Algebra 2 – 3415
11.2 –Combinatorics & Venn Diagram

Name: _____**KEY**_____

Date: _____ Period: _____

1.) The senior class at Dundee-Crown High School has 590 students. In a recent survey asking students about which elective they are taking (art or woods), 205 students checked the box for art, of which 60 checked both the boxes for art and woods, and 230 students checked the box for neither. Use this information to fill in and label the Venn diagram with actual numbers and then answer the questions. (Assume that no students checked "art" or "woods" in addition to "neither")

a.) How many students are taking art? _____205_____

**b.)** How many students are taking only woods? _____155_____

c.) P (only art) = $\dfrac{145}{590} = \dfrac{29}{118} = .2458 = 24.58\%$

d.) P (woods) = $\dfrac{215}{590} = \dfrac{43}{118} = .3644 = 36.44\%$

ART   WOODS
BOTH
145   60   155

NEITHER: 230
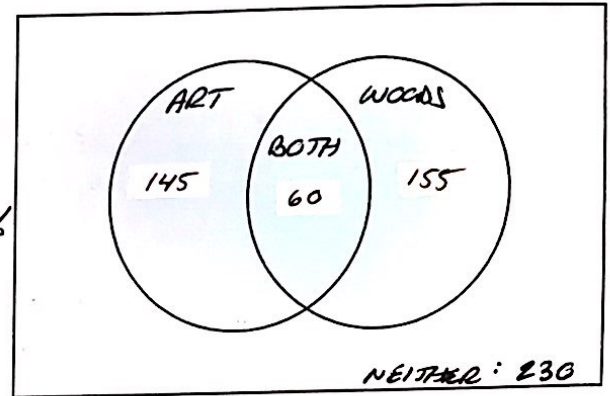
2.) In a recent survey, 300 Starbucks customers were asked about their coffee preferences, comparing lattes to cappuccinos. 45% checked the box for preferring lattes, 24% checked both of the boxes for lattes and cappuccinos, and 10% checked the box for neither. Use that information to fill in the Venn diagram with actual numbers and then answer the questions below.

a) Fill in the Venn diagram below.

LATTES   CAPPS
BOTH
135   72   63
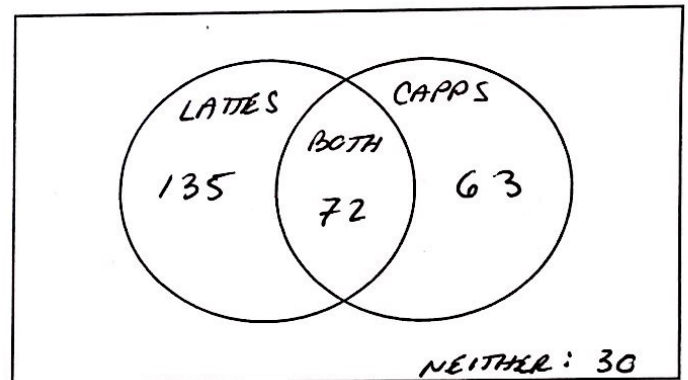
NEITHER: 30

b) How many people like drinking lattes? _____207_____

c) How many people don't like neither lattes nor cappuccinos? _____30_____

d) What is the **probability** that a person only likes lattes? _____45%_____

$\dfrac{135}{300} = \dfrac{9}{20} = .45 = 45\%$

e) What is the **probability** that a person likes cappuccinos? _____21%_____

$\dfrac{63}{300} = \dfrac{21}{100} = .21 = 21\%$

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3.) At a school board meeting, there are 18 females and 13 males. If a committee is to be set up with 5 members, find the probability of each if they are chosen at random.

a) P (3 females and 2 males)

$$\frac{_{18}C_3 \cdot {}_{13}C_2}{_{31}C_5} = \frac{816 \cdot 78}{169911} = \frac{63648}{169911} = .3746 = 37.46\%$$

b) P (2 females and 3 males)

$$\frac{_{18}C_2 \cdot {}_{13}C_3}{_{31}C_5} = \frac{153 \cdot 286}{169911} = \frac{43758}{169911} = .2575 = 25.75\%$$

c) P (1 females and 4 males)

$$\frac{_{18}C_1 \cdot {}_{13}C_4}{_{31}C_5} = \frac{18 \cdot 715}{169911} = \frac{12870}{169911} = .0757 = 7.57\%$$

