

Name \_\_\_\_\_

Accel Geom/ Adv Alg.

Date \_\_\_\_\_ Period \_\_\_\_\_

Probability Review

1) A security code consists of 5 digits (0-9) and a digit may not be used more than once. How many possible security codes are there?

$$10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 = \boxed{30240}$$

2) Amy must choose a password for her voicemail that consists of 3 letters followed by 3 digits. She cannot use the letters A and Z or the digits 0 and 9. Each letter or number may be used more than once. What is the probability that her nosy brother guesses her password?

$$24 \cdot 24 \cdot 24 \cdot 8 \cdot 8 \cdot 8 = 7077888$$

$$\frac{1}{7,077,888}$$

3) If one person is randomly selected from a class that has 6 sophomores, 12 juniors, and 7 seniors, find the probability that the person is a senior.

$$\frac{7}{25}$$

4) If a bag has 22 orange, 18 red, 12 green, and 8 blue marbles, what is the probability that in one draw you will not select a blue marble?

$$\frac{52}{60} = \frac{13}{15}$$

5) 2 number cubes are rolled. What is the probability that one roll is a "3" and the other roll is an even number?

$$\frac{1}{6} \cdot \frac{3}{6} = \frac{3}{36} = \frac{1}{12}$$

6) You flip a coin and then roll a 6-sided die. Find the probability that the coin lands heads up and the die shows a one.

$$\frac{1}{2} \cdot \frac{1}{6} = \frac{1}{12}$$

7) A) A jar contains 6 red balls, 3 green balls, 5 white balls, and 7 yellow balls. Two balls are chosen one at a time and replaced. What is the probability that both balls are green?

$$\frac{3}{21} \cdot \frac{3}{21} = \frac{9}{441} = \frac{1}{49}$$

B) What is the probability if the balls are not replaced?

$$\frac{3}{21} \cdot \frac{2}{20} = \frac{6}{420} = \frac{1}{70}$$

8) A box contains a penny, a nickel, and a dime. Find the probability of choosing a dime first, not replacing it, and then choosing a penny.

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

9) A box of chocolates contains 5 milk, 5 dark, and 5 white chocolates. You randomly select and eat 3 chocolates.

a) Find the probability that the first piece is milk, the 2<sup>nd</sup> is dark, and the 3<sup>rd</sup> is white

$$\frac{5}{15} \cdot \frac{5}{14} \cdot \frac{5}{13} = \frac{125}{2730} = \boxed{\frac{25}{546}}$$

b) Find the probability that the first piece is dark, the 2<sup>nd</sup> and 3<sup>rd</sup> are white.

$$\frac{5}{15} \cdot \frac{5}{14} \cdot \frac{4}{13} = \frac{100}{2730} = \boxed{\frac{10}{273}}$$

You roll two number cubes- one red and one black

10) What is probability that the red shows a multiple of 2 and the black shows a "5"

$$\frac{3}{6} \cdot \frac{1}{6} = \frac{3}{36} = \boxed{\frac{1}{12}}$$

	Red					
	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

11) What is the probability that their sum is 6 or 8?

$$P(6 \cup 8) = P(6) + P(8) = \frac{5}{36} + \frac{5}{36} = \frac{10}{36} = \boxed{\frac{5}{18}}$$

12) What is probability that you roll a even on red and the sum is less than 10?

$$\frac{14}{36} = \boxed{\frac{7}{18}}$$

13) What is the probability that the sum is greater than 7 given that the black cube shows an even number?

$$\frac{9}{18} = \boxed{\frac{1}{2}}$$

14) What is probability of getting a sum of 4 or a sum greater than 10?

$$P(4 \cup >10) = P(4) + P(>10) = \frac{3}{36} + \frac{3}{36} = \frac{6}{36} = \boxed{\frac{1}{6}}$$

15) What is probability of getting a sum that is even or a sum that is greater than 9?

$$P(E \cup >9) = P(E) + P(>9) - P(E \cap >9) \\ = \frac{18}{36} + \frac{6}{36} - \frac{4}{36} = \frac{20}{36} = \boxed{\frac{5}{9}}$$

16) Your teacher has a bag of candy to pass out. It contains 5 snickers, 3 skittles, 4 hot tamales, and 7 starburst. You get to select 3 candies from the bag. What is the probability that you select all 3 skittles?

$$\frac{3}{19} \cdot \frac{2}{18} \cdot \frac{1}{17} = \frac{6}{5814} = \boxed{\frac{1}{969}}$$

17) Each letter of the word SAMSUNG are on separate cards, face down on the table. If you pick a card at random, what is the probability that you pic the letters S or U?

$$P(S \cup U) = P(S) + P(U) \\ = \frac{2}{7} + \frac{1}{7} = \boxed{\frac{3}{7}}$$

18) A store owner is keeping track of customers and whether or not they make a purchase. What is the probability that a customer from this group makes a purchase?

