Probability Distributions

Checklist

Use this alongside our Walkthrough Guides to tick off the concepts you're confident with to plan your study and find areas of improvement!

Data

- ◯ I can describe the difference between **discrete** and **continuous data**
- ◯ I can give examples of discrete and continuous data
- ◯ I can define the **expected value**
- ◯ I can calculate an expected value using the correct formula
- ◯ I can define the difference between expected gain and expected winnings, and use them to answer context questions
- ◯ I can calculate variance and standard deviation
- ◯ I can apply continuity correction to normal distribution calculations to calculate the probability when discrete values are being used

Normal Distribution

- ◯ I know what **μ**, **σ**, and **x** represents
- ◯ I can state the values of the mean and standard deviation for a standard normal
- ◯ I can draw a diagram of the normal distribution, including a line representing the probability that needs to be calculated
- ◯ I can calculate a normal distribution x-value, given the probability or area probability using the calculator, by inserting values for lower bound, upper bound, mean, and standard deviation.
- ◯ I can convert an x-value from a normal distribution to a z-value for a standard Normal distribution, using the formula: $Z = \frac{(X - \mu)}{\sigma}$
- ◯ I can use the normal distribution table to calculate the area or probability from the Z-value given
- ◯ I can use the normal distribution tables to calculate the z-value from the area or probability given
- ◯ I can calculate the mean of a normal distribution from the z-value, x-value and mean, using the formula: $Z = \frac{(X - \mu)}{\sigma}$
- ◯ I can calculate the standard deviation of a distribution normal distribution from the z-value, x-value and mean, using the formula: $Z = \frac{(X - \mu)}{\sigma}$
- ◯ I can use the **inverse normal distribution** to calculate the x-value, given the probability or area
- ◯ I can discuss any assumptions that can or cannot be made in a normal distribution problem
- ◯ I can discuss limitations of the normal distribution that are important for the context given

Binomial Distribution

- ◯ I can state the meaning of the symbols: **n**, **p/π**, **x**
- ◯ I understand that the symbols p and π are the same and both can be used in a binomial distribution
- ◯ I can use the cumulative binomial distribution to calculate the probability where x is less than or less than or equal to one value
- ◯ I can use the cumulative binomial distribution to calculate the probability where x is greater than, or greater than or equal to one value
- ◯ I can use particular binomial distribution to calculate where x is equal to one value
- ◯ I can determine whether to use Bcd or Bpd when solving binomial distribution problems using a graphics calculator
- ◯ I can state the values of the number of trials and the probability of success
- ◯ I can state the 4 conditions that must be met for binomial distribution to be an appropriate model
- ◯ For binomial distribution, I can calculate:
  - ◯ M**ean** using $\mu = np$
  - ◯ **Variance** using $\sigma^2 = np(1 - p)$
  - ◯ **Standard deviation** using $\sigma = \sqrt{(np(1-p))}$
- ◯ I can explain why a given situation can be modelled using binomial distribution
- ◯ I can draw a number line to show the x values that must be included in the binomial distribution calculation
- ◯ I can discuss any assumptions that can or cannot be made in a binomial distribution problem
- ◯ I can discuss limitations of the binomial distribution that are important for the context given
- ◯ I can use the inverse binomial distribution to calculate the value of n when the value of $P(X = 0)$ is given

Poisson Distribution

- ◯ I can state the meaning of the symbols: **λ**, **x**
- ◯ I can state the value of the mean number of occurrences in the given interval
- ◯ I can use cumulative Poisson distribution to calculate the probability where x is greater than, or greater than or equal to one value
- ◯ I can state the 4 conditions that must be met for a Poisson distribution to be an appropriate model
- ◯ I can draw a number line to show the x values that must be included in the Poisson distribution calculation
- ◯ For Poisson distribution, I can calculate:
  - ◯ **Mean** using $\mu = \lambda$
  - ◯ **Variance** using $\sigma^2 = \lambda$
  - ◯ **Standard deviation** using $\sigma = \sqrt{\lambda}$
- ◯ I can explain the relationship between λ and time
- ◯ I can calculate the value of λ depending on the time interval and can change the value of λ when the time interval changes
- ◯ I can explain why a given situation can be modelled using Poisson distribution
- ◯ I can describe the features of a Poisson distribution curve
- ◯ I can discuss any assumptions that can or cannot be made in a Poisson distribution problem
- ◯ I can determine whether to use Pcd or Ppd when solving Poisson distribution problems using the graphics calculator
- ◯ I can use particular Poisson distribution to calculate the probability where x is equal to one value
- ◯ I can use cumulative Poisson distribution to calculate the probability where x is less than or less than or equal to one value.
- ◯ I can discuss limitations of the Poisson distribution that are important for the context given
- ◯ I can use inverse Poisson distribution to calculate the value of λ when the value of $P(X = 0)$ is given

Uniform Distribution

- ◯ I can describe the features of a uniform, or rectangular, distribution
- ◯ I can draw a diagram of the uniform distribution, including a line representing the lower bound, a line representing the upper bound, and a shaded area representing the probability that needs to be calculated
- ◯ I can calculate the height of a uniform distribution by rearranging the formula for the area of a rectangle
- ◯ I can state the values of the **minimum**, **maximum**, and **height**, or **frequency**
- ◯ I can explain why a given situation can be modelled using a uniform distribution
- ◯ I can discuss the features of a uniform distribution
- ◯ I can discuss any assumptions that can or cannot be made in a uniform distribution problem
- ◯ I can calculate the area of a rectangle using the formula: $A = \text{base} \times \text{height}$
- ◯ I can use uniform distribution to calculate the area, or probability, for an event occurring
- ◯ I can discuss limitations of the uniform distribution that are important for the context given

Triangular Distribution

- ◯ I can describe the terms: **minimum**, **maximum** and **mode**
- ◯ I can use triangular distribution to calculate the probability, or area, where x is between any smaller value of c, or between c and any greater value
- ◯ I can state the meaning of the symbols, a, b, c and f(x), in relation to the triangular distribution
- ◯ I can identify the minimum, maximum and mode on a triangular distribution graph
- ◯ I can calculate the mode using $\frac{2}{(b-a)}$
- ◯ When a ≤ x ≤ c, I can calculate the height of the distribution using f(x) = $\frac{2(x-a)}{(b-a)(c-a)}$
- ◯ When c ≤ x ≤ b, I can calculate the height of the distribution using f(x) = $\frac{2(b-x)}{(b-a)(b-c)}$
- ◯ I can calculate the area of a triangle using A = ½(b × h)
- ◯ I can use triangular distribution to calculate the probability, or area, where x lies between two values, that are not a, b and c
- ◯ I can use triangular distribution to calculate the value of x when the probability or area is given
- ◯ I can use triangular distribution to calculate the probability, or area, where x is less than or greater than one value
- ◯ I can explain why a given situation can be modelled using a triangular distribution
- ◯ I can describe the features of a triangular distribution
- ◯ I can discuss any assumptions that can or cannot be made in a triangular distribution problem
- ◯ I can discuss limitations of the triangular distribution that are important for the context given

