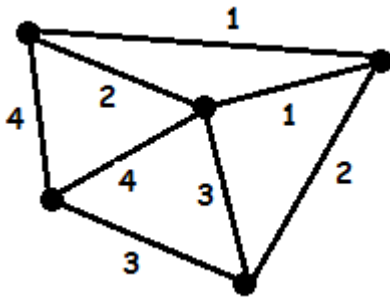Name:_____ Period _____
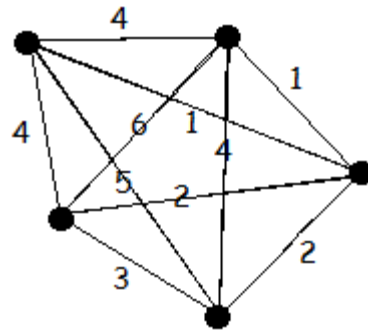
1. What is an Euler circuit?

2. What is a minimal spanning tree?

Find the minimal spanning tree in each of the graphs.

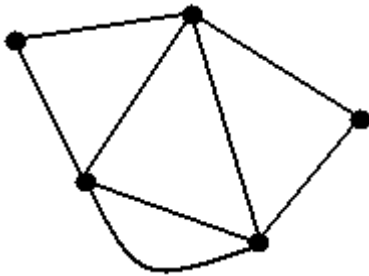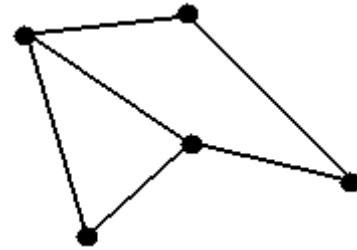3.   4.

For each graph in questions #5a and #5b, either find the Euler circuit or an Euler path. If the graph has an Euler circuit; find one and label the edges in the order in which you travel them. If the graph has an Euler path, but not an Euler circuit, find one and label its edges in the order in which you travel them. (One of them is a path and the other is a circuit.)
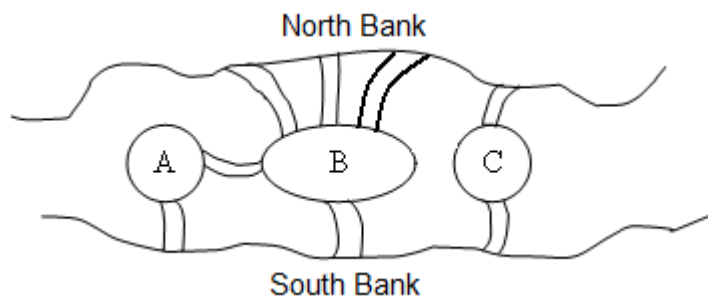
5.   a) Graph 1   5.   b) Graph 2

6. Consider the following map containing islands and bridges connecting them to the North Bank or South Bank of a river.


North Bank

South Bank

a) Does the graph of the map have an Euler circuit?

b) If it has an Euler circuit, number the bridges in the order you cross them. If it doesn't, fix it so that it will by adding bridge(s).

7. A mail carrier is assigned a new section of town. Before heading out, he wants to determine the most efficient route that still allows him to visit each house and return to the post office without visiting a house twice.
    a. Find such a route on the map below or explain why no such route exists. (List the letters as you visit them or highlight the path using arrows to show direction.)

