STATISTICAL DISTRIBUTIONS

KEY WORDS & DEFINITIONS

1 **Random variable** A variable whose outcome depends on a random event.
2 **Sample space** The range of values a variable can take.
3 **Discrete variable** A variable that can only take specific values.
4 **Probability Distribution** A full description of the probability of all possible outcomes in a sample space.
5 **Uniform distribution** When the probabilities in a distribution are all equal.
6 **Binomial Distribution** A distribution where the random variable, X, represents the number of successful trials in an experiment.
7 **Cumulative probability distribution** The sum of probabilities up to and including the given value..

BINOMIAL DISTRIBUTION

Conditions for a binomial distribution B(n , p)

- Only two possible outcomes (success/failure)
- Fixed number of trials, n
- Fixed probability of success, p
- Trials are independent of each other .

Probability mass function of a Binomial distribution

$$p(X = r) = \binom{n}{r} p^r (1-p)^{n-r}$$

Binomial Cumulative Probability Function

The sum of all the individual probabilities up to and including the given value of x in the calculation for P(X ≤ x)

These values can be found in the tables or on a calculator.

Phrase	Means	Calculation
Greater than 5	X > 5	1 – P(X ≤ 5)
No more than 3	X ≤ 3	P(X ≤ 3)
At least 7	X ≥ 7	1 – P(X ≤ 6)
Fewer than 10	X < 10	P(X ≤ 9)
At most 8	X ≤ 8	P(X ≤ 8)

WHAT DO I NEED TO KNOW

Probabilities of all possible outcomes add to 1
$\Sigma P(X = x) = 1$ for all x

Probability distributions can be described in different ways. E.g. if X = the score when a fair die is rolled

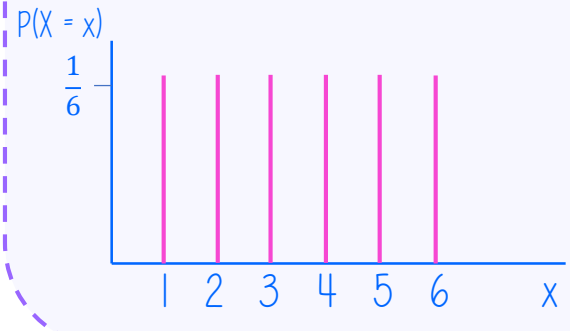
Table:

x	1	2	3	4	5	6
P(X=x)	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$

Probability Mass Function:

$$P(X = x) = \begin{cases} \frac{1}{6}, & x = 1,2,3,4,5,6 \\ 0 & \text{otherwise} \end{cases}$$

Diagram:



CALCULATORS FOR BINOMIAL

Casio fx-991EX:
Menu 7 – Binomial CD or Binomial PD

Casio CG50:
Menu 2 - F5 Dist – F5 Binomial – Bpd or Bcd

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