1. In a recent hiring period, XYZ Corporation hired 23% of the males who applied and 11% of the females. A lawsuit was contemplated because these numbers seemed to indicate that there was gender discrimination. On closer examination, it was found that XYZ was hiring for only two of its divisions: engineering and secretarial. Applicants applying by gender per department are given in the following table:

	Males applying	Males hired	Females applying	Females hired
Engineering	400	100	20	5
Secretarial	50	5	300	30
Total	450	105	320	35

For the engineering division, what percentage of male applicants were hired?

A) 22%
B) 25%
C) 50%
D) 30%

2. In a recent hiring period, XYZ Corporation hired 23% of the males who applied and 11% of the females. A lawsuit was contemplated because these numbers seemed to indicate that there was gender discrimination. On closer examination, it was found that XYZ was hiring for only two of its divisions: engineering and secretarial. Applicants applying by gender per department are given in the following table:

	Males applying	Males hired	Females applying	Females hired
Engineering	400	100	20	5
Secretarial	50	5	300	30
Total	450	105	320	35

For the engineering division, what percentage of female applicants were hired?

A) 15%
B) 13%
C) 20%
D) 25%

3. In a recent hiring period, XYZ Corporation hired 23% of the males who applied and 11% of the females. A lawsuit was contemplated because these numbers seemed to indicate that there was gender discrimination. On closer examination, it was found that XYZ was hiring for only two of its divisions: engineering and secretarial. Applicants applying by gender per department are given in the following table:

	Males applying	Males hired	Females applying	Females hired
Engineering	400	100	20	5
Secretarial	50	5	300	30
Total	450	105	320	35

What can be observed about the percentage of males hired compared to the percentage of females hired in the engineering division?

A) A higher percentage of males were hired.
B) A higher percentage of females were hired.
C) The same percentage of males and females were hired.
D) Not enough information to make an observation.

4. In a recent hiring period, XYZ Corporation hired 23% of the males who applied and 11% of the females. A lawsuit was contemplated because these numbers seemed to indicate that there was gender discrimination. On closer examination, it was found that XYZ was hiring for only two of its divisions: engineering and secretarial. Applicants applying by gender per department are given in the following table:

	Males applying	Males hired	Females applying	Females hired
Engineering	400	100	20	5
Secretarial	50	5	300	30
Total	450	105	320	35

For the secretarial division, what percentage of male applicants were hired?

A) 22%
B) 15%
C) 10%
D) 5%

5. In a recent hiring period, XYZ Corporation hired 23% of the males who applied and 11% of the females. A lawsuit was contemplated because these numbers seemed to indicate that there was gender discrimination. On closer examination, it was found that XYZ was hiring for only two of its divisions: engineering and secretarial. Applicants applying by gender per department are given in the following table:

	Males applying	Males hired	Females applying	Females hired
Engineering	400	100	20	5
Secretarial	50	5	300	30
Total	450	105	320	35

For the secretarial division, what percentage of female applicants were hired?

A) 10%
B) 13%
C) 30%
D) 20%

6. In a recent hiring period, XYZ Corporation hired 23% of the males who applied and 11% of the females. A lawsuit was contemplated because these numbers seemed to indicate that there was gender discrimination. On closer examination, it was found that XYZ was hiring for only two of its divisions: engineering and secretarial. Applicants applying by gender per department are given in the following table:

	Males applying	Males hired	Females applying	Females hired
Engineering	400	100	20	5
Secretarial	50	5	300	30
Total	450	105	320	35

What was the overall percentage of male applicants hired?

A) 10%
B) 14%
C) 23%
D) 25%

7. In a recent hiring period, XYZ Corporation hired 23% of the males who applied and 11% of the females. A lawsuit was contemplated because these numbers seemed to indicate that there was gender discrimination. On closer examination, it was found that XYZ was hiring for only two of its divisions: engineering and secretarial. Applicants applying by gender per department are given in the following table:

	Males applying	Males hired	Females applying	Females hired
Engineering	400	100	20	5
Secretarial	50	5	300	30
Total	450	105	320	35

Which of the following is NOT correct?