    b. If a route exists, explain which type of route it is (Euler path, Euler circuit, Hamiltonian path, or Hamiltonian circuit).
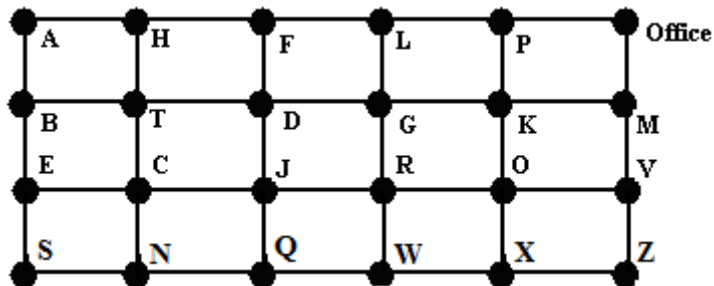
8. Your company must run Ethernet cables to the offices below so that all of the offices have high-speed internet access. For each computer to be on the office network, there must be a way to get from each computer to the other computers by following the cable. One worker proposed the following set up.
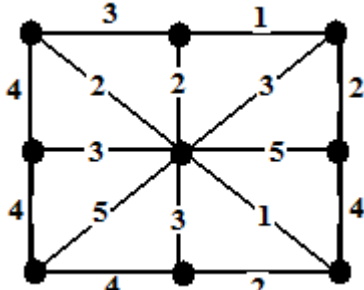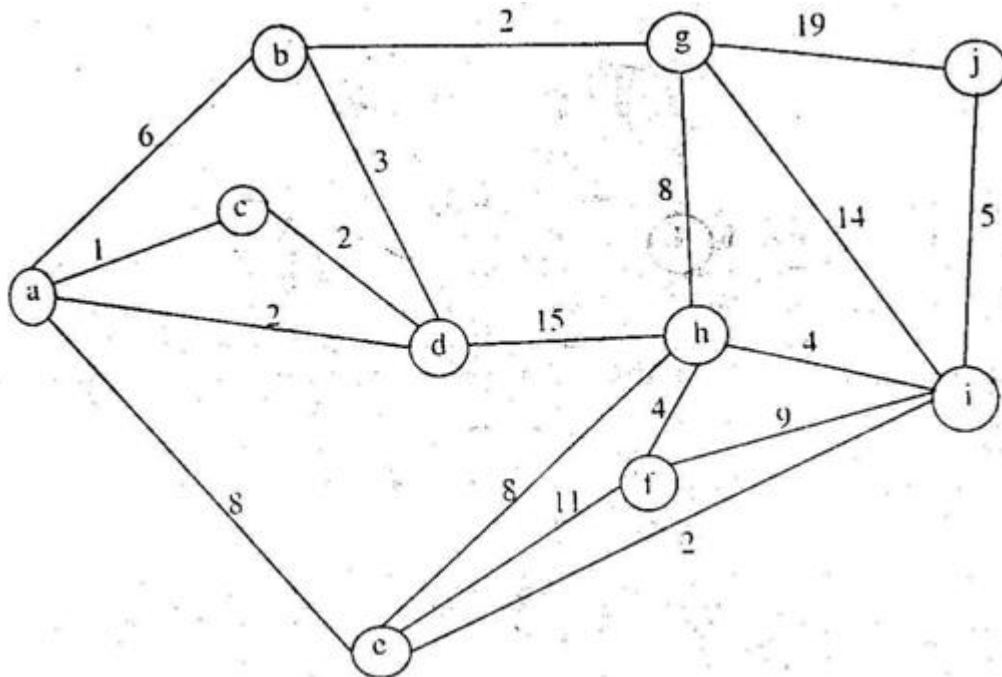

a. Design a more efficient network indicating which cables are used using the letters.
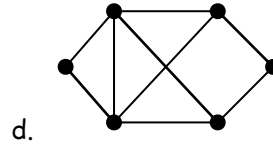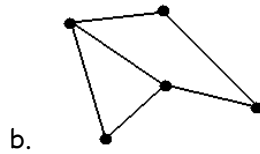
b. Design the most cost effective network given the costs in *tens of dollars* for each length of cable in the chart above. Indicate which cables are used and the total cost.

9.

