Review Probability   Name___*Key*___ Period_____

Evaluate and show the set up.

1. $_7P_3 = 35$ 2. $_7P_5 = 2520$ 3. $_7C_2 = 21$

4.   The company Sea Esta has ten members on its board of directors. In how many different ways can it elect a president, vice president, secretary and treasurer? $_{10}P_4 = 5040$

5.   In the Long Beach Air Race six planes are entered and there are no ties, in how many ways can the first three finishers come in? $6 \cdot 5 \cdot 4 = 120$

6.   A four person committee is to be elected from an organization's membership of 11 people. How many different committees are possible? $_{11}C_4 = 330$

7.   There are 12 standbys who hope to get on your flight to Hawaii, but only 6 seats are available on the plane. How many different ways can the 6 people be selected? $_{12}C_6 = 924$

8.   The model car you are thinking of buying is available in nine different colors and three different styles. In how many ways can you order the car?
$9 \cdot 3 = 27$

9.   A book club offers a choice of 8 books from a list of 40. In how many ways can a member make a collection? $_{40}C_8 = 76,904,685$

10.   Suppose you find seven articles related to the topic of your research paper. In how many ways can you choose 5 articles to read?

11. $_7C_5 = 21$
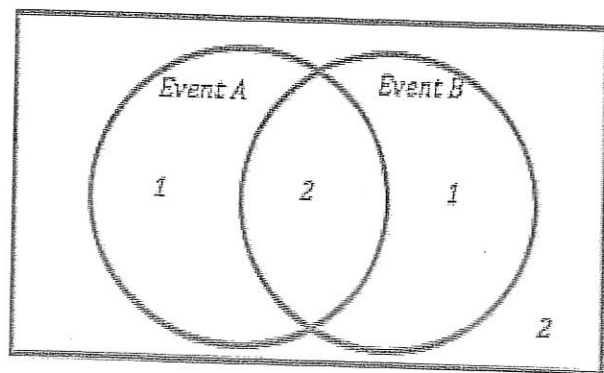
a. How many total outcomes are possible?

b. $P(A) = \frac{3}{6} = \frac{1}{2}$

c. $P(B) = \frac{3}{6} = \frac{1}{2}$

d. $P(A \cap B) = \frac{2}{6} = \frac{1}{3}$

e. $P(A|B) = \frac{2}{3}$

Given the data collected from 200 individuals concerning whether or not to extend the length of the school year in the table below answer the questions.

	For	Against	No Opinion	
Youth (5 to 19)	7	35	12	54
Adults (20 to 55)	30	27	20	77
Seniors (55 +)	25	16	28	69
	62	78	60	200

12.

13. Given that condition that a person is an adult what is the probability that they are in favor of extending the school year? P(For|Adult) = $30/77$

14. Given the condition that a person is against extending the school year what is the probability they are a Senior? P (Senior|Against) = $16/78$

15. What is the probability that a person has no opinion given that they are a youth? P (no opinion| youth) = $12/54$

16. The most important meal of the day.

Notation		2-way Table			
Key: Male = M Female = F Eats Breakfast = E Doesn't Eat Breakfast = D			Eats	Doesn't	Total
Sample size = 685		Male	247	178	425
$P(E) = \frac{351}{685}$ $P(E|M) = \frac{247}{425}$		Female	104	156	260
$P(E \cap M) = \frac{247}{685}$ $P(E|F) = \frac{104}{260}$		Total	351	334	685
$P(E \cap F) = \frac{104}{685}$					

Venn Diagram	Tree Diagram
Eats 104 (247) Male 178 156	M (62%) 425 → E (58) = 247, D (42%) = 178 F (38%) 260 → E (40%) = 104, D (60%) = 156

17. What is the probability of selecting a King from a deck of cards followed by a 10?

with replacement

$$\left(\frac{4}{52}\right)\left(\frac{4}{52}\right) = \frac{1}{169} \approx .0059$$

w/o replacement

$$\frac{4}{52} \cdot \frac{4}{51} = \frac{4}{663} \approx .006$$

18. Two cards are selected from a deck of cards. First a red card is chosen and without replacement a queen is chosen. What is the probability?

$$\frac{1}{2}\left(\frac{4}{51}\right) = .0392$$

19. Three numbers are chosen from cards numbered 1-10. First a three is chosen and without replacement a two is chosen and not replaced and then a 10 is chosen. What is the probability?

$$\left(\frac{1}{10}\right)\left(\frac{1}{9}\right)\left(\frac{1}{8}\right) \approx .00138$$

20. What is the probability of flipping a coin and getting heads three times in a row?

$$\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)\left(\frac{1}{2}\right) = \frac{1}{8} = .125$$

21. The following data represents the number of men and women passengers aboard the titanic and whether or not they survived.

