Algebra 2 **Module 19 Review**

Name: Miss B Key **Date:** _____ **Hour:** ___

19.1 Probability and Set Theory

For problems 1-7, use the below descriptions of the sets to complete each statement.. Write each set in set notation.

$A = \{21, 23, 25, 27, 29\}$	$B = \{21, 24, 27, 30\}$	$U = \{20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30\}$

1. $A \cap B$ (intersection)

$\{21, 27\}$

2. A^C (complement: Not in A)

$\{20, 22, 24, 26, 28, 30\}$

3. $A \cup B$ (union)

$\{21, 23, 24, 25, 27, 29, 30\}$

4. B^C

$\{20, 22, 23, 25, 26, 28, 29\}$

5. $n(A)$ number of elements in A

5

6. $n(B)$ number of elements in B

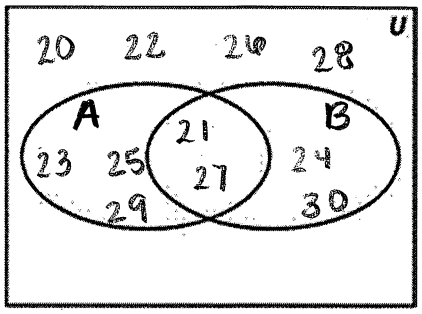
4

7. Is $B \subset A$? Why or why not?

no; not all the elements of B are in A.

For 8-9, use the descriptions of the sets from above.

8. Create a Venn diagram to represent A, B, and U.



9. Describe the parts of the Venn Diagram that correspond to #1-4 above.

1. The intersection of the two circles
2. The area outside of the A circle
3. Both the A and B circles
4. The are outside of the B circle

For 10-13, refer to the descriptions of the sets above and the Venn diagram to find the probabilities.

10. Write a fraction giving the probability that a number chosen from the universal set will be in set A.

$\frac{5}{11}$

11. What is the probability that a number in U is *not* in A?

$1 - \frac{5}{11} = \frac{6}{11}$

12. What is the probability that a number in U is in $A \cup B$.

$\frac{7}{11}$

13. What is the probability that a number in U is *not* in A or B?

$\frac{4}{11}$

19.2 Permutations and Probability

For 1-3, give the value of each expression.

1. $5! = 120$ **2.** $\frac{8!}{7!} = 8$ **3.** $\frac{7!}{3!} = 840$

Use the Fundamental Counting Principle to solve 4-6.

4. Alicia is designing a flag with 3 stripes. She has 5 different colors of fabric to use in any order she likes, but she does not want 2 stripes next to each other to be the same color. How many different color patterns can she choose from? Explain your answer. (Colors can be repeated)

$5 \cdot 4 \cdot 4 = 80$ different patterns

5. A travel agent is offering a vacation package. Participants choose the type of tour, a meal plan, and a hotel class from the chart. How many different vacation packages are offered?

$3 \cdot 2 \cdot 4 = 24$ packages

Tour	Meal	Hotel
Walking	Restaurant	4-Star
Boat	Picnic	3-Star
Bicycle		2-Star
		1-Star

6. There are 8 marbles in a bag, all of different colors. In how many orders can 4 marbles be chosen?

$8 \cdot 7 \cdot 6 \cdot 5 = 1680$ ways

7. Gil's padlock can be opened by entering 3 digits in the right order. (Digits 0-9)

a) How many different orders of digits are there, if digits **cannot be repeated**? $10 \cdot 9 \cdot 8 = 720$

b) How many different orders of digits are there, if digits **can be repeated**? $10 \cdot 10 \cdot 10 = 1000$

c) What is the probability that someone could guess the right order (when digits **cannot be repeated**) on the first try?

$\frac{1}{720}$ (bic only one correct code)

8. Kim's playlist includes 8 songs.

a) How many different ways can all the songs on the playlist be shuffled? ${}_8P_8 = 8! = \boxed{40,320}$

b) Kim only has time to listen to 4 songs. How many different 4-song orders are possible? ${}_8P_4 = \boxed{1680}$

c) What is the probability that Kim's favorite and second favorite songs are played when 4 songs are played? $\frac{2}{8} \cdot \frac{1}{7} \cdot \frac{6}{6} \cdot \frac{5}{5} = \frac{2}{56} = \boxed{\frac{1}{28}}$ or $\frac{{}_2P_2 \cdot {}_6P_2}{{}_8P_4} = \frac{2 \cdot 30}{1680} = \frac{30}{840} = \boxed{\frac{1}{28}}$

9. How many different arrangements of the letters in the word DOODLE are possible?

$n = 6$, $D_r = 2$, $O_r = 2$ $\quad \frac{6!}{2!2!} = \frac{6 \cdot 5 \cdot 4 \cdot 3 \cdot \cancel{2 \cdot 1}}{\cancel{(2 \cdot 1)}(2 \cdot 1)} = \boxed{180 \text{ arrangements}}$

10. Marie is arranging her stuffed animals on the windowsill. She has a teddy bear, a kangaroo, an elephant, a cat, a dog, and a chipmunk. How many ways can she arrange 4 of her animals?

