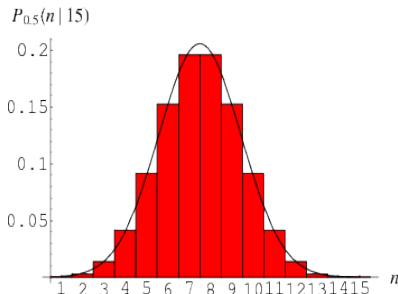


## Goals

This fortnight we are going to:

- Understand probability distributions for discrete variables
- Understand Bernoulli trials
- Understand binomial theorem and binomial probability distribution
- Recognise situations when the binomial distribution applies and learn how to solve problems involving the binomial distribution
- Recognise and use the formula and CAS for binomial probabilities and graphs
- Understand the assumptions on which the binomial model is based



## Theoretical Components

Make notes on the following chapters:

### Maths Quest 12 Mathematical Methods

- 11A - The binomial distribution
- 11B - Problems involving the binomial distribution for multiple probabilities
- 11D - Expected value, variance and standard deviation of the binomial

### Binomial Distribution:

- <https://www.youtube.com/watch?v=xNLQuuvE9uq>
- <https://www.youtube.com/watch?v=WWv0RUxDfbs>
- <https://stattrek.com/probability-distributions/binomial>

$$Pr(X = x) = {}^n C_x p^x q^{n-x} \text{ where } x = 0, 1, 2, \dots, n.$$

**That is:**  $x$  = the occurrence of the successful outcome.

The formula may also be written as:

$$Pr(X = x) = {}^n C_x p^x q^{n-x} \text{ where } x = 0, 1, 2, \dots, n.$$

Here, the probability of failure,  $q$ , is replaced by  $1 - p$

## Practical Components

### Do the following questions:

Organise your solutions neatly in your exercise book.

Chapter 11 of Maths Quest 12 Mathematical Methods (pdf – Google Classroom)

- 11A: 3, 5, 7, 11, 14, 15, 23, 29
- 11B: 2, 4, 7, 9, 11, 13, 21, 22, 28
- 11D: As many as you need

Mathspace

## Investigation

See next page

### Other

**Random fun fact:** It is surprising that there should be a connection between the Riemann zeta-function, defined as a function over the complex numbers, and the set of prime numbers. But such a connection is exactly what one of the most famous and important unsolved mathematical mysteries describes. The Riemann hypothesis, which purports that all zeros of the Riemann zeta-function have real parts equal to  $\frac{1}{2}$ , is equivalent to a statement describing the asymptotic distribution of the prime numbers. This hypothesis holds such importance in mathematics that either proving or disproving it will reward the solver a prize of a million dollars!

## Week 5 and 6 Investigation

The winner of the baseball World Series championship is determined through a best-of-seven playoff.

In 1996 the Atlanta Braves beat the New York Yankees in the first two games of the World Series.

Assuming that either team was equally likely to win each game:

- What was the chance of a Yankee comeback? i.e. winning the series?
- What is the probability that the Yankees beat the Braves in the third, fourth, fifth and sixth games?
- Compare and comment on the probabilities calculated.

Who won the 1996 World Series? (Do some research)

Comment on the result.