Name: KEY Pd:_____

MATH 2 HONORS

TEST REVIEW: Probability

1. The following table shows activities some students are involved in, with the students identified by their initials.

Student	Student council	Community service	Band	Drama	Sports team
AS	✔				✔
RV		✔		✔	
DB	✔		✔		
BB		✔	✔	✔	
NP	✔				✔
DG			✔		✔
DK	✔	✔		✔	

A student is chosen from the group at random. Consider the following events.

B: The student is in the band.

S: The student is on the sports team.

How many outcomes are in the event $(B \cup S)^c$?

There are 2 outcomes in $(B \cup S)^c$.

R S E

2. Raekwon, Sage, and Eleni work at a restaurant. On Monday, the boss assigns one of them at random to write the daily specials on the chalkboard in front of the restaurant. Then on Tuesday, the boss again assigns one of them at random to the same task. Which event has the most outcomes?

a. Raekwon is assigned at least once. 5

b. Raekwon is assigned exactly once. 4

c. Raekwon is not assigned. 4

d. The same person is assigned twice. 3

Sample Space: {RR, RS, RE, SR, SS, SE, ER, ES, EE}

3. How many ways can you roll a pair of dice and get an odd product?

There are 9 different ways.

4. Ivan rolls a 6-sided die and then rolls it again. What is the probability that the first roll is odd or the sum of the rolls is odd?

5

0

$P(O \cup S) = P(O) + P(S) - P(O \cap S)$

$= \frac{18}{36} + \frac{18}{36} - \frac{9}{36}$

$= \frac{27}{36}$

$P(O \cup S) = \frac{3}{4}$

5. Hamilton High School has 200 eleventh-grade students. There are 165 eleventh graders in physical education, 60 eleventh graders in intramural sports, and 180 eleventh graders in physical education or intramural sports. What is the probability that a randomly chosen eleventh grader at Hamilton High School is in physical education and intramural sports?

E

I

O

$$P(E \cup I) = P(E) + P(I) - P(E \cap I)$$

$$\frac{180}{200} = \frac{165}{200} + \frac{60}{200} - P(E \cap I)$$

$$\frac{45}{200} = P(E \cap I)$$

$$P(E \cap I) = \frac{9}{40} = 0.225 = 22.5\%$$

6. Which event has the greatest probability if 3 coins are tossed?

$S = \{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT\}$

a. at least 2 tails $\frac{4}{8} = \frac{1}{2}$

b. no tail or exactly 1 tail $\frac{4}{8} = \frac{1}{2}$

c. exactly 1 tail or exactly 2 heads $\frac{6}{8} = \frac{3}{4}$

d. exactly 2 tails or exactly 2 heads $\frac{3}{8}$

7. Byron has a bag that contains the following tiles.

E	L	E	S	R

1

Byron takes a tile from the bag without looking. Then he replaces it. Then he takes another tile from the bag without looking. Consider the following events.

independent

F: Byron takes E first

S: Byron takes E second

F and S: Byron takes E first and E second

$$P(F \cap S) = P(F) \cdot P(S)$$

$$P(F \cap S) = \frac{2}{5} \cdot \frac{2}{5}$$

$$P(F \cap S) = \frac{4}{25} = .16 = 16\%$$

Which option describes the events?

a. *F* and *S* are dependent, and the probability of *F* and *S* is 10%

b. *F* and *S* are dependent, and the probability of *F* and *S* is 16%

c. *F* and *S* are independent, and the probability of *F* and *S* is 10%

d. *F* and *S* are independent, and the probability of *F* and *S* is 16%

8. The expression for batting average in softball is $\frac{number\ of\ hits}{number\ of\ times\ at\ bat}$. Marcia's batting average is 0.420, and she is at bat. Ah-Reum's batting average is 0.300, and she will be at bat after Marcia. Assume that each player's performances is independent of the other's. What is the probability that Marcia or Ah-Reum will get a hit, based on their averages?

M A

$P(M \cup A) = P(M) + P(A) - P(M \cap A)$

$= 0.420 + 0.300 - (0.420)(0.300)$

$P(M \cup A) = 0.594 = 59.4\%$

Recall: For any 2 independent events, then $P(M \cap A) = P(M) \cdot P(A)$

9. Ruben and Mack are electricians working for a company called State Electrical Contractor. Mack has been on 60% of State's service calls. At least one of the two workers has been on 76% of State's service calls. Assume that Mack being on a service call and Ruben being on a service call are independent events. What is the probability that Ruben will on the next service call, based on the data?

R M

$P(M \cup R) = P(M) + P(R) - P(M)P(R)$

$.76 = .6 + P(R) - (.6)(P(R))$

$.16 = P(R) - (.6)(P(R))$

$.16 = P(R)(1 - .6)$

$P(R) = 0.4 = 40\%$

10. The table shows data on 400 students at a college.

Comparing Field of Study in College with High School Attended

High school attended	Field of study in college				
	Science, math, or engineering	Business or economics	Social sciences	Visual and performing arts	
Washington	30	28	35	25	118
Lincoln	25	32	35	28	120
Jefferson	65	30	40	27	162
	120	90	110	80	400

Each pair of events below describes a student chosen randomly at the college. Which pair of events seems to be dependent, based on the data in the table? Use: $P(A \cap B) = P(A) \cdot P(B)$

a. The student is in science, math, or engineering and went to Jefferson High School.

b. The student is in business or economics and went to Washington High School.

c. The student is in social sciences and went to Washington High School.

d. The student is in visual and performing arts and went to Jefferson High School.