4.) A card game using 36 unique cards: four suits (diamonds, hearts, clubs, and spades) with cards numbered from 1 to 9 in each suit. A hand is a collection of 9 cards, which can be sorted however the player chooses. Find the probability of each if they are chosen at random.

a.) P (getting all four of the 1s)

$$\frac{_4C_4 \cdot {}_{32}C_5}{_{36}C_9} = \frac{1 \cdot 201376}{94143280} = .0021 = .21\%$$

b.) P (4 clubs and 5 hearts)

$$\frac{_9C_4 \cdot {}_9C_5}{_{36}C_9} = \frac{126 \cdot 126}{94143280} = \frac{15876}{94143280} = .00017 = .017\%$$

c.) P (all diamonds)

$$\frac{\cdot {}_9C_9}{_{36}C_9} = \frac{1}{94143280} = .00000001 = .000001\%$$

5.) Given a class of 12 girls and 10 boys, find the probability that a committee selected at random will consist of ...   ^ of 5 individuals

a.) P (3 girls and 2 boys)

$$\frac{_{12}C_3 \cdot {}_{10}C_2}{_{22}C_5} = \frac{220 \cdot 45}{26334} = \frac{9900}{26334} = .3759 = 37.59\%$$

b.) P (all girls)

$$\frac{_{12}C_5}{_{22}C_5} = \frac{792}{26334} = .0301 = 3.01\%$$

6.) If you roll a pair of standard dice, what is the probability that they land in the given sums.

To answer the question, you will need to find the total number of outcomes and the number of desired outcomes. To do this you may create a table like the one shown.

		Die 1					
		1	2	3	4	5	6
Die 2	1	(1,1)	(2,1)	(3,1) —	(4,1)	(5,1)	(6,1)
	2	(1,2)	(2,2) ⌐	(3,2)	(4,2)	(5,2)	(6,2)
	3	(1,3) —	(2,3)	(3,3)	(4,3)	(5,3)	(6,3) '
	4	(1,4)	(2,4)	(3,4)	(4,4)	(5,4) '	(6,4)
	5	(1,5)	(2,5)	(3,5)	(4,5) '	(5,5)	(6,5)
	6	(1,6)	(2,6)	(3,6) '	(4,6)	(5,6)	(6,6)

a) What are the total number of possible outcomes? $\underline{\quad 36 \quad}$

$$\frac{1}{9} = .11 = 11\%$$

b) What is the probability they roll showing a sum of 9?

$$\frac{4}{36} = \frac{1}{9} = .11 = 11\%$$

$$\frac{11}{12} = .9167 = 91.67\%$$

c) What is the probability of not showing a sum of 4?

$$\frac{33}{36} = \frac{11}{12} = .9167 = 91.67\%$$

7.) How many ways can gold, silver, and bronze medals be awarded for a race run by 8 people?

$$\underline{8} \cdot \underline{7} \cdot \underline{6} = {}_8P_3 = 336$$

8.) How many four-letter code words can be formed using a standard 26-letter alphabet …

a.) if repetition is allowed?

$$\underline{26} \cdot \underline{26} \cdot \underline{26} \cdot \underline{26} = 26^4 = 456976$$

b.) if repetition is not allowed?

$$\underline{26} \cdot \underline{25} \cdot \underline{24} \cdot \underline{23} = 358800$$

9.) The Chess Club has six members. In how many ways …

a.) can all six members line up for a picture?

$$\underline{6} \cdot \underline{5} \cdot \underline{4} \cdot \underline{3} \cdot \underline{2} \cdot \underline{1} = 6! = 720$$

b.) can they choose a president and a secretary?

$$\underline{6} \cdot \underline{5} = {}_6P_2 = 30$$

c.) can they choose three members to attend a regional tournament with no regard to order?

$${}_6C_3 = 20$$