Name: _____ Per: _____ Date: _____
Serafino ▪ Precalculus S2

9A–CW   **A Combinatorics Quest Through Your Day** _____

Directions: Show <u>all set–up work</u> in the space provided.   Evaluate at the very end, when finished with everything.

1. **Saturday Morning Outfit:** You wake up, groggy and are trying deciding what to wear.

    a.   You have 5 pairs of shorts, 3 shirts and 2 shoes that could match. How many outfits are you considering?

    b.   You hear on the radio it may be a little chilly. Shorts may not keep you warm. You also lay out 2 pairs of jeans on the bed, in addition to everything else. Now, how many outfits could you chose from?

2. **SATS:** It's time to take the SATs!   After 4 terrible hours, you come to a sweet, short, 10-question section, each with five possible answer choices.

    a.   You're burnt out and tired so you make a HORRIBLE decision and fill out those bubbles randomly. How many different ways are there to fill out that 10–question section?

    b.   What is the probability you randomly fill it out correctly by chance?

    c.   Hmmm… you tend to think you did something wrong whenever you have two consecutive answers that are the same. How many different ways are there to fill out that section if you make sure each answer is different from the previous one?

3. **Lunch:** You stop at a deli for lunch.   At a deli, you have the choice of 3 breads, 4 cheeses, 5 meats, and 8 veggies.

    a.   How many different sandwiches can you make if you select one from each category?

    b.   How many different sandwiches can you make if you select one kind of bread, one kind of cheese, two meats, and three veggies?

    c.   How many different sandwiches can you make if you select one bread, one cheese, one or two meats and between 2 and 4 veggies?

4. **Free lunch!** Fifteen people are in the line with you. There is a special promotion and 3 people will randomly win a free meal. In how many groups could win a free meal?

5. **Afternoon Bowling:** You and a group of friends decide to go bowling. There are 7 of you who want to go.

    a. Only 4 can bowl at a time. How many different groups could end up bowling?

    b. If your original group had 4 males and 3 females but you wanted to make a "2 boys vs 2 girls" game, how many different match–ups could you possibly make?

    c. Out of the bowlers, the person with the lowest score has to buy the person with the highest score an ice cream.   How many ways could those two people occur?

    d. Assuming you have sick bowling skills and can knock down the pins in any order you want, in how many ways could you knock down 10 pins?

6. **Party!** Your friends decide to have a totally safe, responsible party. 20 total people will attend. The first 5 people who show up get to sit on awesome comfy couches.

    a. How many different groups of people could end up on those couches?

    b. How many different ways can those 5 people arrange/sit on those couches?

    c. How many different ways can those 5 people arrange/sit on those if you and your two best friends insist on sitting next to each other?

7. **Hunger Strikes:** Now you're hungry for pizza! 12 of you want to go get pizza but there are only two cars that hold 5 people each. If you fill the cars, only 10 will be able to get pizza. .

    a. Of the 12 hungry people, how many different groups of 10 could go get pizza?

    b. The 12 people decide to race to see who gets to go. The first 5 people to get to car 1 and car 2 get to go. How many ways can that happen?

    c. How many different ways can 5 friends sit in the car if you call shotgun and 2 people with licenses?

8. **Pizza:** You stop at Serafino's Sumptuous Slices which offers the following toppings: sausage, veggies, buffalo chicken, and hot peppers. Assuming you could get none or any number or combination of toppings, how many different pizzas could you possibly order?

9. **Pizza Place Romance**: You meet a cutie in line at the pizza place and score some digits, written on a napkin. But when you get in the car, you accidentally spill soda all over the napkin that has the phone number on it. You can make out the following: 2 0 1 – 5 5 5 – 4 3 ? ?

   a. Knowing the first 5 digits, You decide to call every possible number possible until you get it right. How many phone calls could you make?

   b. You vaguely remember that the last four digits were all different from one another. How many phone calls do you have to make now?

   c. You strain your eyes and can see that the digit after the 3 has a straight line in it, so it's either a 7, 9, or 1. How many phone calls do you have to make now?

10. **Breaking In**: You got the pizzas but the music is so loud at your friend's house no one can let you back in. You try to use the passcode on the garage but you can't remember your friend's passcode. It's 4 digits.

   a. How many different passcodes are possible if no repeats are possible and you know the pattern is "even–odd–even–odd"?

   b. How many different passcodes contain NO 5s? (your friend hates 5s)

11. **License Plates**: You got into the garage!! You look at your friends' parents car's license plate, which has the standard NJ configuration: Letter – Number – Number – Letter – Letter – Letter.

   a. How many NJ license plates are possible in this format?

   b. How many NJ license plates have only vowels as the letters? (sure, Y can be a vowel).

   c. How many license plates have the number "99" in it and no repeated letters?

12. **Music**: You get back to the party, full and happy, you decide to take over as DJ. You find 50 songs on your friend's iPhone, organized in 5 Playlists: 14 Hip Hop, 16 pop, 10 from 80's, 3 from 90's and 7 Oldies.

   a. If you shuffle the songs within each playlist but keep the songs within a playlist playing together until the next playlist, how many different ways could you play those 50 songs?

13. **Goodnight**: The party is a great success. You go home and as you fall asleep you, wonder…

   a. How many ways are there to rearrange the letters in: PARTY

   b. How many ways are there to rearrange the letters in: PIZZA

   c. How many ways are there to rearrange the letters in: DEFENSELESSNESS