Total distance of the shortest path: _____

10. Which of the following graphs has an Euler circuit?

a.

c.

b.

d.
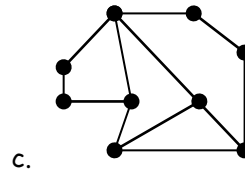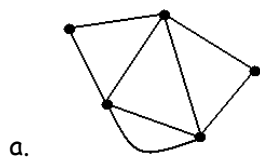
11. Which of the following graphs has a Hamiltonian circuit?

a.

c.

b.

d.
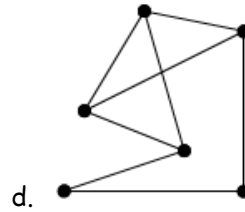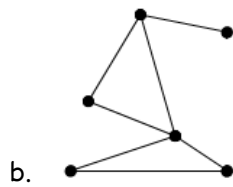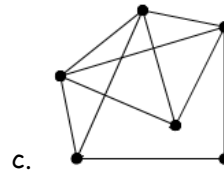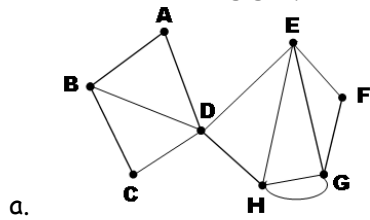
12. Which of the following graphs is the minimal spanning tree for the network below?

a.

c.

b.

d.
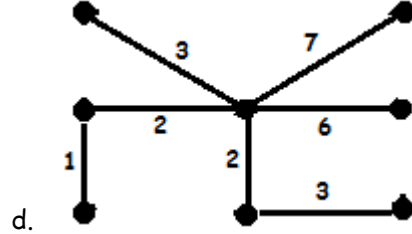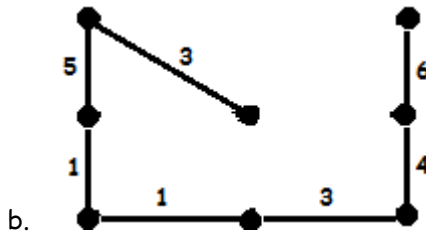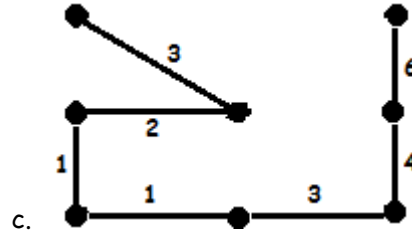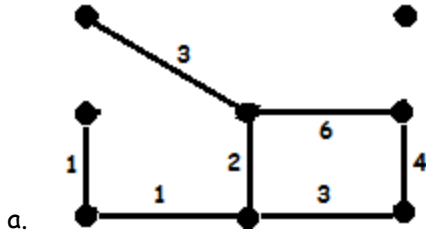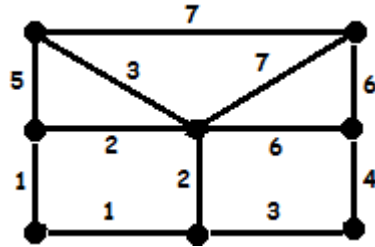
13. Which of the following is NOT true in a minimal spanning tree?
   a. Back tracking is not allowed.
   b. Cycles are not allowed.
   c. All the vertices must be connected in some way.
   d. The smallest values are the only ones to be used.

14. How do you find the minimum completion time on a PERT Chart?

Use this diagram to answer #15-18.
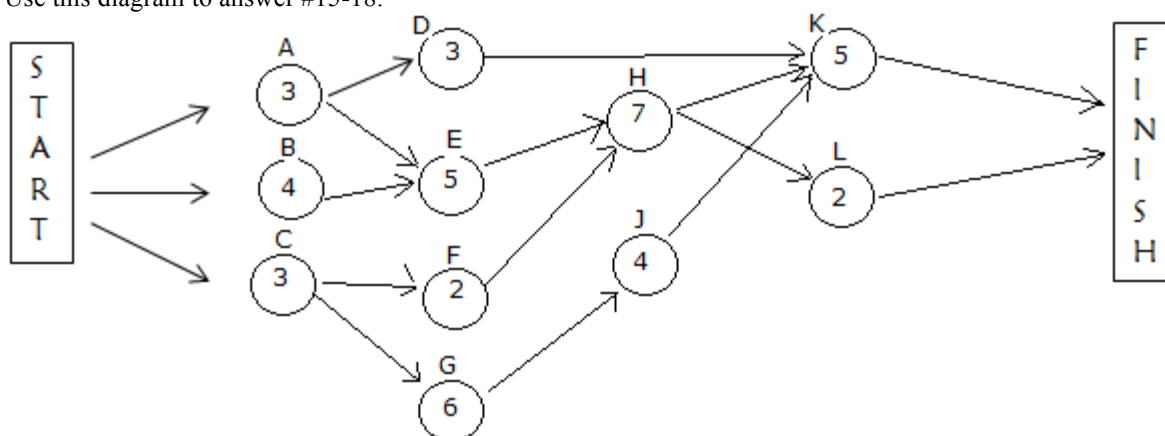
15. The minimum time to complete this project is...

