

S2 Notes

1 Continuous random variables

1.1 Probability Density Function

- $f(x) \geq 0$ for all values of x , so that no probabilities are negative.
- $\int_{-\infty}^{\infty} f(x)dx = 1$ (The sum of all probabilities is 1)
- $P(a < x < b) = \int_a^b f(x)dx$

1.2 Median

When finding the median of a CRV with multiple ranges, set $F(x)$ to 0.5 and rearrange. If x lies outside the range, change to a different range until one works

2 Continuous distributions

2.1 Continuity correction

Probability	Corrected Probability
$P(X = n)$	$P(n - 0.5 < X < n + 0.5)$
$P(X > n)$	$P(X > n + 0.5)$
$P(X \leq n)$	$P(X < n + 0.5)$
$P(X < n)$	$P(X < n - 0.5)$
$P(X \geq n)$	$P(X > n - 0.5)$

3 Discrete distributions

3.1 Samples

When asked to list all the possible samples remember:

$$\text{Number of samples} = \text{Number of options}^{\text{Sample size}}$$

4 Hypothesis tests

Remember to split the significance level for a two tailed test

4.1 Method

1. Establish the null and alternative hypothesis (H_0 and H_1)
2. Define distribution under H_0
3. Decide on the significance level
4. Collect data, state the test statistic, $X =$
5. Calculate the probability of obtaining the test statistic or a more extreme result (same direction as H_1)
6. Compare this to the sig level as a decimal
 - If **greater** than the sig level, it is a **non significant** result, it is not in the critical region and we **do not** reject H_0
 - If **less** than sig level, it is a **significant result**, it is in the critical region and we **reject** H_0
7. Interpret the results in terms of the original claim