	Survived	Did not survive	Total
Men	146	659	805
Women	296	106	402
Total	442	765	1207

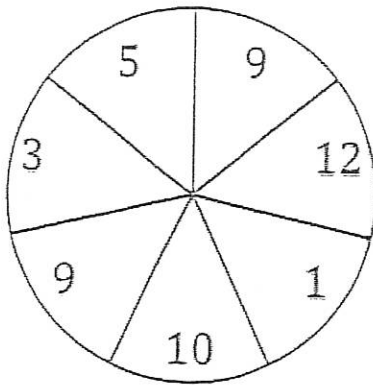$$P(w) = \frac{402}{1207}$$

$$P(s) = \frac{442}{1207}$$

$$P(s|w) = \frac{296}{402}$$

$$P(w \text{ or } s) = \frac{402}{1207} + \frac{442}{1207} - \frac{296}{1207} = \frac{548}{1207}$$

overlap

$$P(w \text{ or } m) = \frac{402}{1207} + \frac{805}{1207} = \frac{1207}{1207} = 1$$

22. Calculate the probability of each spin.

$P(\geq 2) = $ 6/7 $P(\leq 3) = $ 2/7

$P(\leq 4) = $ 2/7 $P(3) = $ 1/7

$P(\geq 6) = $ 4/7 $P(\geq 7) = $ 4/7

23. Calculate:

5! 120   3! 6 $\dfrac{7!}{3!2!}$ 420

24. On a die numbered 1-6, what is the probability of not getting a 3?

5/6

What is the probability of getting a 7?

0

25. The table shows patient data for red-green color blindness in one doctor's office.

M: means male   M': means not male
C: means color blind   C': means not color blind

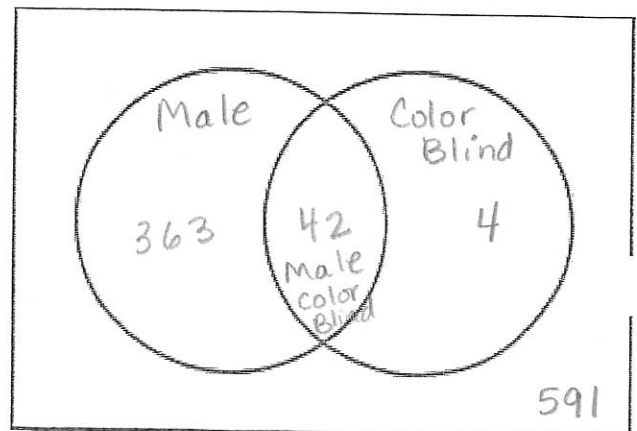|	M	M'	Total
C	42	4	46
C'	363	591	954
Total	405	595	1000

Find the following probabilities:

a) P(C) = 46/1000

b) P(M'∩C') = 591/1000

c) P(M|C') = $\dfrac{363}{954}$

Draw a Venn diagram to represent the given data.

Name: _____

Period: _____ Date: _____

Review for 10.1 – 10.3 & 11.1 Quiz

1. A lunch menu consists of 4 different kinds of sandwiches, 3 different kinds of soup, and 2 different drinks. How many choices are there for ordering a sandwich, a bowl of soup, and a drink?

$$\frac{4}{\text{sand}} \cdot \frac{3}{\text{soup}} \cdot \frac{2}{\text{drink}} = 24$$

2. What is the probability of rolling an odd number if you roll a six-sided die with sides numbered from 1 through 6?

$$\frac{3}{6} = \frac{1}{2}$$

3. You have an equally likely chance of choosing any number from 1 to 15. What is the probability that you choose a number greater than 9?

choose
10, 11, 12, 13, 14, 15

$$\frac{6}{15} = \frac{2}{5}$$

4. A coin is tossed and a die is rolled. What is the probability that the coin shows tails _and_ the die shows an odd number?

$$\frac{1}{2} \cdot \frac{3}{6} = \frac{1}{4}$$

5. Evaluate: $\dfrac{10!}{5! \cdot 6!} = 42$

6. You have an equally likely chance of choosing any number from 1 to 12. What is the probability that you choose a number less than 5?
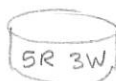
choose
1, 2, 3, 4

$$\frac{4}{12} = \frac{1}{3}$$

7. Tell whether the events are _independent_ or _dependent_. Then answer the question.

a. Two urns both contain red balls and white balls. Urn I contains 4 red balls and 6 white balls, and Urn II contains 5 red balls and 3 white balls. A ball is drawn from each urn. What is the probability that both balls are white?

Independent

4R 6W   5R 3W

$$\frac{6}{10} \cdot \frac{3}{8} = \frac{18}{80} = \frac{9}{40} \approx .225$$

b. A drawer contains 9 black socks, 7 gray socks, and 5 blue socks. Without looking, you draw out a sock and then draw out a second sock without returning the first sock. What is the probability that the two socks you draw out are the same color?

dependent   2 Blacks or 2 Gray or 2 Blue

$$\frac{9}{21} \cdot \frac{8}{20} + \frac{7}{21} \cdot \frac{6}{20}1 + \frac{5}{21} \cdot \frac{4}{20} =$$

$$6/35 + 1/10 + 1/21 = \boxed{67/210} \approx .319$$

8. A jar contains 3 red marbles, 6 blue marbles, 5 green marbles, and 1 black marble.

   a. What is the probability of selecting a red marble?