16. The activities that cannot be delayed are...

17. The number of hours that D can be delayed without compromising the minimum time is...

18. The number of hours that F can be delayed without compromising the minimum time is...

Find the chromatic number for each of the following.

19.   20.
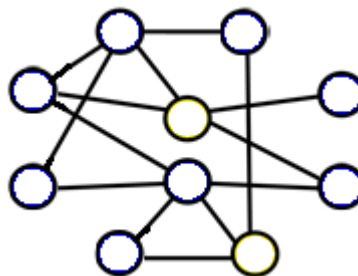
Use the following scenario to answer questions 21-23.

Kayla plays chess. Next week she will be competing in a tournament in which she will play 3 games. To win a trophy, she must win at least 2 games.

21. How many total possible outcomes can she have when she plays her 3 games?

22. What is the probability she will win at least 2 games?

23. What is the probability of winning a trophy?

Use the following scenario to answer questions 24-25.

Shari gets an allowance of $20 per week. She has decided she needs more money, so she has made a deal with her mother in hopes of increasing her weekly allowance. She proposes that she will throw a dart at the dart board. If she hits the board, she gets the original $20 plus another shot at the dartboard for an additional $20. If she misses the first throw, she only gets $10 for the week. Shari hits the dart board 50% of the time.

24. Shari's mom is worried about how often she will be giving her daughter $40 a week. Given Shari's stats, how many weeks will her mom be out $40?

25. How many weeks in a year will her mom only have to pay $10?

26. For a rectangular shape such as a display screen, the longer side is called the width (W) and the shorter side is the height (H). The aspect ratio is W:H or W/H.

   The aspect ratio of a rectangle is 12:9. If the width of the rectangle measures 60 inches, what is the measure of the shorter side?

27. Find the aspect ratio of this rectangle.
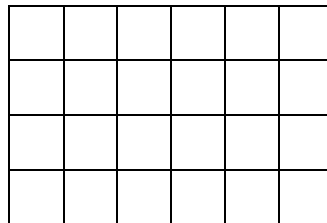
28. Which of the following is a good definition for Compound Probability?

   a) Probability from a chance experiment that has only 2 outcomes.
   b) Probability that takes into account a given event occurring.
   c) Two events that do affect the other's chance of occurring.
   d) The average of a probability distribution.

Use the following information for questions 29-32.
You are thrown 4 fastballs and you must hit them in a fair zone to count.
   If you hit all 4 in a fair zone you win the big prize
   If you hit 3 or 2 in a fair zone you win a medium size prize
   If you hit 1 in the fair zone you get the small prize
   If you hit zero you do not win and receive no prize.

29. What is the probability you will win the big prize?

30. What is the probability of getting the small prize?

31. What is the probability of getting nothing?

32. What is the probability of winning a medium prize?

33. Jar 1 has 6 marbles in it. Jar 2 has 4 cubes in it. Find the probability of drawing out a blue marble and a green cube without looking.
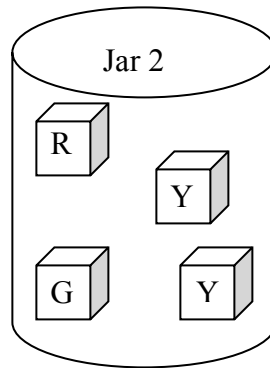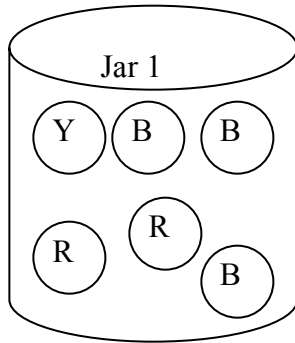
34. What is the chromatic number of a map or graph?