A) The overall percentage of female applicants hired is less than that of male applicants.
B) We are observing Simpson's paradox.
C) We compare the company's overall percentage hired with the percentage hired for each division.
D) The absolute numbers involved in calculating the percentages caused a paradoxical situation.

8. In a recent hiring period, XYZ Corporation hired 23% of the males who applied and 11% of the females. A lawsuit was contemplated because these numbers seemed to indicate that there was gender discrimination. On closer examination, it was found that XYZ was hiring for only two of its divisions: engineering and secretarial. Applicants applying by gender per department are given in the following table:

	Males applying	Males hired	Females applying	Females hired
Engineering	400	100	20	5
Secretarial	50	5	300	30
Total	450	105	320	35

Suppose you are an attorney for a female plaintiff. How would you argue that there was gender discrimination?

9. In a recent hiring period, XYZ Corporation hired 23% of the males who applied and 11% of the females. A lawsuit was contemplated because these numbers seemed to indicate that there was gender discrimination. On closer examination, it was found that XYZ was hiring for only two of its divisions: engineering and secretarial. Applicants applying by gender per department are given in the following table:

	Males applying	Males hired	Females applying	Females hired
Engineering	400	100	20	5
Secretarial	50	5	300	30
Total	450	105	320	35

Suppose you are an attorney for XYZ Corporation. How would you argue that there was no gender discrimination?

10. _____ paradox occurs when combining, or aggregating, data masks underlying patterns.

A) Taylor's
B) Samson's
C) Euler's
D) Simpson's

11. Logic is the study of methods and principles used to distinguish good from bad reasoning.

A) True
B) False

12. Choose a valid conclusion based on the premises: *If you study hard, you will earn a passing grade. You have studied hard.*

A) You studied hard.
B) You will earn a passing grade.
C) You studied hard and earned a passing grade.
D) If you don't study hard, you will not earn a passing grade.

13. A(n) _____ fallacy arises from the content of an argument, not its form or structure.

A) formal
B) informal
C) deductive
D) inductive

14. An argument is _____ if its premises justify its conclusion.

A) strong
B) weak
C) valid
D) invalid

15. An argument for a practice that is based on the popularity of that practice is an example of:

A) false authority.
B) straw man.
C) false dilemma.
D) appeal to common practice.

16. The _____ type of informal fallacy simply draws a conclusion that is really a restatement of the premise.

A) false cause
B) circular reasoning
C) hasty generalization
D) straw man

17. For an inductive argument, a conclusion can be drawn from specific examples. Therefore, we have irrefutable evidence for the conclusion.

A) True
B) False

18. The following is a valid argument: *All dogs bark. Sparky barks. Therefore, Sparky is a dog.*

A) True
B) False

19. If an inductive argument claimed an invalid conclusion, what is the most likely type of fallacy?

A) false dilemma
B) false authority
C) circular reasoning
D) hasty generalization

20. *We can't afford a more expensive home because it will cost more* is an example of:

A) a false dilemma.
B) false authority.
C) circular reasoning.
D) a hasty generalization.

21. A study found that healthier people own more than three cars, so we need to buy more cars. What type of informal fallacy is this?

A) false authority
B) false dilemma
C) false cause
D) straw man

22. *He shouldn't be trusted because he is a tax evader* is an example of what type of informal fallacy?

A) appeal to common practice
B) hasty generalization
C) false dilemma
D) dismissal based on personal attack

23. Use inductive reasoning to make a conclusion: Every observed score of test X is above 70 and Leo took test X.

A) Leo's score is above 70.
B) Leo's score is below 100.
C) Every score is above 70.
D) There are more than 70 scores of the test.

24. Use inductive reasoning to determine the next number: 1, 2, 3, 5, 8, 13, _____.

A) 18
B) 19
C) 20
D) 21

25. The following table shows the number of children's blocks that will fit in cubes of various sizes. (Measurements are in inches.)

Size of cube	1 × 1 × 1	2 × 2 × 2	3 × 3 × 3	4 × 4 × 4
Number of blocks	1	8	27	64

Use the pattern observed to determine how many blocks will fit a cube of 30 × 30 × 30.

26. Another informal fallacy is the gambler fallacy. An example of this would be: *I play the lottery every week, but I never win. I'm due for a win, so I need to buy more lottery tickets.* Explain why this is a fallacy.