Customers by Gender			
	Men	Women	
Bought	7	4	11
Didn't Buy	5	9	14
	12	13	25

$$\frac{11}{25}$$

19) A bag contains 10 beads, 2 black, 3 white, and 5 red. A bead is selected at random. Find the indicated probabilities.

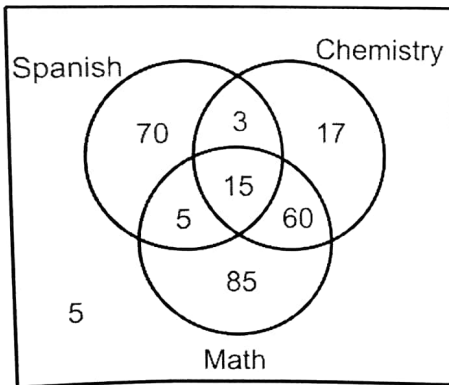
a. Selecting a white bead, replacing it, and then selecting a red bead  $\frac{3}{10} \cdot \frac{5}{10} = \frac{15}{100} = \frac{3}{20}$

b. Selecting a white bead, not replacing it, and then selecting a red bead

$$\frac{3}{10} \cdot \frac{5}{9} = \frac{15}{90} = \frac{1}{6}$$

c. Selecting 3 non-red beads without replacement

$$\frac{5}{10} \cdot \frac{4}{9} \cdot \frac{3}{8} = \frac{60}{720} = \frac{1}{12}$$



20) The number of students enrolled in several classes is represented in the Venn Diagram. Determine the total number of students for the following problems.

a)  $(S \cap C) \cup M = 168$

b)  $M' = 95$

c)  $(S \cup C)' \cap M = 85$

1) Universe:  $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20\}$

A: even numbers

B: multiples of 3

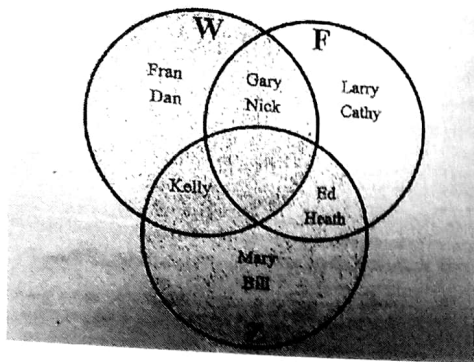
C: odd numbers

D: numbers greater than 12

E: numbers less than 5

F: multiples of 5

- a)  $A \cup B = \{2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 3, 9, 15\}$
- b)  $\sim D = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$
- c)  $C \cap D = \{13, 15, 17, 19\}$
- d)  $\sim F = \{1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 13, 14, 16, 17, 18, 19\}$
- e)  $D \cup E = \{1, 2, 3, 4, 13, 14, 15, 16, 17, 18, 19, 20\}$
- f)  $F \cap C = \{5, 15\}$



22) The diagram shows the different places students had been in the last year; water park (W), fair (F), and zoo (Z).

- How many people had been to the water park? 5
- How many people had ONLY been to the fair? 2
- How many people had been to the zoo? 5
- How many people had ONLY been to the water park? 2

23)  $W \cup Z = \{F, D, G, N, K, M, B, E, H\}$

24)  $Z \cap W = \{K\}$

25)  $W' \cap Z' = \{C, L\}$

26)  $(W \cap Z) \cap F' = \{K\}$

27)  $(F \cup W) \cap Z' = \{F, D, G, N, L, C\}$

28)  $W' = \{L, C, E, H, M, B\}$

29)  $(W \cap Z)' = \{F, D, G, N, L, C, E, H, M, B\}$

30)  $W \cap F \cap Z = \{ \}$

Given a standard deck of 52 cards, find the following probabilities.

31) Drawing 2 cards at random and getting an ace and a 4 (no replacement)

$$\frac{4}{52} \cdot \frac{4}{51} = \frac{16}{2652} = \boxed{\frac{4}{663}}$$

32) Drawing a Queen given it's a face card

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

33) Drawing a red card or a 6

$$P(R \cup 6) = P(R) + P(6) - P(R \cap 6) = \frac{26}{52} + \frac{4}{52} - \frac{2}{52} = \frac{28}{52} = \boxed{\frac{7}{13}}$$

34) Picking a heart or a diamond.

$$P(H \cup D) = P(H) + P(D) = \frac{13}{52} + \frac{13}{52} = \frac{26}{52} = \boxed{\frac{1}{2}}$$

35) Picking a heart, putting it back in the deck, and then picking a diamond.

$$\frac{13}{52} \cdot \frac{13}{52} = \frac{169}{2704} = \boxed{\frac{1}{16}}$$

36)  $P(4|Black)$

$$\frac{2}{26} = \boxed{\frac{1}{13}}$$

37) Drawing a red card, replacing it, and drawing an ace.

$$\frac{26}{52} \cdot \frac{4}{52} = \frac{104}{2704} = \boxed{\frac{1}{26}}$$

38) Drawing a face card or a black card

$$P(F \cup B) = P(F) + P(B) - P(F \cap B) \\ = \frac{12}{52} + \frac{26}{52} - \frac{6}{52} = \frac{32}{52} = \boxed{\frac{8}{13}}$$

