**MAH Unit 14 Probability WS**

1. A whole number smaller than 25 is chosen at random. Find the probabilities of choosing:

a. A factor of 20

b. An even number or a 7

c. A number smaller than 15

2. In a game numbered balls are put in a bag. The whole numbers range from 4 through 92.

If one ball is chosen find the probabilities of that ball being:

a) Odd or a multiple of 5

b) A factor of 50 or a multiple of 3

If two balls are chosen without replacement find the probabilities of the two balls:

c) Both being even

d) Having a sum of 40

3. Consider a deck of 52 cards.

If one card is chosen what is the probability of choosing:

a) a spade or a 5?

b) a red jack or a queen ?

If 2 cards are chosen without replacement what is the probability of choosing:

c) Two jacks?

d) Two red cards?

e) Any pair?

4. Liz has 2 blue, 1 red and 1 white dress(es) and 3 pairs of shoes colored blue, red and white. If she decides at random what to wear, what are the probabilities of wearing:

a. A blue dress and blue shoes?

b. Shoes and a dress that are both not white?

c. Blue or red shoes?

5. How many ways can 7 students come in first, second, and third place in a math contest? Only one student can earn each place.

6. There are 9 balls in a hat. The balls are numbered1-9. You need to choose 3 of the balls (without replacement). How many possible combinations are there? What is the probability of choosing all odd numbers?

7. There are 26 students in an English class. For a certain activity, 4 of those students need to form a group. How many ways can a group of 4 students be formed?

8. How many ways can a student select six questions from an exam containing ten questions, if you take into account the different orders in which you can answer the question?

9. Mary has to visit 6 friends. In how many different orders can she visit them?

10. In a research project about pet behavior a random sample of 500 cats was chosen. 52% of the cats liked to sleep inside the house. Fish was the favorite dish of 25% of those cats, while 62.5% of the cats sleeping outside had another favorite dish.

a. How many cats in the sample like fish?

b. A cat is chosen at random. What’s the probability that she likes fish and sleeps inside?

c. How many cats in the sample don’t like fish?

d. How many cats in the sample like to sleep outside and like fish?

11. In a town, 45% of all households have a pet and 35% have children. 40% of all households with children have a pet. A household is chosen at random. Find the probability of that household

a. having no children, but a pet

b. having neither children nor a pet c. having children, but no pets

12. In a school, 10% of students have 7 ball pens, 30% of students have 3 ball pens, 40% of students have 2 ball pens and 20% of students have 1 ball pens. What is the expected number of ball pens of a student?

13. In a survey report of offices, 60% of offices have 10 air conditioners, 10% of offices have 3 air conditioners, and 30% of offices have 6 air conditioners. What is the expected number of air conditioners in offices?

14. An investor is going to make a long-term investment in a company. If all goes well, an investment of $100 will be worth $900 in twenty years. The risk is that the company may go bankrupt within twenty years in which case the investment is worthless. Suppose there is a 25% chance that the company will go bankrupt within 20 years. What is the expected value of this investment?

15. A bucket contains 12 blue, 10 red, and 8 yellow marbles. For $5, a player is allowed to randomly pick two marbles out of the bucket without replacement. If the colors of the two marbles match each other, the player wins $12. Otherwise the player wins nothing. What is the expected gain or loss for the player?

16. In the carnival game W*iffle Roll,* a player will roll a wiffle ball across some colored cups. Suppose that if the ball stops in a blue cup, the player wins $20. If it stops in a red cup, they win $10, and if it stops in a white cup, the player wins nothing. There are 25 white cups, 4 red cups, and 1 blue cup. Assume the chances of stopping in any cup is the same. How much should this game cost if it is to be a fair game?

17. In a game of chance, the cost to play is $2. The player gets 3 bean-bags to toss at a board. The board has red and black areas. The probability of hitting a red area is 20%. If a player hits only one red they win a

$3 prize, if a player hits only 2 reds then they win a $5 prize, if a player hits red on all three tosses then they win a $10 prize.

a) Find the probability of hitting only 1 red in three throws. b) Find the probability of hitting only 2 reds in three throws. c) Find the probability of hitting all 3 reds in three throws.

d) What is the expected value for the player of the game?

18. A lawn darts team has choice of hitting a short field bonus throw or long zone bonus. 1 point is for the short field hit and getting the ball in the long zone is worth 3 points. The coach tracked the statistics of using attempt strategies: Short Field (1 point) = 85.8% Long Field (3 points) = 28.7%

If the team gets 10 chances to score this season, what strategy would result in statistically the most points?

19. A car company finds a major defect in their vehicle that results in the car’s engine bursting into flames during operation. As the CEO of the company you must make a decision entirely based on the most cost effective method of fixing this problem. Your company sold 826,723 of these cars. You could:

a) Recall all the cars and fix the problem. The financials behind this method include:

 The cost to fix the cars would be $832 per car.

 The cost to contact customers to make the fix would be 51 cents per customer.

 A $350,000 fine by the government for issuing a recall.

 In all recall situations, only an average of 81.6% of customers actual have the car serviced for the recall.

b) You could just defend your company against law suits brought on by individuals in a class-action law

suits. The financials behind this method include:

 An industry average of 49.2% of customers that are part of the active plaintiffs.

 2.5 million dollars for legal fees.

 An average award of $483 per plaintiff.

Answer Key:

1) A) 0.24 or 24% B) 0.56 or 56% C) 0.6 or 60%

2) A) 0.6 or 60 % B) 0.37 or 37% C) 0.2528 or 25.28% D) 0.0041 or 0.41 %

3) A) 0.31 or 31% B) 0.1154 or 11.54% C) 0.00452 or 0.452% D) 0.245 or 24.5%

E) 0.0588 or 5.88%

4) A) 0.16667 or 16.667% B) 0.5 or 50% C) 0.6667 or 66.67%

5) 210

6) 84; 0.119 or 11.9%

7) 14, 950

8) 151, 200

9) 720

10) A) 155 B) 0.13 or 13% C) 345 D) 90

11) A) 0.31 or 31% B) 0.34 or 34% C) 0.21 or 21%

12) 2.6

13) 8.1

14) $575

15) ($7(0.32) + -$5(0.68)) = -$1.16

16) $2

17) A) 0.384 or 38.4% B) 0.096 or 9.6% C) 0.008 or 0.8% D) -$0.29

18) All long throws

19) A) $562,043,794.10

B) $198,959,146.80 It’s cost effective to NOT do the recall (but morally wrong)