${}_6P_4 = \boxed{360 \text{ ways}}$

19.3 Combinations and Probability

1. Calvin has enough money to buy 3 new T-shirts at a buy two, get one free sale. There are 8 color choices, and he wants to get 3 different colors.

a) Explain why you should use combinations rather than permutations for this problem.

The order in which he chooses the shirts does not change his selection

b) How many possible combinations of 3 colors are there?

$_8C_3 = 56$

2. Find the number of combinations of 7 objects taken 4 at a time.

$_7C_4 = 35$

3. Rachel has 10 valuable baseball cards. She wants to select 2 of them to sell online. How many different combinations of 2 cards could she choose?

$_{10}C_2 = 45$

4. Mrs. Marshall has 11 boys and 14 girls in her kindergarten class. 25 Total

a) In how many ways can she select 2 students to pass out a snack?

$_{25}C_2 = 300$

b) In how many ways can Mrs. Marshall select 3 students to carry papers to the office? Show your calculations.

$_{25}C_3 = 2300$

c) What is the **probability** that she chooses all 3 boys to carry papers to the office?

$$\frac{_{11}C_3}{_{25}C_3} = \frac{165}{2300} = \boxed{\frac{33}{460}}$$

***d)** How many different ways can she select one boy and two girls to carry papers to the office?

$_{11}C_1 \cdot {}_{14}C_2 = 11 \cdot 91 =$ 1001 ways

5. Sally is dealing 5-card hands from a standard deck of cards for a card game.

a) How many different 5-card hands are possible? $_{52}C_5 = 2{,}598{,}960$

b) What is the probability that all cards are black? $\frac{_{26}C_5}{_{52}C_5} = \frac{65780}{2{,}598{,}960} = \boxed{\frac{3289}{129948}}$

c) What is the probability that all the cards in the hand are face cards?

$$\frac{_{12}C_5}{_{52}C_5} = \frac{792}{2{,}598{,}960} = \boxed{\frac{33}{108290}}$$

d) What is the probability that none of the cards in the hand are face cards?

$$\frac{_{40}C_5}{_{52}C_5} = \frac{658008}{2598960} = \frac{54834}{216580} = \boxed{\frac{27417}{108290}}$$

19.4 Mutually Exclusive and Overlapping Events

1. Are the events "choosing a black card" and "choosing a 10" from a deck of playing cards mutually exclusive? Explain why or why not.

No, There are two black 10's.

2. What is the probability that a black 10 will be drawn from a standard deck of cards?

$\frac{2}{52} = \boxed{\frac{1}{26}}$

3. A can of vegetables with no label has a $\frac{1}{8}$ chance of being green beans and a $\frac{1}{5}$ chance of being corn.

a) Are the events "green beans" and "corn" mutually exclusive? yes

b) What is the probability that an unlabeled can of vegetables is either green beans or corn?

$\frac{1}{8} + \frac{1}{5} = \frac{5}{40} + \frac{8}{40} = \boxed{\frac{13}{40}}$

4. Ben spins a spinner with the numbers 1-8. Find each probability:

a) He spins a multiple of 3 or a multiple of 5.

mult of 3; 3, 6
mult of 5; 5

$\frac{2}{8} + \frac{1}{8} = \boxed{\frac{3}{8}}$

b) He spins a number greater than 2 or an even number.

greater than 2; 3, 4, 5, 6, 7, 8
even number; 2, 4, 6, 8

$\frac{6}{8} + \frac{4}{8} - \frac{3}{8} = \boxed{\frac{7}{8}}$

c) He spins a prime number or an odd number.

prime; 2, 3, 5, 7
odd; 1, 3, 5, 7

$\frac{4}{8} + \frac{4}{8} - \frac{3}{8} = \boxed{\frac{5}{8}}$

5. Of the 400 doctors who attended a conference, 240 practiced family medicine, and 130 were from countries outside of the United States. One-third of the family medicine practitioners were not from the United States.

a) Complete the 2-way table.

	Family Medicine	Not Family Medicine	Total
From US	160	110	270
Not from US	80	50	130
Total	240	160	400

b) What is the probability that a doctor at the conference practices family medicine or is from the United States?

$\frac{240}{400} + \frac{270}{400} - \frac{160}{400} = \frac{350}{400} = \boxed{\frac{7}{8}}$

c) What is the probability that a doctor at the conference practices family medicine or is not from the United States?

$\frac{240}{400} + \frac{130}{400} - \frac{80}{400} = \frac{290}{400} = \boxed{\frac{29}{40}}$

d) What is the probability that a doctor at the conference does not practice family medicine or is from the United States?

$\frac{160}{400} + \frac{270}{400} - \frac{110}{400} = \frac{320}{400} = \boxed{\frac{4}{5}}$