39) Drawing a spade, a diamond, or a multiple of 5

$$P(S \cup D \cup \text{Mult of } 5) = P(S) + P(D) + P(\text{mult of } 5) - P(S \cap D \cap \text{mult of } 5) \\ = \frac{13}{52} + \frac{13}{52} + \frac{8}{52} - \frac{4}{52} = \frac{30}{52} = \boxed{\frac{15}{26}}$$

40) Drawing a card with a number less than 4 or drawing a jack.

$$P(<4 \cup J) = P(<4) + P(J) \\ = \frac{8}{52} + \frac{4}{52} = \frac{12}{52} = \boxed{\frac{3}{13}}$$

41) Drawing a 3, not replacing it, then drawing the Queen of Hearts.

$$\frac{4}{52} \cdot \frac{1}{51} = \frac{4}{2652} = \boxed{\frac{1}{663}}$$

1. A sociologist collected data on the types of pets in 100 randomly selected households, and summarized the results in a table.

		Owns a cat		Total
		Yes	No	
Owns a dog	Yes	15	24	39
	No	18	43	61
Total		33	67	100

42) Create a table of the joint and marginal relative frequencies.

		Owns a cat		
		Yes	No	Total
owns a dog	Yes	.15	.24	.39
	No	.18	.43	.61
	Total	.33	.67	1

43)  $P(\text{owns a cat})$

$$\frac{33}{100} = .33$$

44) Probability that they own a dog given that they do not own a cat

$$\frac{24}{67} \approx .36$$

45) Probability that they do not own a cat and do own a dog

$$\frac{24}{100} = \frac{6}{25} = .24$$

46)  $P(\text{does not own a dog} | \text{own a cat})$

$$\frac{18}{33} = \frac{6}{11} \approx .55$$

47) Of the 65 students going on a soccer trip with their school, 43 are players and 12 are left-handed. Only 5 of the left handed students are soccer players.

	S	R	L	
S	38		5	43
NS	15		7	22
	53		12	65

a) What is the probability that one of the students on the trip is a soccer player or is right handed?

$$P(S \cup R) = P(S) + P(R) - P(S \cap R) = \frac{43}{65} + \frac{53}{65} - \frac{38}{65} = \frac{58}{65}$$

b) What is the probability that one of the students is not a player or is left-handed?

$$P(S' \cup L) = P(S') + P(L) - P(S' \cap L) = \frac{22}{65} + \frac{12}{65} - \frac{7}{65} = \frac{27}{65}$$

Table below shows results of a survey of 10<sup>th</sup>-12<sup>th</sup> graders if they own an I-Phone.

	Owens I-Phone	Doesn't Own I-Phone	Total
10 <sup>th</sup> Grade	204	270	474
11 <sup>th</sup> Grade	192	160	352
12 <sup>th</sup> Grade	198	165	363
Total	594	595	1189

48) Given the student is a 10<sup>th</sup> grader, what is the probability that they own an I-Phone?  $\frac{204}{474} = \frac{34}{79}$

49) What is the probability that the student is a 11<sup>th</sup> grader or a 12<sup>th</sup> grader?

$$P(11 \cup 12) = P(11) + P(12) = \frac{352}{1189} + \frac{363}{1189} = \frac{715}{1189}$$

50) What is the probability that a student is a senior who doesn't own an I-Phone?

$$\frac{165}{1189}$$

51) What is the probability that the student is a 10<sup>th</sup> grader given they own an I-Phone?

$$\frac{204}{594} = \frac{34}{99}$$

### Challenge D

1. A bag contains 13 blue blocks and 17 red blocks. Below shows how many times each block was pulled then replaced. What was the experimental probability of choosing a red block?

Red	Blue
22	8

$$\frac{22}{30} = \frac{11}{15}$$

2. What is the theoretical probability of choosing a red block from problem 1?

$$\frac{17}{30}$$

You toss a dice 30 times and recorded the results in the table below.

# on dice	Results
1	3
2	8
3	7
4	5
5	3
6	4

54. Find the experimental probability of each:

$$P(1) = \frac{3}{30} = \frac{1}{10} \quad P(2) = \frac{8}{30} = \frac{4}{15} \quad P(3) = \frac{7}{30} \quad P(4) = \frac{5}{30} = \frac{1}{6} \quad P(5) = \frac{3}{30} = \frac{1}{10} \quad P(6) = \frac{4}{30} = \frac{2}{15}$$

55. Find the theoretical probability of rolling an odd number or a number greater than 1?  $P(\text{odd} \cup >1) = P(\text{odd}) + P(>1) - P(\text{odd} \cap >1)$

$$= \frac{3}{6} + \frac{5}{6} - \frac{2}{6} = \frac{6}{6} = 1$$

56. What number had an experimental probability that matched the theoretical probability? 4