains 6 cherry, 3 orange and 2 lemon candies. You reach in and take 3 pieces of candy at random. Find the probability.**

46) 1 cherry, 2 lemon 46) _____

A) .0303 B) .0424 C) .0364 D) .3636

**Find the expected value for the random variable x having this probability function.**

47) Find the expected value for the random variable x having this probability function. 47) _____

| x | 20 | 25 | 30 |
|---|---|---|---|
| P(x) | 0.2 | 0.5 | 0.3 |

A) 27.5 B) 25.5 C) 25 D) 22.5

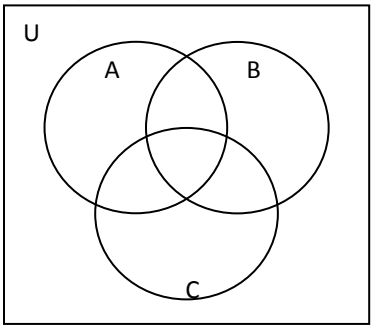
**A die is rolled five times and the number of twos that come up is tallied. Find the probability of getting the indicated result.**

48) Two comes up zero times. 48) _____

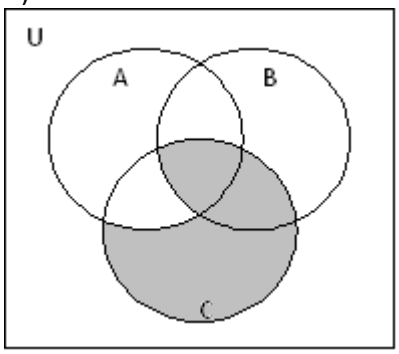
A) .424 B) .402 C) .0001 D) .161

**Shade the Venn diagram to represent the set.**

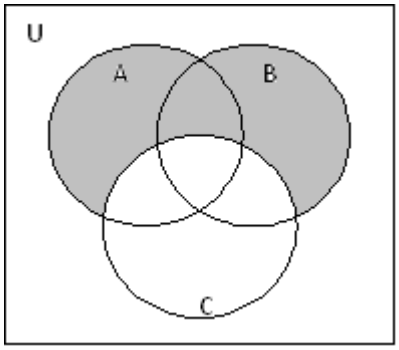
49) C'∩ (A U B) 49) _____




A)




B)




**In a certain college, 33% of the physics majors belong to ethnic minorities. Find the probability of the event from a random sample of 10 students who are physics majors.**

50) More than seven belong to an ethnic minority. 50) _____

A) .0032 B) .0028 C) .0185 D) .0154

51) More than one belong to an ethnic minority. 51) _____

A) .985 B) .892 C) .982 D) .913

**Find the probability of the event.**

52) A die is rolled 18 times and two threes come up. 52) _____

A) .060 B) .099 C) .160 D) .230

53) The probability that a radish seed will germinate is .7. The gardener plants 20 seeds and she harvests 16 radishes. 53) _____

A) .068 B) .075 C) .571 D) .130

**Write a negation for the statement.**

54) Not all people like football. 54) _____

A) All people like football.
B) Some people like football.
C) All people do not like football.
D) Some people do not like football.

55) Some people don't like walking. 55) _____

A) Everyone likes walking.
B) Nobody likes walking.
C) Some people don't like walking.
D) Some people like walking.

**Write the negation of the conditional. Use the fact that negation of p -> q is p ∧ ~q.**

56) If she doesn't study, she won't pass her math test. 56) _____

A) She studies and will pass her math test.
B) If she doesn't study, she will pass her math test.
C) She doesn't study and she won't pass her math test.
D) She doesn't study and will pass her math test.

**Write an equivalent statement that does not use the if … then connective. Use the fact that p-> q is equivalent to ~p ∨ q.**

57) If Jane does not want to go, then she stays home. 57) _____

A) Jane does not want to go so she stays home
B) Jane does not want to go and she does not stay home.
C) Jane does want to go or she stays home.
D) Jane does want to go or she does not stay home.

**Use De Morgan's laws to write the negation of the statement.**

58) Cats are lazy or dogs aren't friendly. 58) _____

A) Cats aren't lazy or dogs aren't friendly.
B) Cats are lazy and dogs are friendly.
C) Cats aren't lazy and dogs are friendly.
D) Cats aren't lazy or dogs are friendly.

59) A day late and a dollar short. 59) _____

A) A day late or not a dollar short.
B) Not a day late or not a dollar short.
C) Not a day late and a dollar short.
D) Not a day late and not a dollar short.

**Find the area under the normal curve for the condition.**

60) Find the percent of the total area under the curve between z = -2.36 and z = -0.14. 60) _____

A) 43.9% B) 43.1% C) 43.5% D) 43.4%

**At one high school, the mean time for running the 100-yard dash is 15.2 seconds with a standard deviation of 0.9 seconds. The times are very closely approximated by a normal curve. Find the percent of times that are:**

61) Between 14.3 and 16.1 seconds. 61) _____

A) 68% B) 47.5% C) 50% D) 34%

**A company installs 5,000 light bulbs. The lifetimes of the light bulbs are approximately normally distributed with a mean of 500 hours and a standard deviation of 100 hours. Find the approximate number of bulbs that can be expected to last the indicated amount of time.**

62) Between 540 hours and 780 hours. 62) _____

A) 1,710 B) 2,217 C) 1,717 D) 2,215

**Obtain the five-number summary for the given data.**

63) The test scores of 15 students are listed below. 63) _____

| | | | | |
|---|---|---|---|---|
| 40 | 45 | 50 | 52 | 59 |
| 61 | 65 | 68 | 75 | 77 |
| 85 | 87 | 90 | 94 | 95 |

A) 40, 51.5, 68, 85.5, 95
B) 40, 51.5, 71.5, 85.5, 95
C) 40, 52, 68, 87, 95
D) 40, 52, 71.5, 87, 95