11. The table below shows the winning percentages of the four athletic teams at Bay High School that are active in league competition.

Winning Percentages at Bay High School

Team	Percent of games won
Boys' baseball	60%
Boys' lacrosse	50%
Girls' softball	80%
Girls' lacrosse	60%

All four teams are scheduled to play today. The school's athletic director wants to know the probability that at least one team will win today, based on the data. She assumes that each team's winning or losing is independent of all the other team's results. Complete parts a-f to find the probability the director wants.

a. What is the probability that the boys baseball team (B) or boys' lacrosse team (L) will win today?

$P(B \cup L) = P(B) + P(L) - P(B \cap L)$
$= .6 + .5 - (.6)(.5)$
$P(B \cup L) = .8 = 80\%$

b. What is the probability that a boys team will win today?

The only two boys teams are baseball and lacrosse. Therefore, this is the same as #a.
80%

c. What is the probability that the girls' softball team (S) or girls' lacrosse team (G) will win today?

$P(S \cup G) = P(S) + P(G) - P(S) \cdot P(G)$
$= .8 + .6 - (.8)(.6)$
$P(S \cup G) = .92 = 92\%$

d. What is the probability that a girls' team will win today?

The only two girls teams are softball and lacrosse. Therefore, this is the same as #c.
92%

e. What is the probability that a boys' team (M) or a girls' team (F) will win today?

$P(M \cup F) = P(M) + P(F) - P(M)P(F)$
$= .8 + .92 - (.8)(.92)$
$P(M \cup F) = .984 = 98.4\%$

f. What is the probability that at least one team will win today?

This is the same as #e.
98.4%

12. Paula rolls a pair of number cubes. What is the probability that she gets doubles (D) (the same number on both cubes) if both numbers are odd (O)?

→ given

$$P(D \mid O) = \frac{P(D \cap O)}{P(O)} = \frac{3}{9} = \frac{1}{3}$$

Use $P(B|A)=P(B)$ and $P(A|B)=P(A)$

13. The Leons have 3 children. Which pair of events is independent?

a. The oldest child is a girl. Exactly 2 children are girls.

b. The second oldest child is a girl. At least 2 children are girls.

c. The oldest child is a boy. Exactly 2 consecutive children are boys.

d. The second oldest child is a boy. Exactly 2 consecutive children are boys.

$S=\{ggg, ggb, gbg, gbb, bgg, bgb, bbg, bbb\}$

14. A survey revealed that 40% of the students at Douglas High School are involved in an extracurricular (E) activity. The survey also showed that 32% of the students at the school are involved in an extracurricular activity and also participated in the fall 5K fundraiser (F). What is the probability that a student who is involved in an extracurricular activity also participated in the 5K fundraiser?

$$P(F|E)=\frac{P(F\cap E)}{P(E)}=\frac{.32}{.4}$$

$$P(F|E)=.8=80\%$$

15. The table below shows numbers of purchases in three stores and the corresponding gender of the customers for each number of purchases. What is the probability that a purchase is made by a male (M), given that the purchase is made in store B (B)?

Gender	Store			
	Store A	Store B	Store C	
Male	15	20	25	60
Female	20	15	15	50
	35	35	40	110

$$P(M|B)=\frac{P(M\cap B)}{P(B)}=\frac{\frac{20}{110}}{\frac{35}{110}}=\frac{20}{35}=\frac{4}{7}$$

16. What is the probability that 2 cards selected from a standard deck of 52 cards without replacement are both odd numbers? odd numbers: 3, 5, 7, 9

$$\frac{16}{52}\cdot\frac{15}{51}=\frac{20}{221}=0.0904=9.04\%$$

17. What is the probability that 2 cards selected from a standard deck of 52 cards without replacement are both multiples of 5?

$$\frac{8}{52}\cdot\frac{7}{51}=\frac{14}{663}=0.021=2.1\%$$

D L

18. Dan and Lamar are brothers. Each Monday, Tuesday, and Wednesday they toss a coin to decide which one of them has to walk the family dog. Consider the following events.

A: Dan walks the dog on Monday.

B: Dan walks the dog on exactly 2 consecutive days.

Complete the following.

a. List the sample space.

$S = \{DDD, DDL, DLD, DLL, LDD, LDL, LLD, LLL\}$

b. Find $P(B|A)$, first using probabilities and then using outcomes. Show your work.

$P(B|A) = \frac{P(B \cap A)}{P(A)} = \frac{\frac{1}{8}}{\frac{4}{8}} = \frac{1}{4}$

$P(B|A) = \frac{\#\text{ of outcomes in } (B \cap A)}{\#\text{ of outcomes in } A} = \frac{1}{4}$

c. Determine if *A* and *B* are independent. Show your work and explain your method.

$P(B) = \frac{\text{number of outcomes in } B}{\text{number of outcomes in sample space}} = \frac{2}{8} = \frac{1}{4}$

$P(B|A) = \frac{1}{4}$ (as shown in part b)

A and B are independent because $P(B) = P(B|A)$

d. Compare $P(B|A)$ and $P(A|B)$. Show your work and explain what your answer means.

$P(A|B) = \frac{\text{number of outcomes in } (A \cap B)}{\text{number of outcomes in } B} = \frac{1}{2}$

$P(B|A) = \frac{1}{4}$ (as shown in part b)

$P(A|B) > P(B|A)$ which means it is more likely that Dan walks the dog on Monday given that he walks the dog on exactly 2 consecutive days than it is that Dan walks the dog on exactly 2 consecutive days given that he walks the dog on Monday.