

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 $P(X \leq x)$

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

Phrase	Means	Calculation
Greater than 5	$X > 5$	$1 - P(X \leq 5)$
No more than 3	$X \leq 3$	$P(X \leq 3)$
At least 7	$X \geq 7$	$1 - P(X \leq 6)$
Fewer than 10	$X < 10$	$P(X \leq 9)$
At most 8	$X \leq 8$	$P(X \leq 8)$

WHAT DO I NEED TO KNOW

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

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

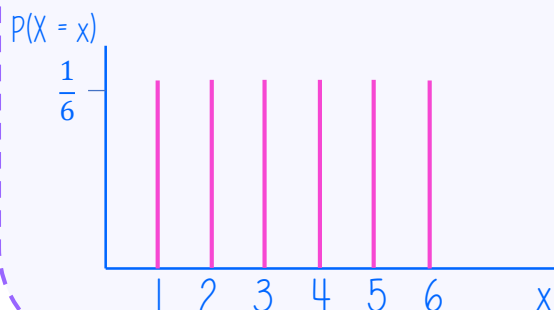
Table:

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