PROBLEM 1 Pizza Special

Mario's Pizzeria advertises special deals in the newspaper.

> **Today's Special at Mario's Pizzeria**
>
> Large one-topping pizza $9.00
>
> Small one-topping pizza $6.50
>
> Choose either a square or a round pizza with thick or thin crust.
>
> **Available toppings: pepperoni or mushrooms**
>
> **Enjoy a fresh-baked pizza!!!**

A **tree diagram** is a visual model for determining the sample space of multiple events.

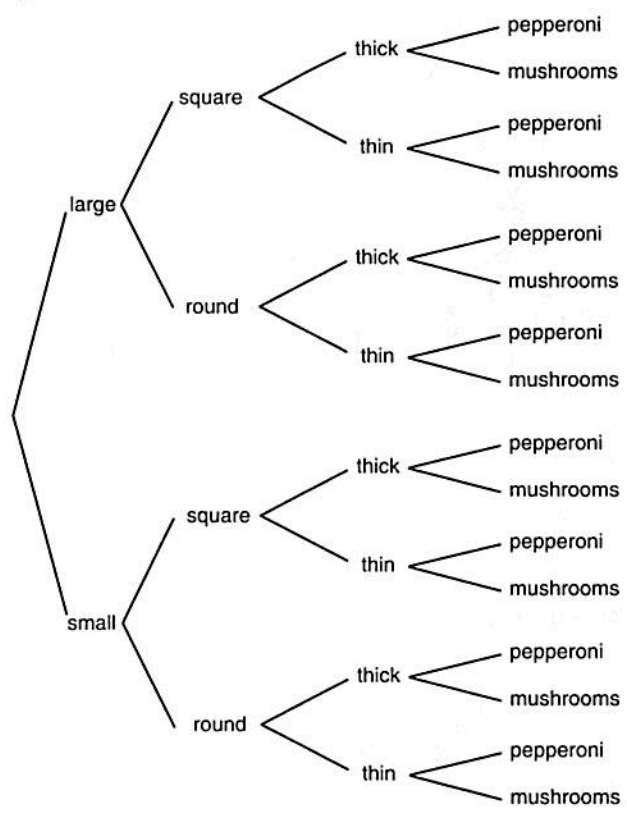
Amaliya and Romeo sketched tree diagrams to show the possible pizza specials at Mario's Pizzeria.

Look @ example

How many combinations?

16

Amaliya



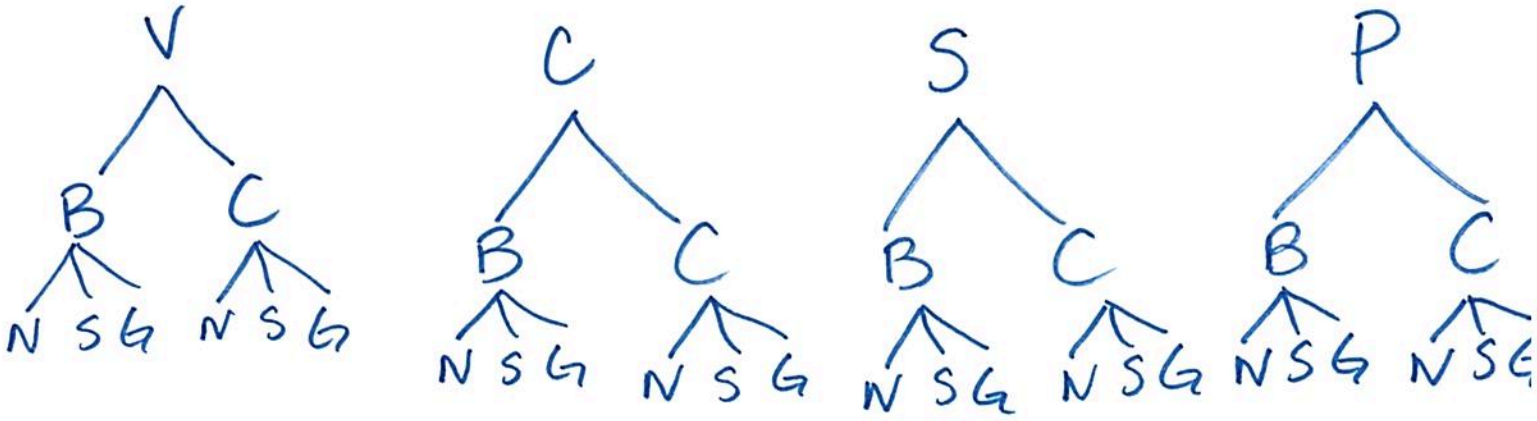
PROBLEM 4 Stan's Frozen Yogurt

Stan's Frozen Yogurt Shop offers frundaes—frozen yogurt sundaes. The shop advertises different frundae options for customers.

BUILD YOUR OWN FRUNDAE
Choose one yogurt flavor, fruit, and topping.