27. Consider the statement *If it is Sunday, then I will go shopping*. Formulate the converse.

A) If it is not Sunday, then I will not go shopping.
B) If I go shopping, then it is Sunday.
C) If I do not go shopping, then it is not Sunday.
D) If I go shopping, then it is not Sunday.

28. Let *p* represent the statement *I have studied hard* and *q* represent the statement *I received a passing grade*. Express the given statement in symbolic form: *I studied hard but did not receive a passing grade.*

A) *p* AND (NOT *q*)
B) *p* OR (NOT *q*)
C) (NOT *p*) OR (NOT *q*)
D) (NOT *p*) OR *q*

29. Determine whether the given statement is true or false: If $1+2=5$, then $1=0$.

A) True
B) False

30. Two statements are logically _____ if they have the same truth tables.

A) equal
B) similar
C) associated
D) equivalent

31. Determine whether the given statement is true or false: *If Earth is flat, then donkeys are purple.*

A) True
B) False

32. Find a logically equivalent statement of *If your GPA is above 3.5, then you are eligible for membership of the honor society X.*

A) If your GPA is not greater than 3.5, then you are not eligible for membership of the honor society X.
B) If you are not eligible for membership of the honor society X, then your GPA is above 3.5.
C) If you are not eligible for membership of the honor society X, then your GPA can't be greater than 3.5.
D) If you are eligible for membership of the honor society X, then your GPA is above 3.5.

33. Let p represent the statement *I am happy* and q represent the statement *I enjoy my job*. Express the given statement in symbolic form: *I am not happy only if I enjoy my job.*

A) (NOT q) $\rightarrow p$
B) (NOT p) $\rightarrow q$
C) $p \rightarrow$ (NOT q)
D) $q \rightarrow$ (NOT p)

34. The inverse is logically equivalent to the:

A) conditional.
B) contrapositive.
C) converse.
D) conjunction.

35. The inverse of the statement *If* $(-1)\times(-1)=1$*, then* $1=2$ is valid.

A) True
B) False

36. The _____ is logically equivalent to the contrapositive.

A) converse
B) inverse
C) conjunction
D) conditional

37. Make the truth table for the given compound statement: NOT $p \rightarrow$ (p AND q)

38. Using truth tables, show that the given two statements are logically equivalent: NOT (p OR q) and (NOT p) AND (NOT q)

39. Formulate the converse of the statement *All math classes are difficult.*

A) If a class is difficult, then it is a math class.
B) If a class is a math class, then it is difficult.
C) If a class is not difficult, then it is not a math class.
D) If a class is not a math class, then it is not difficult.

40. Formulate the inverse of the statement *If you don't exercise, then you will gain weight.*

A) If you gain weight, then you didn't exercise.
B) If you exercise, then you gain weight.
C) If you do not gain weight, then you exercised.
D) If you do exercise, then you will not gain weight.

41. Formulate the contrapositive of the statement *My friends all play video games.*

A) If you are my friend, then you play video games.
B) If you are not my friend, then you do not play video games.
C) If you do not play video games, then you are not my friend.
D) If you play video games, then you are my friend.

42. If the inputs of the OR gate are 0 and 1, what is the output?

A) 0
B) 1
C) 2
D) -1

43. The logic gate XOR corresponds to the *exclusive* use of *or*, in which we ask whether one or the other, but not both, is true. If the inputs to the XOR gate are 1 and 1, what is the output?

A) 0
B) 1
C) 2
D) 3

44. Set B is a subset of set A if every element of A is also an element of B.

A) True
B) False

45. Two sets are called _____ if they have no elements in common.

A) subsets
B) unequal
C) disjoint
D) equivalent

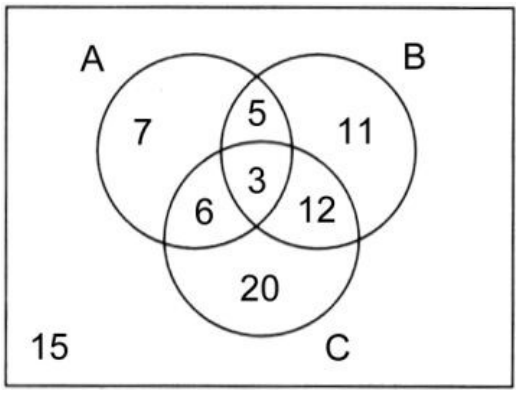
46. Write the given set as a list of elements: The set of whole numbers between 4 and 8 inclusive.

