Math 11 Winter 2019 **NAME Last**_____ **First** KEY

Quiz Sections 7.1-7.6, 8.1-8.4

23 out of 20 points possible on this quiz

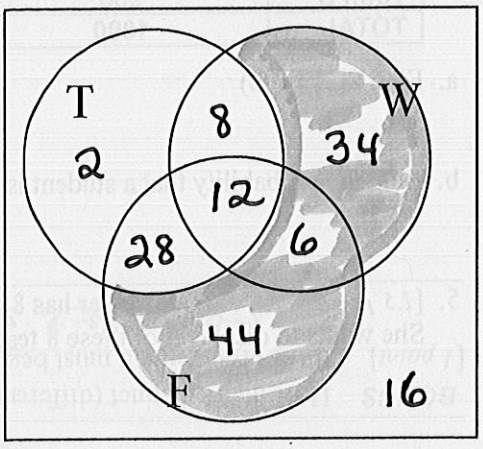
The word **distinct** means **different** or **unique** or **NOT identical**, or **NOT the same.**

1. 150 college students are surveyed about their for spring break plans

T = { students who plan to Travel}
W = { students who plan to Work to earn money}
F = { students who plan to spend time with Family or Friends}

In the group of **150** students included in the survey,
90 plan to spend time with Family/Friends
60 plan to Work to earn money
50 plan to Travel
Of those:
40 plan to Travel and to spend time with Family/Friends
20 plan to Travel and to Work to earn money
18 plan to spend time with Family/Friends and Work to earn money
This includes that fact that **12** people expect to do all three of these activities

see bottom of page for how to do this



a. [*4 points*] Complete the numbers in ALL 8 regions shown in the Venn diagram (*inside and outside circles*).

b. [*1.5 points*] How many plan to Work to earn money or to spend time with Family/Friends but NOT travel.

$34+6+44=84$ $(W \cup F) \cap T^c$ shaded above

QUESTIONS 2 – 3: SHOW WORK SETTING UP THE CALCULATION & EVALUATE THE ANSWER

2. [*2 points*] How many distinct (different, unique) arrangements can be made using all 9 letters of the word SLEEPLESS ?

repeated letters
E:3 S:3 L:2

$$\frac{9!}{3!\,3!\,2!} = \frac{362880}{72} = 5040$$

For question 1 work from center out

$W \cap F \cap T$ has 12 in the center
so the total "wedge" for $W \cap F$ must have $18-12=6$
$T \cap F$ must have $40-12=28$
$T \cap W$ must have $20-12=8$

Then outer part of T circle has $50-(8+12+28)=2$
outer part of W circle has $60-(8+12+6)=34$
outer part of F circle has $90-(12+28+6)=44$

And add up everything gives $2+8+34+28+12+6+44=134$
So the region outside the circles has $150-134=16$

QUESTION 3 HAD A CORRECTION. HERE ARE BOTH VERSIONS SOLUTIONS

3. Question 3 a, b, c refer to the following: A radio station just received recordings for 24 different new songs. 8 of these songs are pop songs and 12 are rock songs and 4 are jazz.

a. [*1.5 points*]] They want to play 7 songs in the next hour.
How many different selections of 7 of these new songs are possible?
(Note: We care which 7 songs are selected (chosen) to be played, but not the order in which they are played.)

$_{24}C_7 = 346104$

b. [*1.5 points*] How many different selections of 7 songs are possible if 2 are pop songs, 3 are rock songs and 2 are jazz? *(Note: We care which 7 songs are selected (chosen) to be played, but not the order in which they are played.)*

$(_8C_2)(_{12}C_3)(_4C_2) = (28)(220)(6) = 36960$

orderdoes not matter

c. **BONUS** [*1 point*] How many different ordered playlists of 7 songs are possible that consist of 2 pop songs , 3 rock songs, and 2 jazz.
(Note: We care which 7 songs are selected and also care about the order in which they are arranged to be played.)

$[(_8C_2)(_{12}C_3)(_4C_2)] \cdot (7!) = (36960)(5040) = 186,278,400$

select the 7 songs from categories as needed — arrange the 7 songs selected

OR

3. Question 3 a, b, c refer to the following: A radio station just received recordings for 20 different new songs. 6 8 of these songs are pop songs and 12 10 are rock songs and 4 are jazz.

a. [*1.5 points*]] They want to play 7 songs in the next hour.
How many different selections of 7 of these new songs are possible?
(Note: We care which 7 songs are selected (chosen) to be played, but not the order in which they are played.)