Find the chromatic number of the following:
35. a   35. b
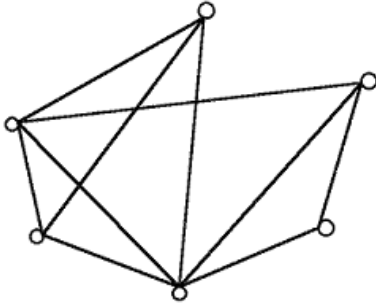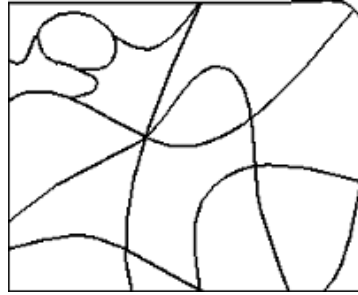
36. 50 students in Mr. Price's class received Playstation 3 games for Christmas. He polled the students to see if any of them received Modern Warfare 2 (MW) or Uncharted 2 (Un). The response was 31 received Modern Warfare 2, 26 received both and 7 didn't get either game. Which of the following Venn Diagrams correctly shows the data from the classes?

A.

MW   UN

5   (26)   12

7

B.

MW   UN

31   (26) 2

7
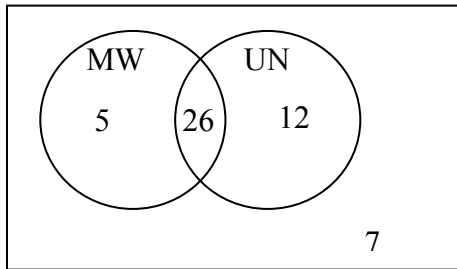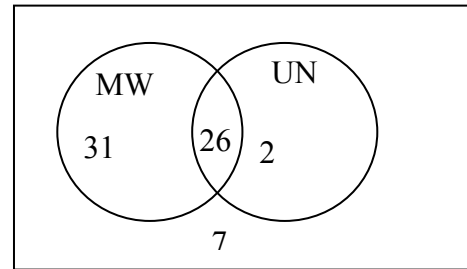
37. You toss a coin without looking at the board to the right of this question. Looking at the board as an area model, what are the chances that your coin lands on a red section?

RED			
BLUE	GREEN	BLUE	BLUE
BLUE	GREEN		RED

The combo meal sale is a huge success. They release some data showing their percentages of how often items were chosen:

Sandwich	Side	Drink
Jr. Bacon Cheeseburger (65%)	Fries (63%)	Coke (33%)
Crispy Chicken Sandwich (35%)	Salad (17%)	Diet Coke (18%)
	Baked Potato (20%)	Dr. Pepper (26%)
		Sprite (23%)

38. So based on these sales numbers, what are the odds that the next customer orders a Jr. Bacon Cheeseburger, fries or potato, and a Dr. Pepper?

39. How many possible combinations are there for a combo meal?

Questions 40 – 45 Given P245/70R16 tires, answer the following:

40. This is a tire for what type of vehicle?

41. 245 specifies the tire's _____in _____ .

42. This tire's aspect ratio is _____ .

43. The aspect ratio of a tire is always given as a

    _____ .

44. What does the 16 stand for?

    _____.

45. What is the diameter of this tire in <u>inches</u>?

Use the following information to answer questions 46-47:

Actual mileage = k · odometer reading (mileage)

Actual speed = k · speedometer reading (miles per hour)

Where k =   <u>circumference of bigger tire</u>
                      circumference of factory-installed tire

46. If the odometer reading is 30,000 miles on your car and you have tires with a circumference of 103 inches, you have actually traveled _____ miles. (The factory-installed tires circumference is 93 inches.)

47. If the speedometer reading is 60 mph on your car and you have tires with a circumference of 103 inches, you are actually traveling _____ mph. (Factory-installed tires circumference is 93 inches.)