A) {4, 5, 6, 7}
B) {5, 6, 7}
C) {4, 5, 6, 7, 8}
D) {5, 6, 7, 8}

47. Suppose *A* is the set of even numbers and *B* is the set of odd numbers. How are *A* and *B* related?

A) A is a subset of B.
B) B is a subset of A.
C) A and B are disjoint.
D) A and B are equivalent.

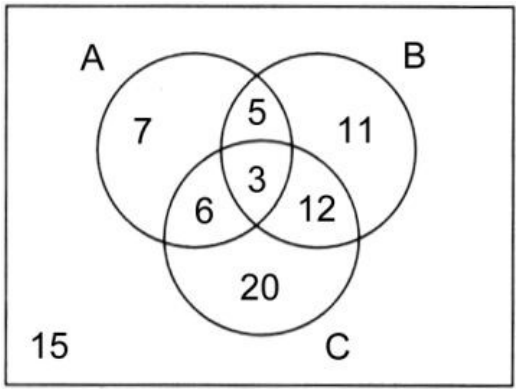
48. A group of students were surveyed to see how many used product A, product B, or product C. The following is a Venn diagram showing the results of the survey:



How many students surveyed used none of these products?

A) 64
B) 38
C) 15
D) 3

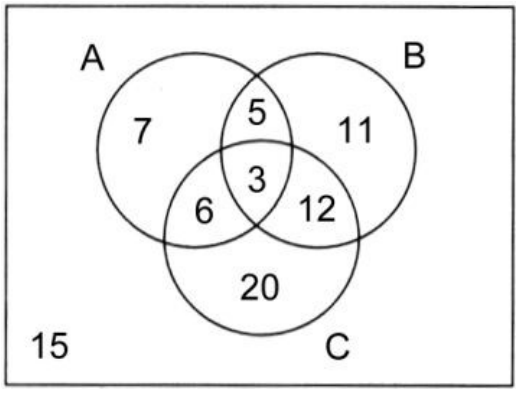
49. A group of students were surveyed to see how many used product A, product B, or product C. The following is a Venn diagram showing the results of the survey:



How many students surveyed use only product C?

A) 41
B) 20
C) 35
D) 32

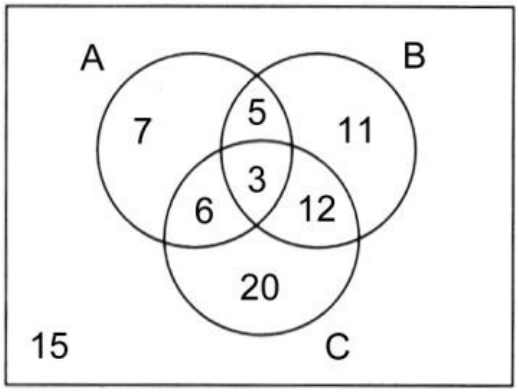
50. A group of students were surveyed to see how many used product A, product B, or product C. The following is a Venn diagram showing the results of the survey:



How many students surveyed did NOT use product A?

A) 43
B) 57
C) 58
D) 15

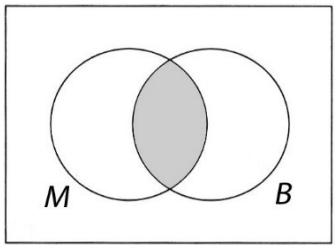
51. A group of students were surveyed to see how many used product A, product B, or product C. The following is a Venn diagram showing the results of the survey:



How many students were surveyed?

