Distribution: the possible values a variable can take and how frequently they occur.

Y: the actual outcome of an event

y: one of the possible outcomes

p(y): the probability function

mean = average value (μ)

variance = how spread out the data is or how the data is far away from the mean (σ^2)

standard deviation is the root square of the variance (σ for population data) and (s for sample data)

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x	~	N	(μ, σ^2)
variable	tilde	type	characteristics

Binomial Distribution: B (n, p) or B(number of trials and the probability of success in each one)

Conditional Probability Law: p(E\F) =p(E∩F)/p(f)

Or

Product rule: p(E∩F) = p(E\F) * p(f)

Independent Events Law: p(E\F) = p(E)

If you want to know if two events are independent or not, we use the following law: if p(E∩F) = p(E) * p(f) then the two events are independent.

So, $p(E1 \cap E2 \cap En)$ = p(E1) * p(E2) * p(En)

Bayes' theorem: P(A|E) = [P(A). P(E|A)]/P(E) .

Sample space: every possible result that can happen.

Outcome: number of results ^ number of repetitions.

Ex: A= {1,2,3} , B = {2,3,4} , S = {0,1,2,3,4}.
A ∩ B = {2,3}
A ∪ B = {1,2,3,4}
A` = {0,4}
B` = {0,1}
P (A ∩ B) =2/5
P (A ∪ B) =4/5
P(A)=3/5
P(B`) =2/5
P(S)=5/5=1

Counting techniques

1. **Multiplication rule**

2. **Permutation rule:**
    a. **Ordering elements**
    b. **Of similar objects**
    c. **Of subsets**

3. **Combination**

Multiplication rule:

Ex: a coffee shop has 4 types of sandwiches, 5 types of coffee and 2 cake types in how many ways can we choose one of each.
= 4*5*2 = 40.

Permutation rule:

1 – ordering elements:
Ex: 6 students are lining up outside the heads office what is the number of different orders that they could queue up in ?

= 6! = 720

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2 – subsets
Ex: in an examination a student must choose 4 out of 10 questions. how many different ways can she select which 4 questions she attempts.

$$P_r^n = \frac{n!}{(n-r)!}$$ **= 10P4 = 5040**

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3 – similar objects

Ex: how many different orders of that ward [MINIMUM]

= n! / (n! *n!) = 7! / (3! *2!) = 420.