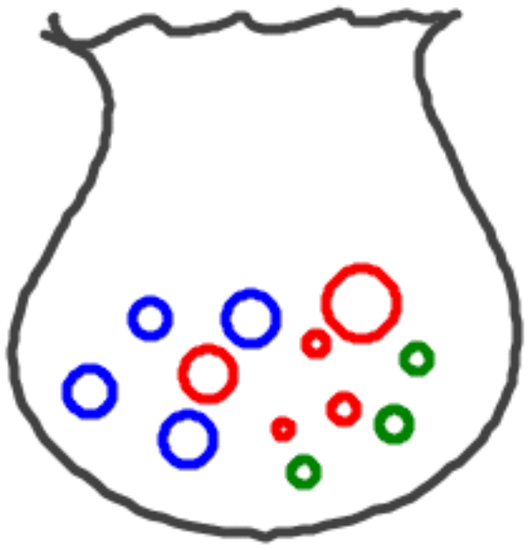
PROBABILITY- The likelihood of an event occurring

$$\text{Probability} = \frac{\#\text{ of ways an event can occur}}{\text{total \# of possible outcomes}}$$



12 MARBLES TOTAL

Probability of getting a green

$$P(\text{Green}) = \frac{3}{12} = \frac{1}{4}$$

$$P(\text{not Blue}) = \frac{8}{12}$$

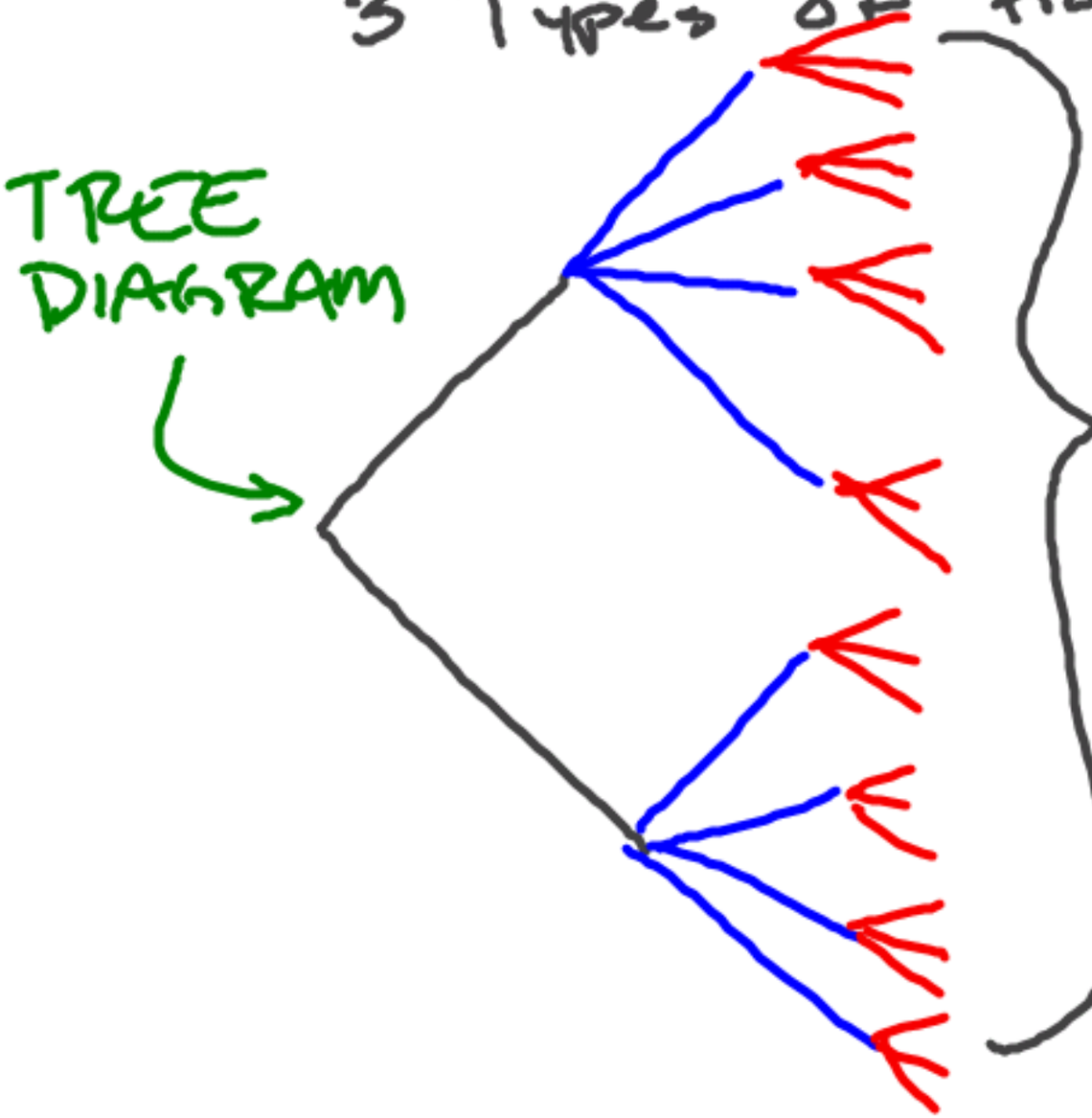
COUNTING PRINCIPLE- How we figure out all the possible mixtures of choices