48. Jason has a spinner game with three spinners, each divided into three equal parts of red, green, and blue. What is the probability of getting blue on all three spinners?

49. What is the percentage of students taking both courses?
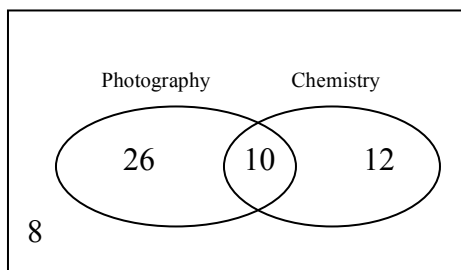
50. You are hired to estimate how many people attend a celebration at Zilker Park. You mark off a five foot by five foot square to help make your estimation. Which of the following situations might distort your estimation?

   A. The entire offensive line of the Dallas Cowboys is in your square
   B. There is a class of kindergartners in your square.
   C. There are some mothers with babies in strollers.
   D. All of the above can distort your estimation.

51. There are about 6,600,000,000 people living in the world. About how many males are there? (A reasonable estimation)

How many phone numbers are possible in the (512) area code if:

52. For the form ABC-XXXX, A is restricted to 2-9. X, B, and C can be any digit 0-9.

53. How many area codes would be possible if all three digits could be any value 1-9?

54. Texas for the last 30 years has manufactured about 31.5 million license plates. The six-digit license plate has been replaced because with a seven-digit license plate with the following pattern: A A 0 – A 0 0 0. There are 3 letters with the restriction of no vowels and 4 numbers between 0-9. How many plate numbers will be assigned?

55. How many phone numbers are possible in the (737) area code if:

    For the form ABC-XXXX, X can be any digit 0-9

56. You are standing amongst a crowd that is 10 feet deep and 2 miles long at a parade. You want to estimate how many people are there. If each person occupies 2 square feet, estimate the size of the crowd watching the parade along a 2 mile stretch. (Both sides of the street) (There are 5,280 feet in one mile)

57. You are standing amongst a crowd that is 5 feet deep and 1.5 miles long at a parade. You want to estimate how many people are there. If each person occupies 2.5 square feet, estimate the size of the crowd watching the parade along a 1.5 mile stretch. (Both sides of the street) (there are 5,280 feet in one mile)

58. The seniors at our high school decided to play a prank on the principal by completely filling his office with soccer balls. To determine the number of basketballs needed the students measured the room after moving out the furniture. If the room measured 15 ft by 20 ft by 10 ft, approximately how many soccer balls did the students put in the principal's office? The soccer balls had a circumference of 27 inches.

59. What mathematical model is the basketball in the problem above?

60. John is giving away baseballs to children in need. He is quickly calculating how many baseballs could fit in the bed of his pick-up truck.

> Info needed:
> bed of truck = 48in by 72in by 18in
> 120 balls can fit in one cubic foot
>
> 1. 48x72x18 = 62,208 cubic inches
> 2. 62,208/12 = 5184 cubic feet
> 3. 120balls/1cubicfoot = x/5184cubicfeet
> 4. Number of baseballs would be 622,080

Where did John make his mistake?

A. The volume of his truck bed should be 36 cubic feet
B. The proportion should have been 120balls/1cubicfoot = 5184cubicfeet/x
C. He should not be doing proportions at all
D. John has not made a mistake

61. Find the false statement about Fermi questions.
   A. Fermi questions were named after an Italian physicist.
   B. Fermi questions have limited information, but are possible by using mathematics to find a reasonable numerical estimate.
   C. Fermi questions do not rely on making logical assumptions about a situation to reach an estimate.
   D. A classic Fermi question is "How many piano tuners are there in the city of Chicago?"

The aspect ratio of a rectangular shape is its length (L) divided by its width (W). It is expressed as L:W or L/W

62. The dimensions of a desk are 25in long and 20in wide. What is the aspect ratio of the desk?

63. If the aspect ratio of a chalkboard eraser is 8:6 and the width of the eraser is 9 in, what is the length of the eraser?

