Beckfoot

Maths | AS Statistics | Year 13

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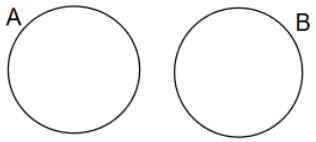
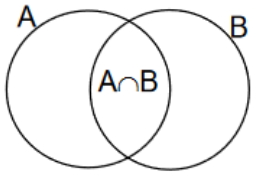
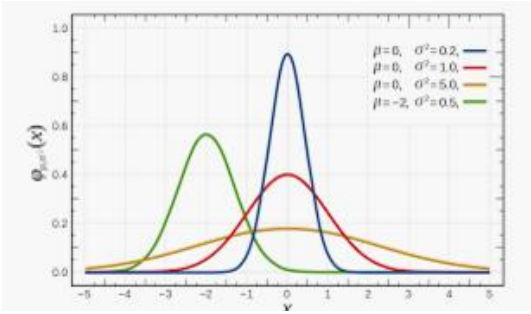
Probability

1	**Remember that you can only add probabilities to find P(A ∪ B) if the events are mutually exclusive** For example, if you want to find the probability that a student chosen at random studies either Maths or English, you need to take into account that some students might study both Maths and English – these events are not mutually exclusive .P(A ∪ B) = P(A)+P(B) only if A and B are mutually exclusive events.  P(A ∪ B) = P(A) + P(B) - P(A ∩ B) ALWAYS because when A and B are mutually exclusive, P(A∩B) = 0 
2	**Make sure you understand clearly the difference between P(A ∩ B) and P(A ∪ B)** P(A ∩ B) is the probability that both event A **and** event B occur. It is equal to 0 for mutually exclusive events. P(A ∪ B) is the probability that event A **or** event B **or both** events A and B occur.

Conditional Probability

1	**Using a tree diagram can reduce error and simplify problems** On some simpler problems you will not need to draw a tree diagram, but it is a very useful method to show all outcomes and probabilities and reduces errors in copying information from the question.
2	**Learn and understand the conditional probability formula** The formula for conditional probability is: $$P(B \mid A) = \frac{P(B \cap A)}{P(A)}$$ which can be rearranged to produce: $$P(A \cap B) = P(A)P(B \mid A)$$ Memorise them and understand how they work.
3	**Read the question carefully!** Be careful with the phrasing of the question. Sometimes the wording starts with 'Given that.....' If you are using P(A | B), remember that B is the event you are given.



Normal Distribution

1	**Use symmetry where you can** Initially make sure you are very confident in being able to manipulate standardised test scores by using symmetry.
2	**Make good use of diagrams to illustrate your answers** Draw a sketch showing the distribution and shading the area you are considering.
3	**Define your variables** Carefully define your non-standardised variable with X or Y or ..... (but of course not Z).
4	**Be careful to distinguish between values of Z and values of X** Confusion with notation makes it harder for you to be awarded method marks. Show clearly how you are standardising values.
5	**Write down clear probability statements** Again you are more likely to receive method marks if your statements are easy to read.
6	**Know how to use your calculator to find Normal probabilities** Make sure you know how to use both the Normal and inverse Normal functions.
7	**Remember that the Normal distribution is a continuous distribution** Probabilities such as P(X=45) will be zero if X is a Normal distribution, as this would mean finding the area of a line.

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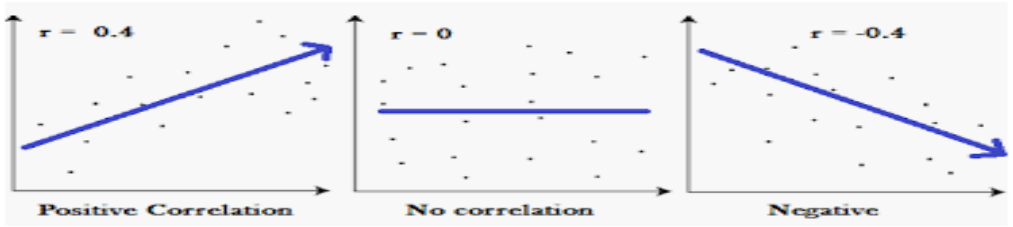
Using the Normal Distribution

1	**Make sure you know the distribution of the sample means** Given a population with a mean of μ and a standard deviation of σ, the distribution of sample means has a mean of μ and a standard deviation of σ/√n, where n is the sample size.
2	**Remember what assumptions you are making** You need to assume that the underlying distribution has a Normal distribution. Given a population X with a mean of μ and a standard deviation of σ, so that $X \sim N(\mu, \sigma^2)$, the distribution of sample means is $\bar{X} \sim N\left(\mu, \frac{\sigma^2}{n}\right)$.
3	**Write down clear probability statements** Again you are more likely to receive method marks if your statements are easy to read.
4	**Make sure you write down hypotheses correctly** Make sure you know whether you are using a one-tail test or a two-tail test. Always write down your hypotheses using symbols in terms of μ, and remember to state that μ is the true population mean (there is often a mark awarded specifically for this).
5	**Be sure to interpret the result of the test correctly** Make sure you know whether you are looking at the left-hand tail or the right-hand tail, so that you can draw the correct conclusion. A sketch diagram is helpful.
6	**Remember to state the result of the test in words** It is not enough to state "accept H_0" or "reject H_0" (although you must do this!) –you must also give the result in plain English, using words such as "the evidence suggests..."or "there is not sufficient evidence to suggest that..." – never "This proves that..."!



Testing for Correlation

1	**Make sure that you know the difference between the meanings of r and ρ and use them appropriately** The calculated value of r, which is the correlation coefficient for the sample data set, provides an estimate for ρ , which is the correlation coefficient for the parent population. You should use ρ in the statement of your hypotheses.
2	**Make sure you write down hypotheses correctly** Make sure you know whether you are using a one-tail test or a two-tail test. Think carefully about the form of the alternative hypothesis: depending on the wording of the question, it may be $\rho > 0$, $\rho < 0$ or $\rho = 0$. Always write down your hypotheses using symbols in terms of ρ, and remember to state that ρ is the correlation coefficient for the parent population.
3	**Remember to state the result of the test in words** It is not enough to state "accept H_0" or "reject H_0" (although you must do this!) –you must also give the result in plain English, using words such as "the evidence suggests..."or "there is not sufficient evidence to suggest that..." – never "This proves that..."!
4	**Remember that correlation does not imply causation** If there is correlation between two sets of variables, it may be the case that one variable causes the other, but this is not necessarily the case. For example, a third variable might affect both variables.