$_{20}C_7 = 77520$

b. [*1.5 points*] How many different selections of 7 songs are possible if 2 are pop songs, 3 are rock songs and 2 are jazz? *(Note: We care which 7 songs are selected (chosen) to be played, but not the order in which they are played.)*

$(_6C_2)(_{10}C_3)(_4C_2) = (15)(120)(6) = 10800$

orderdoes not matter

c. **BONUS** [*1 point*] How many different ordered playlists of 7 songs are possible that consist of 2 pop songs , 3 rock songs, and 2 jazz.
(Note: We care which 7 songs are selected and also care about the order in which they are arranged to be played.)

$[(_6C_2)(_{10}C_3)(_4C_2)] \cdot (7!) = (10800)(5040) = 54,432,00$

select the 7 songs from categories as needed — arrange the 7 songs selected

QUESTIONS THIS PAGE: SHOW WORK SETTING UP THE CALCULATION & EVALUATE THE ANSWER

4. [*2 points*] For 3 different towns, the table shows the number of students enrolled in school, by type (level) of school.

	Elementary School (E)	Middle School (M)	High School (H)	TOTAL
Town A	500	350	400	**1250**
Town B	400	250	300	**950**
Town C	900	400	600	**1900**
TOTAL	**1800**	**1000**	**1300**	**4100**

State answer as fraction from table or round to 3 decimal places if using decimal form.

a. Find P(H ∩ C)

$P(H \cap C) = \frac{600}{4100} = .146$

b. Find the probability that a student is in Elementary school given that they are in Town B.

$P(E|B) = \frac{400}{950} = .421$ / Note: $P(B|E) = \frac{400}{1800} = .215$ is not correct

5. [*1.5 points*] An antique dealer has 8 different fine china teacups. Each cup has a different design or pattern. She wants to display 5 of these 8 teacups in a row on a shelf. How many different arrangements are possible?

$_8P_5 = (8)(7)(6)(5)(4) = 6720$

6. [*1.5 points each part*] At BargainMart, here is some information about sales

37% of customers buy clothing
25% of customers buy electronics $P(E) = .25$
45% of customers buy housewares $P(H) = .45$
11% of customers buy both electronics and housewares $P(E \cap H) = .11$

Events:
E = customer buys electronics
H = customer buys housewares
C = customer buys clothing

SHOW WORK. Round answers to 3 decimal places, as needed.

a. Find the probability that a randomly selected customer buys electronics or housewares. ← Find $P(E \cup H)$

Addition Rule for "OR" ∪ $P(E \cup H) = P(E) + P(H) - P(E \cap H)$
$= .25 + .45 - .11 = .59$

b. Find the probability that a randomly selected customer buys electronics (if/given that) they buy housewares.

Conditional Probability Rule $P(E|H) = \frac{P(E \cap H)}{P(H)} = \frac{.11}{.45} = .244$

7. A college tutorial center has 17 tutors on its staff: 7 science tutors and 10 math tutors. 8 tutors are being selected to work on Monday. *SHOW WORK and round answer to 3 decimal places*

a. [*2 points*] Find the **probability** that the group of 8 tutors selected has exactly 6 math tutors.

$\frac{(_{10}C_6)(_7C_2)}{_{17}C_8} = \frac{(210)(21)}{24310} = \frac{4410}{24310} = .181$

b. [*2 points*] Find the **probability** that the group of 8 tutors selected has 5 or 6 math tutors.

$\frac{(_{10}C_5)(_7C_3) + (_{10}C_6)(_7C_2)}{_{17}C_8} = \frac{(252)(35) + (210)(21)}{24310} = \frac{13230}{24130} = .544$

BONUS [*1 point*] How many distinct (different) arrangements can be made using all 9 letters of the word DUPLICATE if the arrangement must begin with 3 consonants. (consonants are DPLCT / vowels are UIAE)

←--consonants--→ ←-----consonants or vowels are OK---→

$_5P_3 \cdot (_6P_6 \text{ or } 6!)$

$(_5P_3)(_6P_6) = [(5)(4)(3)](6!) = 43200$