### 03 Axioms of Probability

A **sample space** is the set of all possible outcomes of an experiment.

An **event** is a subset of the sample space.

*e.g. {Heads}, {(H, T), (T, H)}*

### 04 Conditional Probability & Bayes Theorem

**Conditional Probability**:

**Chain Rule**:

**Marginalisation** refers to the summing of the probability of a random variable X given the joint probability distribution of X with other variables.

**Bayes Rule / Theorem**:

### 05 Independence

Two events are **independent** if:

Two events E and F are **conditionally independent** given G if:

### 07 Random Variables

A **random variable** is a function that maps from the sample space to the real line.

An **indicator random variable** takes 1 if an event occurs and 0 otherwise.

**Conditional Probability for RVs**:

**Marginalisation**:

**Probability Mass Function**:

A probability is associated with each value of a discrete random variable.

**Cumulative Distribution Function**:

where is real-valued.

### 08 Bernoulli & Binomial Random Variables

A **Bernouilli random variable** is a random indicator variable where 1 = success and 0 = failure.

A **binomial random variable** is the sum of the Bernouilli random variables in n trials.

### 09 Mean & Variance

The **expected value** of a random variable is the **mean** or **average**:

linearity

*e.g. (0\*0\*0) + (0\*1\*⅓) + (1\*0\*⅓) + (1\*1\*⅓) = ⅓*

For **independent random variables**:

**Variance**:

**Standard deviation**:

For **independent random variables**:

For **binomial random variables**:

### 10 Correlation & Conditional Expectation

**Joint Probability Mass Function**:

**Covariance**:

**Correlation**:

**Conditional expectation**:

linearity

marginalisation