$$\frac{3}{15} = \frac{1}{5}$$

   b. What is the probability of selecting a black or a blue marble?

$$\frac{1}{15} + \frac{6}{15} = \frac{7}{15}$$

   c. Find the probability of selecting a black, then a blue marble: $\frac{1}{15} \cdot \frac{6}{15} = \frac{2}{75}$

      i. If the first marble is replaced after being selected:

      ii. If the first marble is not replaced after being selected: $\frac{1}{15} \cdot \frac{6}{14} = \frac{1}{35}$

   d. Find the probability of selecting a blue marble, then another blue marble:

      i. If the first marble is replaced after being selected: $\frac{6}{15} \cdot \frac{6}{15} = \frac{4}{25}$

      ii. If the first marble is not replaced after being selected: $\frac{6}{15} \cdot \frac{5}{14} = \frac{1}{7}$

9. In how many ways can 10 runners finish 1st, 2nd, 3rd, and 4th? (HINT: Does the order matter??? If it does, use Permutations; if order does not matter, use Combinations)

$$_{10}P_4 = 5040$$

10. In an activity club, with 20 students, the offices of president, vice-president, secretary, and treasurer will be filled. In how many ways can the offices by filled?

$$_{20}P_4 = 116,280$$

11. How many different license plates are possible if three digits are followed by two letters?

   Repeat   No Repeat

$$10 \cdot 10 \cdot 10 \cdot 26 \cdot 26 = \qquad 10 \cdot 9 \cdot 8 \cdot 26 \cdot 25 =$$

$$676,000 \qquad\qquad 468,000$$

12. How many distinguishable permutations of the letters in SUMMER are there?

$$\frac{6!}{2!} = 360$$

Acc Math I

Permutations and Combinations Worksheet

Name _____

I. Evaluate the following:

1) 5!	2) $\frac{10!}{8!}$	3) $\frac{7!4!}{6!2!} = 84$
120	90	

II. Permutations

4) Evaluate: a) $_7P_4 = 840$ b) $_{10}P_2$ 90 c) $_6P_6$ 720

5) In how many different ways can 7 floats line up for the homecoming parade.

$7! = 5040$

6) In how many ways can 4 of 7 different kinds of bushes be planted along a walkway?

$7 \cdot 6 \cdot 5 \cdot 4 = 840$

7) Four processes are involved in assembling a certain product and they can be performed in any order. The management wants to test each order to determine which is the least time consuming. How many different orders will have to be tested?

$4! = 24$

8) A club with 10 members is to choose 3 officers- president, vice-president and secretary. If each office is to be held by 1 person and no person can hold more than one office, how many ways can these offices be filled?

$_{10}P_3 = 720$

9) A corporation has 10 members on its board of directors. In how many different ways can it elect a president, vice-president, secretary and treasurer?

$_{10}P_4 = 5040$

10) For a segment of a radio show, a disc jockey can play 7 songs. If there are 13 songs to choose from, in how many ways can this segment be arranged?

$_{13}P_7 = 8,648,640$

11) Suppose you are asked to list, in order of preference, the three best movies you have seen this year. If you saw 20 movies, in how many ways can the 3 best be chosen and ranked?

$_{20}P_3 = 6840$

12) How many arrangements of 4 letters from the word COMBINE if no letter is used more than once?

$_7P_4 = 840$

13) How many distinguishable permutations are possible using the letters of the following words:

   a) ATHENS $6! = 720$

   b) BASKETBALL $\dfrac{10!}{2!2!2!} = 453,600$

   c) SUBSTITUTE $\dfrac{9!}{2!3!2!} = 15,120$

   d) ICICLE $\dfrac{6!}{2!2!} = 180$

14) A roofing company has 8 roofing jobs to complete in the next 2 months.

   a) In how many different orders can the roofing jobs be completed?

   $8! = 40,320$

   b) If 5 of the 8 roofing jobs can be completed by the end of the first month, in how many different ways can the first 5 jobs be selected?

   $_8P_5 = 6720$

15) How many vertical arrangements are there of 8 flags if 4 are white, 3 are blue and 1 is red?

   treat like a distinguishable Permutation

   8 colors   4 repeat white   3 repeat Blue

   $\dfrac{8!}{4!3!} = 280$

III. Combinations

16) Your friend is having a party and has 15 games to choose from. There is enough time to play 4 games. In how many ways can you choose 4 games to play?

   $_{15}C_4 = 1365$

17) There are 20 members in a club. Five people are selected to go to the state conference. In how many ways can the five members be selected?

   $_{20}C_5 = 15,504$

18) Your English teacher asked you to read 3 novels from a list of 10. In how many ways can you choose which books to read?

   $_{10}C_3 = 120$

19) The general manager of a fast-food restaurant chain must select 6 restaurants from 11 for a promotional program. How many possible ways can this selection be done?

   $_{11}C_6 = 462$

20) How many ways are there to select 3 bracelets from a box of 20?

   $_{20}C_3 = 1,140$

21) How many different ways can a theatrical group select 2 musicals and 3 dramas from 11 musicals and 8 dramas?

   $_{11}C_2 \cdot _8C_3 = 3080$