Vocabulary

Term	Definition
Adding or subtracting random variables	$E(X \pm Y) = E(X) \pm E(Y)$ and *if X and Y are independent*, $Var(X \pm Y) = Var(X) + Var(Y)$ (The Pythagorean Theorem of Statistics).
Addition Rule	If **A** and **B** are disjoint events, then the probability of **A** *or* **B** is $P(\mathbf{A} \cup \mathbf{B}) = P(\mathbf{A}) + P(\mathbf{B})$
Bernoulli trials, if . . .	(1) there are two possible outcomes. (2) the probability of success is constant. (3) the trials are independent.
Binomial probability model	A Binomial model is appropriate for a random variable that counts the number of successes in a fixed number of Bernoulli trials.
Central Limit Theorem	The Central Limit Theorem (CLT) states that the sampling distribution model of the sample mean (and proportion) is approximately Normal for large *n*, *regardless of the distribution of the population, as long as the observations are independent*.
Changing a random variable by a constant	$E(X \pm c) = E(X) \pm c$ relates to $Var(X \pm c) = Var(X)$ and $E(aX) = aE(X)$ relates to $Var(aX) = a^2\, Var(X)$
Complement Rule	The probability of an event occurring is 1 minus the probability that it doesn't occur. $P(\mathbf{A}) = 1 - P(\mathbf{Ac})$
Conditional probability	$P(\mathbf{A}\|\mathbf{B}) = P(\mathbf{A} \cup \mathbf{B})$ divided by $P(\mathbf{A})$ and $P(\mathbf{A}\|\mathbf{B})$ is read "the probability of **B** *given* **A**"
Continuous random variable	A random variable that can take any numeric value within a range of values is called a continuous random variable. The range may be infinite or bounded at either or both ends.
Discrete random variable	A random variable that can take one of a finite number (could be infinite as long as they are *countable* - meaning they can be listed in order) of distinct outcomes is called a discrete random variable.
Disjoint (mutually exclusive)	Two events are disjoint if they share no outcomes in common. If **A** and **B** are disjoint, then knowing that **A** occurs tells us that **B** cannot occur. Disjoint events are also called "mutually exclusive."
Disjoint events	Two events are *disjoint* (or *mutually exclusive*) if they have no outcomes in common.
Event	A collection of outcomes. Usually, we identify events so that we can attach probabilities to them. We denote events with bold capital letters such as **A**, **B**, or **C**.
Expected value	The expected value of a random variable is its theoretical long-run average value, the center of its model. Denoted μ or $E(X)$, it is found (if the random variable is discrete) by summing the products of variable values and probabilities: $\mu = E(X) = \sum x \cdot P(x)$

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General Addition Rule	For any two events, **A** and **B**, the probability of **A** *or* **B** is *P* (**A** U **B**) = *P*(**A**) + *P*(**B**) - *P*(**A** ⊓ **B**)
General Multiplication Rule	For any two events, **A** and **B**, the probability of **A** and **B** is *P* (**A** ⊓ **B**) = *P*(**A**) x *P*(**A**|**B**)
Geometric probability model	A Geometric model is appropriate for a random variable that counts the number of Bernoulli trials until the first success.
Independence (informally)	Two events are *independent* if knowing whether one ecent occurs does not alter the probability that the other event occurs.
Independence (used casually)	Two events are *independent* if knowing whether one event occurs does not alter the probability that the other event occurs.
Independence (used formally)	Events **A** and **B** are independent when *P*(**A**|**B**) = *P*(**B**)
Law of Large Numbers	the Law of Large Numbers states that the long-run *relative frequency* of repeated independent events settles down to the *true* relative frequency as the number of trials increases.
Legitimate probability assignment	An assignment of probabilities to outcomes is legitimate if each probability is between 0 and 1 (inclusive) and the sum of the probabilities is 1.
Multiplication Rule	If **A** and **B** are independent events, then the probability of **A** *and* **B** is P (A ⊓ B) = P(A) x P(B)
Outcome	The outcome of a trial is the value measured, observed, or reported for an individual instance of that trial.
Probability	The probability of an event is a number between 0 and 1 that reports the likelihood of the event's occurrence. A probability can be derived from equally likely outcomes, from the long-run relative frequency of the event's occurrence, or from known probabilities. We write *P*(**A**) for the probability of event **A**.
Probability model	The probability model is a function that associates a probability *P* with each value of a discrete random variable *X*, denoted $P(X = x)$, or with any interval of values of a continuous random variable.
Random phenomenon	A phenomenon is random if we know what outcomes could happen, but not which particular values will happen.
Random variable	A random variable assumes any of several different values as a result of some random event. Random variables are denoted by a capital letter such as *X*.
Sample space	The collection of all possible outcomes values. The sample space has a probability of 1.

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Sampling distribution model	Different random samples give different values for a statistic. The sampling distribution model shows the behavior of the statistic over all the possible samples for the same size *n*.
Sampling distribution model for a mean	If assumptions of independence and random sampling are met, and the sample size is large enough, the sampling distribution of the sample mean is modeled by a Normal model with a mean equal to the population mean, μ, and a standard deviation equal to σ divided by the square root of *n*.
Sampling distribution model for a proportion	If assumptions of independence and random sampling are met, and we expect at least 10 successes and 10 failures, then the sampling distribution of a proportion is modeled by a Normal model with a mean equal to the true proportion value, *p*, and a standard deviation equal to the square root of *pq* divided by *n*.
"Something Has to Happen Rule"	The sum of the probabilities of all possible outcomes must be 1.
Standard deviation	The standard deviation of a random variable describes the spread in the model, and is the square root of the variance: $\sigma = SD(X) = \sqrt{Var(X)}$
Standard error	When we estimate the standard deviation of a sampling deviation using statistics found from the data, the estimate is called a standard error.
Success/Failure Condition	For a Normal model to be a good approximation of a Binomial model, we must expect at least 10 successes and 10 failures. That is, $np \geq 10$ and $nq \geq 10$.
Tree diagram	A display of conditional events of probabilities that is helpful in thinking through conditioning.
Trial	A single attempt or realization of a random phenomenon.
Variance	The variance of a random variable is the expected value of the squared deviation from the mean. For discrete random variables, it can be calculated as $\sigma^2 = Var(X) = \sum (x - \mu)^2 P(x)$.