64. If the aspect ratio of a chalkboard is 8:6 and the width is 12 in., what is the length of the diagonal?

65. A television with a 5:4 pillar boxed image is displayed on a 20:12 ratio screen. What percent of the screen's area is occupied by the image?

66. Mr. Tysor has a 15.2 in.x 11.4 in. monitor on his computer. After purchasing a HDMI cord and hooking up his computer to his 65" TV, the rim of the picture did not show up on his TV screen. This was because:

   a) He did not put it on full screen.

   b) The aspect ratio of the TV (16:9)) does not match the aspect ratio of his computer monitor.

   c) The aspect ratio of the TV (4:3) does not match the aspect ratio of his computer monitor.

   d) New TVs have a default that will only receive 90 percent of the computer screen.

67.Find the area of a 16:9 60 inch <u>wide screen</u> TV by: _____

a. Drawing a diagram labeled correctly
b. Finding the lengths of the sides
c. Calculating the area. Show all work and include explanations where appropriate.

Use the following for #68-70.

System 1	System 2
Test Average- 50%	Test Average- 60%
Final Exam Grade- 25%	Final Exam Grade- 20%
Homework- 15%	Homework- 10%
Class Participation- 10%	Class Participation- 10%

- Test Average- 85
- Final Exam Grade- 72
- Homework – 92
- Class Participation- 95

68. Above are your grade averages by category. Which grading system gives you the greatest average?

69. If you scored 10 points higher on a homework assignment, how would that affect your final grade?

70. Which grading system is the best benefited if you scored a 75 on your Test Average?

71. Define Binomial Probability:

Use the following scenario to answer question 72

UPC numbers, typically in the form of barcodes, identify retail products. In the United States, UPC codes are often 12-digit barcodes and consist of three parts:
- the first six numbers identify the manufacturer of the product,
- the next five numbers identify the product, and,
- the final number is the check digit.

The above barcode is for the Clorox Company (044600), the product is identified as lemon-scented disinfecting wipes (01628), and the check digit is 3.

The check digit in a UPC number is that value of **d** for which the following sum totals a number whose final digit is 0:

$$3a_1 + a_2 + 3a_3 + a_4 + 3a_5 + a_6 + 3a_7 + a_8 + 3a_9 + a_{10} + 3a_{11} + d$$

In our example, $3(0) + 4 + 3(4) + 6 + 3(0) + 0 + 3(0) + 1 + 3(6) + 2 + 3(8) + d$ must be a sum that ends in 0.

$$\Rightarrow 0 + 4 + 12 + 6 + 0 + 0 + 0 + 1 + 18 + 2 + 24 + d$$

$$\Rightarrow 67 + d$$

$$\therefore d = 3$$

72. Which of the following is a valid UPC code?

a) 1-00982-34983-7

b) 0-28400-07132-1

c) 0-25700-00391-4

d) 7-54246-10478-3

73. Determine the check digit (d) for the UPC number 02467936163**d**.

74. Is the following credit card valid?   5326 8503 0124 4601   Yes_____   No_____

75. 4601 1234 4011 6951 is not a valid credit card; what would you change to make it a valid number?

76. Suppose that the digit indicated by a question mark in the MasterCard number
524?   **2317**   **1527**   **3143** is unreadable. What is the unreadable number?