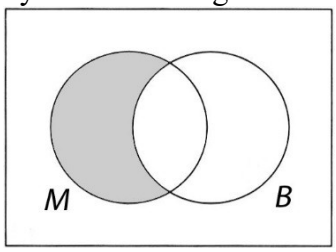
A) 38
B) 53
C) 64
D) 79

52. Suppose set *M* is mathematics majors and set *B* is business majors at a certain university. The shaded region in the following Venn diagram represents students majoring in:



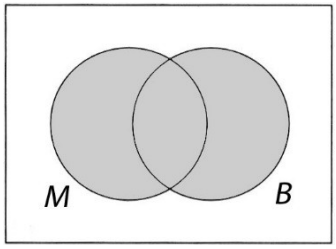
A) mathematics but not in business.
B) business but not in mathematics.
C) mathematics or in business.
D) mathematics and in business.

53. At a certain university, 5% and 17% of total students are mathematics majors (M) and business majors (B), respectively. If 3% of the total students are majoring in both mathematics and business, what percent of total students will be represented by the shaded region of the following Venn diagram?



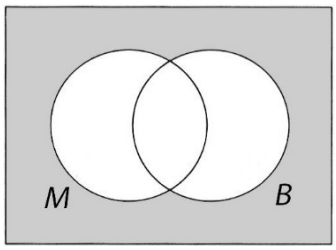
A) 1%
B) 2%
C) 3%
D) 5%

54. Suppose set *M* is mathematics majors and set *B* is business majors at a certain university. The shaded region in the following Venn diagram represents students majoring in:



A) mathematics but not in business.
B) business but not in mathematics.
C) mathematics or in business.
D) mathematics and in business.

55. Suppose set *M* is mathematics majors and set *B* is business majors at a certain university. The shaded region in the following Venn diagram represents students NOT majoring in:

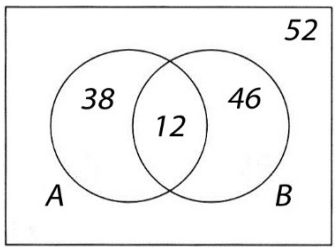


A) mathematics.
B) business.
C) mathematics or in business.
D) mathematics and in business.

56. Suppose that 100 students were given a biology exam and a chemistry exam. Assume that 36 passed the biology exam but not the chemistry exam, 25 passed the chemistry exam but not the biology exam, and 15 passed neither exam. How many passed the chemistry exam?

A) 25
B) 64
C) 49
D) 24

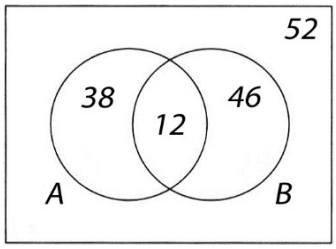
57. The Venn diagram shows the results of a survey asking registered voters if they would vote for proposition A or proposition B:



How many surveyed would vote for only proposition B?

A) 12
B) 58
C) 52
D) 46

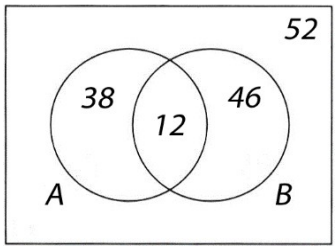
58. The Venn diagram shows the results of a survey asking registered voters if they would vote for proposition A or proposition B:



How many surveyed would NOT vote for proposition A?

A) 46
B) 52
C) 98
D) 58

59. The Venn diagram shows the results of a survey asking registered voters if they would vote for proposition A or proposition B:



To get approved, a proposition must get at least 40% of the total votes. List the approved propositions.

A) None
B) A
C) B
D) A and B

60. Suppose that 140 cars were sorted by model and color. Assume that 20 were Chevrolets but not red, 45 were red but not Chevrolets, and 50 were neither red nor Chevrolets. Make a Venn diagram using Chevrolets and red cars, and include the numbers in each region of the diagram. How many red cars were observed?

61. A survey was conducted asking students how many drank coffee, soda, or water. The results are given in the table:

Coffee	25
Soda	37
Water	22
Coffee and soda	16
Coffee and water	13
Soda and water but not coffee	8
All three	6
None of these	4

Use *C* for coffee, *S* for soda, and *W* for water and make a Venn diagram. The completed diagram should show the number in each region.

62. A terabyte is _____ megabytes.

A) 1000
B) 1 million
C) 1 billion
D) 1 trillion

63. One kilobyte of memory can store about two-thirds of a page of typical text (excluding formatting). Suppose the typical book is 500 pages. Could a 4-gigabyte flash drive hold tens, hundreds, thousands, or millions of such books?