2 types of Cookies

4 different nuts

3 Types of frosting

TREE DIAGRAM



24 Mixtures of choices

$2 \times 4 \times 3 = 24$

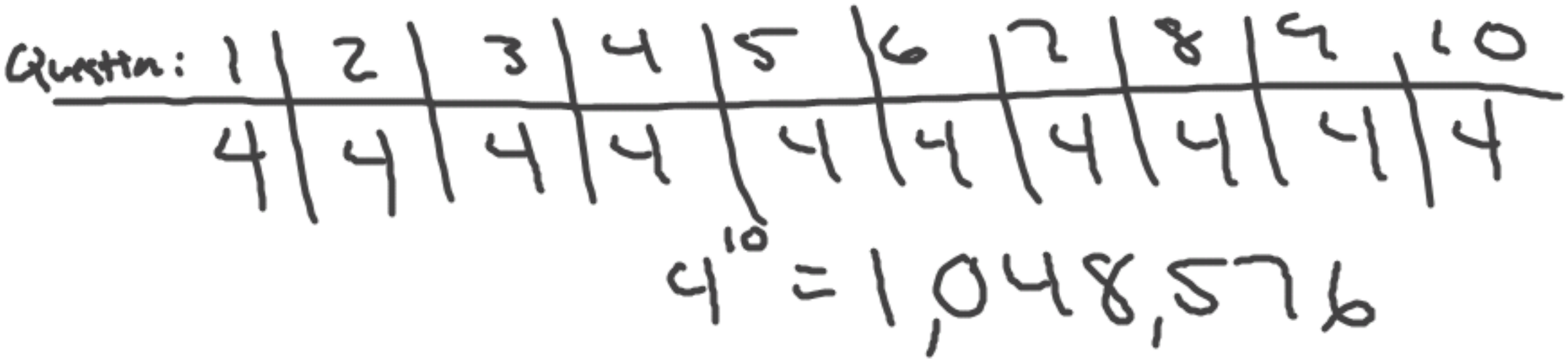
Your favorite car model comes to 2 different body types and has 3 special feature options and 4 different colors to choose from. How many different possible cars of this model are there to choose from?

$2 \times 3 \times 4 = 24$

Gil's Pizza Parlour offers 7 different toppings for it's pizza with 4 types of sauce and 3 different styles of crust. How many different 1 topping pizzas can be created?

$7 \times 4 \times 3 = 84$ different 1 topping pizzas

If every question on a 10 question test has four choices (A, B, C, and D) How many different ways can you answer the questions on the test assuming you were simply guessing on each one?



FACTORIAL (!): Multiplies a number by every number between it and one.

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

Calc: MATH > PRB > #4: !

4 Numbers w/ 10 possible choice

NO REPEATS:

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

REPEATS O.K.: $\frac{1}{5040}$ of getting same order

$10 \cdot 10 \cdot 10 \cdot 10 = 10000$

PERMUTATIONS- The ORDER MATTERS. Things arranged in different orders are considered different outcomes.

ABC
ACB
BAC
BCA
CAB
CBA

} considered 6 different things.

Key words: "arranged" "placed" "ordered"

8 colors different orders of 3 colors can I make.

$8 \cdot 7 \cdot 6 = 336$

PERMUTATIONS FORMULA: Gives the number of possible arrangements
n = total number to choose from
r = number of items choosen and placed in an order

$$_nP_r = \frac{n!}{(n-r)!}$$

$$_nP_r = \frac{n!}{(n-r)!}$$ ← cancels out the part I'm not using

$n = 8$
$r = 3$

$$_8P_3 = P(8,3) = \frac{8!}{(8-3)!} = \frac{8!}{5!}$$

$$\frac{8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}$$

Calc: 8 MATH > PRB > #2: nPr , 3

8 nPr 3

How many ways can you arrange 5 different books on a shelf?

$${}_5P_5 = 120$$

How many ways can you arrange 5 books on a shelf if the one that is a dictionary has to be on one of the ends?

$$24 + 24 = 48$$

A little league team has 12 players on the roster and every player can play any position and bat anywhere in the order. How many different batting orders can the coach make?