Create a Venn Diagram to answer the questions for the following situation.
A marketing class polled 150 people at a shopping center to determine how many read the *Daily News* and how many read the *Weekly Gazette*. They found the following:
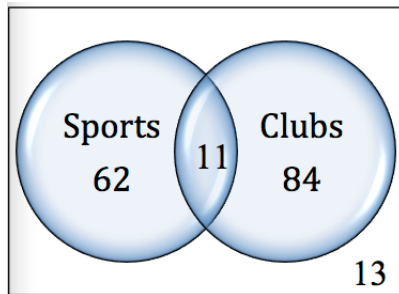   95 just read the *Daily News*, 31 read both, 10 read neither.
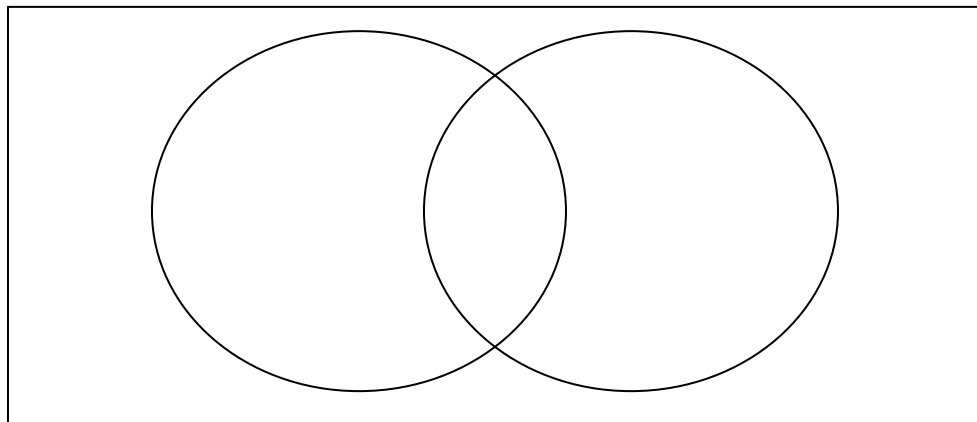
77. What is the probability that a person only reads the Weekly Gazette?

78. P(reads both Daily News and Weekly Gazette)

79. P(a person reads neither)

#80 - 82

80. What is the probability that a person only participates in sports?

81. P(plays sports and goes to clubs)

82. P(does not participate in sports or clubs)

You are eating lunch at Subway and have narrowed your sandwich choices to the items in the table below. You must choose one item from each category and the estimated probability for each choice is included.

Bread	Meat	Spread
Honey Oat (0.4)	Ham (0.6)	Mayo (0.5)
White (0.6)	Turkey (0.4)	Mustard (0.2)
		Ranch (0.3)

Create a tree diagram showing all possible choices to help you answer questions 83-85

83. How many outcomes are possible?

84. P(honey oat, with ham and mayo)

85. P(white bread, with ham and mayo or ranch)?

86. The 3rd baseman for the Atlanta Braves, Chipper Jones, has the following stats after 140 games during the

         2010 season: Batting Average = Hits/At Bats

             35 Doubles
             2 Triples
             168 Singles
             22 Homeruns
             521 At-bats

     What is his slugging percentage?   _____

87. Find the slugging percentage for a baseball player with 40 singles, 4 doubles, 2 triples, and 5 homeruns with 180 at bats.

#88 – 92 The National Football League (NFL) rates quarterbacks for statistical purposes against a fixed performance standard based on the statistical achievements of all qualified pro passers since 1960. This system allows passing performances to be compared from one season to the next.

The following categories are used to compute the quarterback rating:
- percent of completions per attempt (**%COMP**)
- percent of touchdown passes per attempt (**%TD**)
- percent of interceptions per attempt (**%INT**)
- average yards gained per attempt (**YD**)

(From www.nfl.com/help/quarterbackratingformula)

The following is the formula for compiling the quarterback rating (**QR**):

$$QR = \frac{25 + 10(\%COMP) + 40(\%TD) - 50(\%INT) + 50(YD)}{12}$$

For the 2013 regular season, New Orleans Saints quarterback Drew Brees completed 300 passes in 439 attempts for a total of 3,647 yards, with 28 touchdowns and 8 interceptions. Find Brees' quarterback rating for these games.   Round each value to the nearest tenth.

88. Percent of completions per attempt (**%COMP**) =

89. Percent of touchdown passes per attempt (**%TD**) =

90. Percent of interceptions per attempt (**%INT**) =

91. Average yards gained per attempt (**YD**) =

92. What is Brees' quarterback rating for the 2013 regular season?

93. Bob worked for 15 consecutive days, earning an average wage of $ 90 per day. During the first 7 days, his average wage was $ 87/day, and his average wage during the last 7 days was $ 92 /day. What was his wage on the 8th day?