A) Tens
B) Hundreds
C) Thousands
D) Millions

64. There are 1000 billions in a trillion.

A) True
B) False

65. For charity, a school collects 10 million pennies. How much money has the school collected?

A) $10 million
B) $1 million
C) $100,000
D) $10,000

66. A dollar bill is 6.14 inches long, 2.61 inches wide, and 0.0043 inches thick. If you laid 1 million dollar bills end to end, how many miles would the trail be (to the nearest mile)?

A) 1000
B) 97
C) 1198
D) 479

67. If a car drives 11 kilometers per liter, how many miles does it drive per gallon?

A) 11
B) 15
C) 21
D) 26

68. Light travels at 186,000 miles per second. How many FEET does it travel in a microsecond? (A microsecond is a millionth of a second.)

A) 186.0
B) 982.1
C) 9821.0
D) 1860.0

69. You are borrowing $8750 to buy a car. If you pay off the loan in 4 years (48 months), estimate your monthly payment (ignoring interest).

A) $165
B) $173
C) $182
D) $190

70. The number of blogs has grown rapidly. Assuming that two new blogs are created each second, how many blogs will be set up in one month (30 days)?

A) 5.27×10^{5}
B) 6.17×10^{5}
C) 5.27×10^{6}
D) 6.17×10^{6}

71. You are going on a 957-mile trip and your car gets 27 miles per gallon. Gas prices along your route average $3.78 per gallon. Estimate the cost of gasoline for your trip. Round your answer to the nearest dollar.

A) $120
B) $134
C) $145
D) $157

72. If you had $1 million in $10 bills, how many bills would you have?

A) 1 million
B) 100,000
C) 10 million
D) 10,000

73. A study found that your state has a deficit of $2.3 billion. If the population of your state is approximately 3 million, how much would each person in the state have to contribute to pay this deficit? Round to the nearest dollar.

A) $77
B) $767
C) $7667
D) $76,670

74. 0.0000037 is the same as 3.7×10^{-5}.

A) True
B) False

75. Suppose you wanted to line up all the people in the world. (The world's population is about 6.8 billion.) Assuming that each person takes up 12 inches of the line, how many times around Earth would they reach? (Earth has a circumference of about 25,000 miles.) Round you answer to the nearest tenth.

A) 92.1
B) 53.0
C) 51.5
D) 68.2

76. It is estimated that in 2009 the United States consumed 18.69 million barrels of oil a day. A barrel of oil is 42 U.S. gallons. Assuming a U.S. population of 306 million, estimate per capita consumption in gallons. Round your answer to the nearest tenth.

A) 2.1
B) 2.5
C) 2.9
D) 3.5

77. It has been projected that the world's population by 2050 will be 9.34 billion. If the projected U.S. population in 2050 is 438 million, what percent of the world's population will be the U.S. population? Round your answer to the nearest tenth of a percent.

A) 5.1%
B) 4.9%
C) 4.7%
D) 4.3%

78. You need to buy carpet. One store advertises carpet at $1.60 per square foot. Another store has the same carpet advertised at $14.00 “per yard.” (What the store really means is price per *square* yard.) Which is the better buy?

79. The land area of California is 155,959 square miles. As of 2008, the world's population was about 6.7 billion people. If in 2008 all the world's population were put into California, how many people would there be per square mile? Round your answer to the nearest whole number.

Answer Key

1. B
2. D
3. C
4. C
5. A
6. C
7. C
8.
9.
10. D
11. A
12. B
13. B
14. C
15. D
16. B
17. B
18. B
19. D
20. C
21. C
22. D
23. A
24. D
25.
26.
27. B
28. A
29. A
30. D
31. A
32. C
33. B
34. C
35. A
36. D
37.
38.
39. A
40. D
41. C
42. B
43. A
44. B

45. C
46. C
47. C
48. C
49. B
50. C
51. D
52. D
53. B
54. C
55. C
56. C
57. D
58. C
59. A
60.
61.
62. B
63. C
64. A
65. C
66. B
67. D
68. B
69. C
70. C
71. B
72. B
73. B
74. B
75. C
76. B
77. C
78.
79.