$n = 12$

$r = 9$

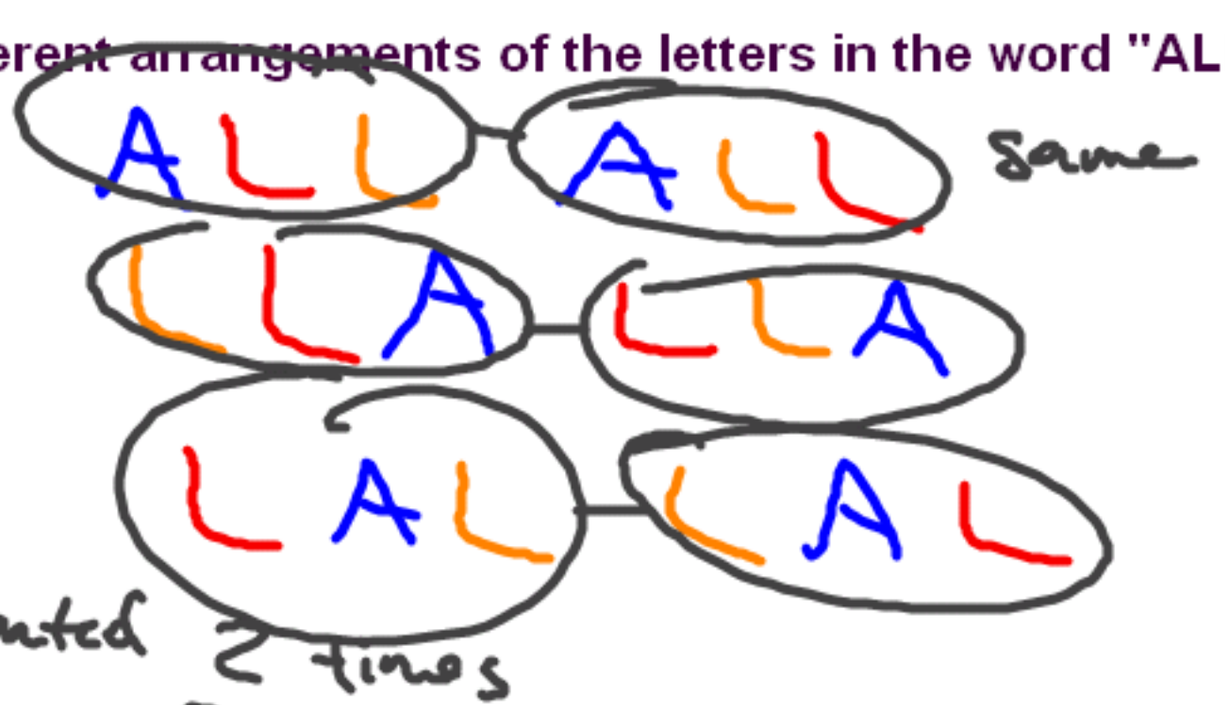
C or P

$_{12}P_9 = 79833600$

How many different arrangements of the letters in the word "COMPUTE" are possible?

$$_7P_7 = 5040$$

How many different arrangements of the letters in the word "ALL" are possible?



L is repeated 2 times

takes out repetitions → $\frac{_3P_3}{2!} = \frac{6}{2} = 3$

How many different arrangements of the letters in the word "ALASKA" are possible?

$$\frac{6P6}{3!} = 120$$

3 A's A A A L S K

calc: (6 nPr 6) / (3!)

How many different arrangements of the letters in the word "MISSISSIPPI" are possible?

11 letters

4 I's 4 S's 2 P's

$$\frac{11P11}{4! \cdot 4! \cdot 2!} = 34650$$

4's S's P's

COMBINATIONS - Order DOES NOT MATTER, each group is considered the same if it has the same elements reguardless of the order they were chosen.

ABC
ACB
BAC
BCA
CAB
CBA

considered the same event

how many "groups" or "sets"

COMBINATIONS FORMULA: $${}_nC_r = \frac{n!}{(n-r)!\,r!}$$

How many different groups of 5 students can a teacher make from a class of 29 students?

$n = 29$
$r = 5$

$_{29}C_5 = 118755$

Combination

How many different 5 card hands can be dealt from a 52 card deck?

$n = 52$
$r = 5$

$_{52}C_5 = 2{,}598{,}960$

Do Combinations and Permutations Worksheet