

# Hypothesis testing using binomial distribution (AS)

O1 Understand and apply the language of statistical hypothesis testing, developed through a binomial model: null hypothesis, alternative hypothesis, significance level, test statistic, 1-tail test, 2-tail test, critical value, critical region, acceptance region,  $p$ -value.

O2 Conduct a statistical hypothesis test for the proportion in the binomial distribution and interpret the results in context.

Understand that a sample is being used to make an inference about the population and appreciate that the significance level is the probability of incorrectly rejecting the null hypothesis.

For a brief commentary on this content go to the [MEI outline SoW](#).

## Pre-requisites

- GCSE: Inequalities.
- AS Binomial distribution: Understand the properties of a Binomial distribution.

## Teaching it!

- \*\*Coming soon\*\*** A series of [videos](#) designed to support students on this topic.
- [Hypothesis testing using the binomial distribution](#): An interactive GeoGebra applet.
- [Critical regions](#): A matching activity connecting hypotheses, critical regions and graphs.
- [The Derren Brown coin flipping scam](#) from Nrich. Related YouTube videos showing [Ten heads in a row](#) and the [Explanation](#).

## Common student errors

- Forgetting that a hypothesis test does not prove anything, rather it provides evidence.
- Looking at the probability of one outcome (e.g. getting exactly 8 heads from 10 coin tosses) rather than a critical region (8 or more heads from 10 coin tosses).
- Failure to define 'p' in the null hypothesis.
- Confusing a one-tailed test for a two-tailed test.

## Getting them thinking

- The historical probability that a student at a certain school passes a statistics module is 0.75. A new teacher is appointed and takes the next group. Out of a group of 10 students only 6 students now pass. Should the Head of Maths be concerned? Are the assumptions necessary for a Hypothesis Test fully met? Assuming they are, change one aspect so the Hypothesis test has a different result.
- A company uses a multiple choice test to see whether employees are suitable for promotion. The test has 30 questions, each with 4 answers. What kind of pass mark would ensure that there was very little chance of someone who guess them all passing? Being promoted means working longer hours. The company monitors test results to check for people deliberately getting questions wrong even though they know the answer – what kind of marks would be evidence of this?