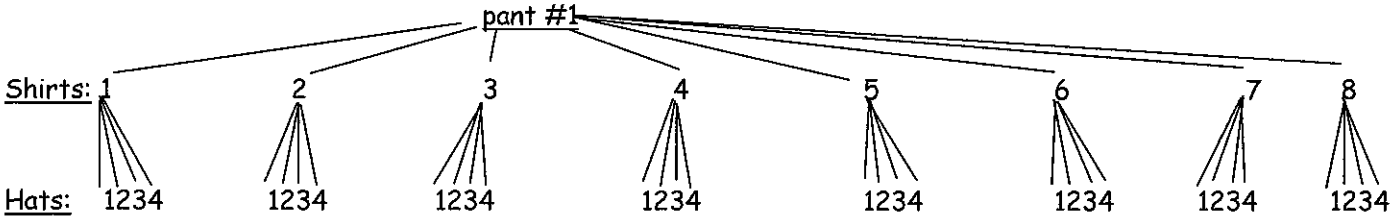
Algebra 1B Name_____

The Counting Principle

When multiple events or options are occurring at once, it is sometimes helpful to draw a tree diagram to represent all the options that can be chosen:

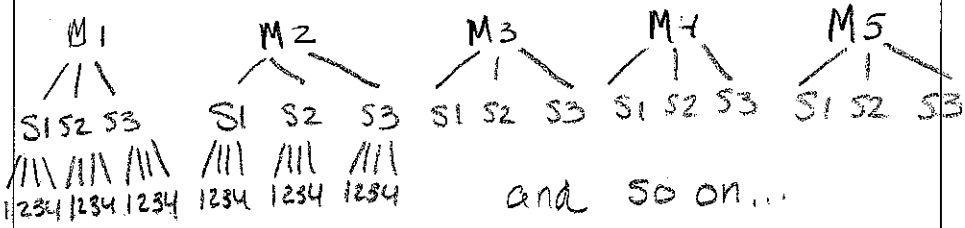
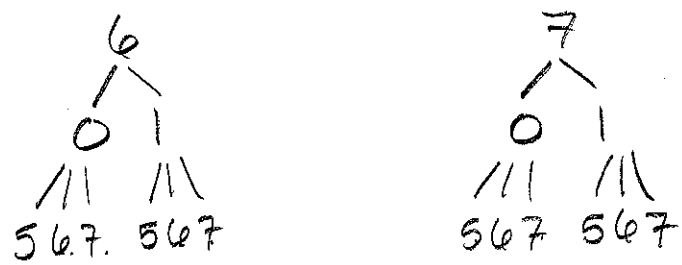
Example: Adriana has 4 hats, 8 shirts and 9 pairs of pant. Choosing one of each, how many different complete outfits can she make?

Solution: For each pair of pants, she also has 8 shirts and 4 hats to choose from:



For each pair of pants, she has 4 x 8 or 32 options for outfits. That means Adriana has 9 x 8 x 4 or 288 total options for outfits

Draw tree diagrams for each of the following situations, in order to answer each question:

1. A restaurant serves 5 main dishes, 3 salads and 4 desserts. How many different meals could be ordered if each has a main dish, salad and dessert?	 12 options per Main Course x5 Main Courses = 60
2. Ohio is adding a new area code to the Columbus area. The first digit must be a 6 or 7, the second can be a 0 or 1, and the third can be a 5, 6, or 7. How many possible area codes are there?	 12 possible codes!

Shortcut!!

Counting Principle: If some event #1 can occur in m number of ways and is followed by an event that can occur in n number of ways, then the two events together can occur is m x n

Lunch Special $6.95	
and	
Soups	**Sandwich**
tomato	turkey
chicken	tuna
	veggie

Use the counting principle to find the number of possible lunches given the choices.

$2 \cdot 3 = 6$ ways

The problems we saw so far involved **independent events, because the outcome of one event does not affect the outcome of the next event.
****Dependent events**, then, occur when the outcome of one event *does* affect the outcome of the next event:

Determine whether each of the following are dependent or independent:

1. Choosing the color and size of a pair of shoes. Independent	2. Choosing the winner and loser of a checkers game. Dependent
3. Arranging the first five letters of the alphabet if each is used only once. Dependent	4. Finding a lock combination of 3 rotating cylinders. Independent

For **dependent events** it is sometimes helpful to make an illustration of options:
Example: A bank PIN consists of 4 digits, with each digit used just once or not at all. How many different 4-digit PINs are there to choose from?

$10 \cdot 9 \cdot 8 \cdot 7 = 5{,}040$

Determine whether each of the following are independent or dependent events and answer each:

1. There are nine justices on the US Supreme Court. If they lined up for a picture, in how many different ways can they line up side-by-side? Dependent $9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$ 362,880 Ways	2. .A golf club manufacturer makes irons with 7 different shaft lengths, 3 different grips, 5 different lies, and 2 different club head materials. How many different clubs are offered? Independent $7 \cdot 3 \cdot 5 \cdot 2 = 210$
3. In how many ways can the 4 call letters of a radio station be arranged if the first letter must be a W or K and no letters can repeat? $2 \cdot 25 \cdot 24 \cdot 23$ 27,600	4. Parker knows he has 18 quarters, 26 dimes, 22 nickels, and 34 pennies in his piggy bank. He pulls out 2 coins. How many outcomes are possible? $4 \cdot 4 = 16$ What are the odds of pulling out a nickel? $\frac{22}{78} = \frac{11}{39}$