Frozen Yogurt Flavors	*Fruit*	*Toppings*
vanilla	bananas	nuts
chocolate	cherries	sprinkles
strawberry		granola
peach		

A) Make a tree diagram of the different sundae options consisting of one yogurt flavor, one fruit, and one topping.



B) How many different sundaes can be made?

$4 \times 2 \times 3 = \boxed{24}$

★ Look @ Counting Principle PP.

Probability - Day 2

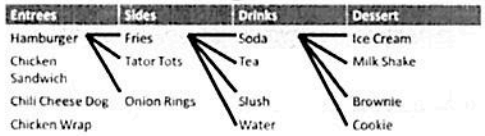
COUNTING PRINCIPLE

Lunch Dilemma

Suppose you are at your local Sonic Drive-In for lunch. You want to choose 1 sandwich, 1 side, 1 drink and 1 dessert. Below are the different options. How many meal possibilities can you make?

Entrees	Sides	Drinks	Dessert
Hamburger	Fries	Soda	Ice Cream
Chicken Sandwich	Tator Tots	Tea	Milk Shake
Chili Cheese Dog	Onion Rings	Slush	Brownie
Chicken Wrap		Water	Cookie

The tree diagram helps show the number of possible outcomes



Each Entrée has 3 possible side choices, so 4(3) =12 entrée/side combinations

Each Entrée/Side has 4 possible drink choices, so 12(4)=48 entrée/side/drink combos

Each Entrée/Side/Drink combo has 4 Dessert choices, so 48(4)= 192 total choices

This is called the Counting Principle!

When there are **m** ways to do one thing,
and **n** ways to do another,
then there are **m×n** ways of doing **both**

So our Sonic Example would be:

4 x 3 x 4 x 4 = 192

Murder Mystery

Suspects	Rooms	Weapons
Colonel Mustard	Kitchen	Rope
Professor Plum	Study	Lead pipe
Beth	Library	Knife
Miss Scarlet	Hall	Wrench
Mrs. White	Garden	Candlestick
Mr. Green	Dining room	shovel
	Ballroom	
	Conservatory	
	Billiard room	

6 · 9 · 6 = 324

Jeans Store

Sizes	Fits	Lengths
3	Boot cut	Short
5	Skinny	Regular
7	Super Skinny	Long
9	Jeggings	
11		
13		
15		

7 · 4 · 3 = 84

Ice Cream Shoppe

Flavor	# of Scoops	Container
Vanilla	1	Cup
Chocolate	2	Waffle Cone
Strawberry	3	Chocolate Dipped Cone
Mint Chocolate Chip		
Chocolate Chip Cookie Dough		
Cookies 'n' Crème		
Rocky Road		

$7 \cdot 3 \cdot 3 = 63$

Party City

Theme	Decorations	Cakes
Birthday	Balloons	Classic
Luau	Streamers	Ice Cream Cake
Super Bowl	Napkins	Cookie Cake
4th of July	Plates	Cupcakes
Costume	Confetti	
Toga	Lights	
	Banner	

$6 \cdot 7 \cdot 4 = 168$

Car Dealership

Type	Make	Color	Interior
Car	Ford	Black	Leather
Truck	Chevy	White	Cloth
SUV	Honda	Red	
	Toyota	Silver	
	Infiniti	Yellow	
	BMW		
	Mercedes		

$3 \cdot 7 \cdot 5 \cdot 2 = 210$

Movie Theater

Popcorn	Drink	Candy
Small	Small	Sour Patch Kids
Medium	Medium	Reese's
Large	Large	Twizzler's
Extra Large Bucket		Junior Mints
		Goobers
		Mike & Ike's

$4 \cdot 3 \cdot 6 = 72$

Pizza Parlor

Size	Crust	Toppings
Small	Hand-tossed	Pepperoni
Medium	Pan	Sausage
Large	Chicago Style	Hamburger
	New York Style	Onion
		Bell Pepper
		Black Olives
		Mushrooms

$3 \cdot 4 \cdot 7 = 84$

Freebirds!

Type	Meat	Toppings
Burrito	Chicken	Cheese
Taco	Steak	Sour Cream
Bowl	None	Corn
Salad		Beans
		Salsa
		Onions
		Guacamole

$4 \cdot 3 \cdot 7 = 84$

PROBLEM 6 The Counting Principle

To determine the total number of possible lunches in Problem 3, Paula used a mathematical principle called the *Counting Principle*. The principle is used to determine the number of outcomes in the sample space.

The **Counting Principle** states that if an action A can occur in m ways and for each of these m ways an action B can occur in n ways, then actions A and B can occur in $m \cdot n$ ways.

The Counting Principle can be generalized to more than two actions that happen in succession. If for each of the m and n ways A and B occur there is also an action C that can occur in s ways, then Actions A, B, and C can occur in $m \cdot n \cdot s$ ways.

1. Devin has an all-day pass for Scream amusement park. His favorite rides are the Bungee-Buggy, Head Rush roller coaster, Beep Beep go-karts, and Tsunami Slide water roller coaster. He never rides any other rides, and he can ride each of his favorite rides as many times as he wants.

A) How many ride order possibilities are there for Devin's next five rides?

$4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 = 1024$

2. Sherry stayed home from school Wednesday because she was ill. She watched a television program from 12:00 p.m. until 12:30 p.m., and another program from 12:30 p.m. until 1:00 p.m. From 12:00 p.m. until 12:30 p.m., her program choices were the news, cartoons, or a talk show. From 12:30 p.m. until 1:00 p.m., her program choices were a comedy, a soap opera, a game show, or a cooking show.

A) How many program selections can Sherry watch from 12:00 pm until 1:00 pm?

$3 \cdot 4 = 12$

3. A student's daily schedule includes math, English, science, social studies, foreign language, art, and physical education. Students are enrolled in each class for one period per day.

A) Determine how many different orders the classes can be arranged to fill a seven-period daily schedule.

$7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 5040$

Factorial!

c. Lunch period is directly after fourth period. How many different class schedule arrangements are possible before lunch period? Explain your reasoning.

$7 \cdot 6 \cdot 5 \cdot 4 = 840$

4. The cell phone PIN to access voicemail is a 4-digit number. Each digit can be a number from 0 to 9, including 0 and 9. How many 4-digit numbers are possible? Repetition of numbers is allowed. Explain your calculation.

$10 \cdot 10 \cdot 10 \cdot 10 = 10{,}000$

5. If repeating digits is not permitted, how many different 4-digit PINs are possible?

$10 \cdot 9 \cdot 8 \cdot 7 = 5040$

6. A typical license plate number for a car consists of three letters followed by four numbers ranging from 0 through 9, including 0 and 9. How many different license plates numbers are possible if letters and numbers can be repeated? Explain your calculation.

$26 \cdot 26 \cdot 26 \cdot 10 \cdot 10 \cdot 10 \cdot 10 =$

$175{,}760{,}000$

7. How many different 3-letter, 4-digit license plate numbers are possible if letters and digits cannot be repeated?

$26 \cdot 25 \cdot 24 \cdot 10 \cdot 9 \cdot 8 \cdot 7 =$

$78{,}624{,}000$

14.1 Intro to Probability/Counting Principle
Pre-AP Geometry

Name Key
Period _____ Date _____

ıst show all work for full credit!! Leave answers as simplified fractions.

1. Evan has white socks and blue socks in his drawer. If he picks a pair at random from the 14 pairs of socks in the drawer, the probability of choosing a white pair is $\frac{2}{7}$. How many blue pairs of socks are in the drawer?

$\frac{2}{7} = \frac{x}{14}$ $x = 4$ ← white

blue = 10 pairs

2. A pencil box contains 5 red, 4 blue, and 6 green pencils. If a pencil is chosen at random, what is the probability that it will not be blue?

$\frac{11}{15}$

3. A class contains 12 juniors and 13 seniors as described below:

	Juniors	Seniors
Male	7	4
Female	5	9

Total = 25

If one student is chosen at random, what is the probability that the student will be a female senior?

$\frac{9}{25}$

4. In a statistics class with 12 men and 14 women, 5 of the men and 8 of the women are also taking a biology class. If one student is chosen at random from the statistics class, what is the probability of selecting a man taking biology?

Total = 26

$\frac{5}{26}$

5. There are 5 students scheduled to read their essays aloud in an English class one day. The teacher will randomly choose the order of the students. In how many different orders can the students read their essays?

$5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

$= \boxed{120}$

6. A restaurant offers a special price for customers who order a sandwich, soup, and a drink for lunch. The diagram shows the restaurant's menu. How many different lunches are possible?

Lunch Menu		
Sandwiches	Soup	Drinks
Cheese	Minestrone	Cola
Chicken	Chicken Noodle	Tea
Ham and Egg	Vegetable	Coffee
Turkey Club		

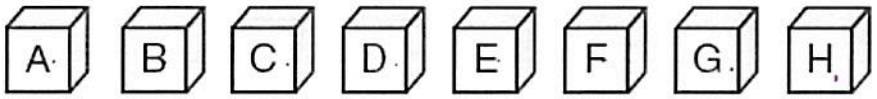
$4 \cdot 3 \cdot 3 = \boxed{36}$

7. A website requires users to make up a password that consists of three letters (A to Z) followed by three numbers (0 to 9). Neither letters nor digits can be repeated. How many different passwords are possible?

$(26 \cdot 25 \cdot 24) \cdot (10 \cdot 9 \cdot 8) =$

$\boxed{11,232,000}$

8. Letter blocks are arranged in a row from A to H, as shown. How many different arrangements in a row could you make with blocks?



$8! = \boxed{40,320}$

9. A photographer arranges 12 members of a soccer team in a row to take a group picture. How many different arrangements are possible?

$12! = \boxed{479,001,600}$