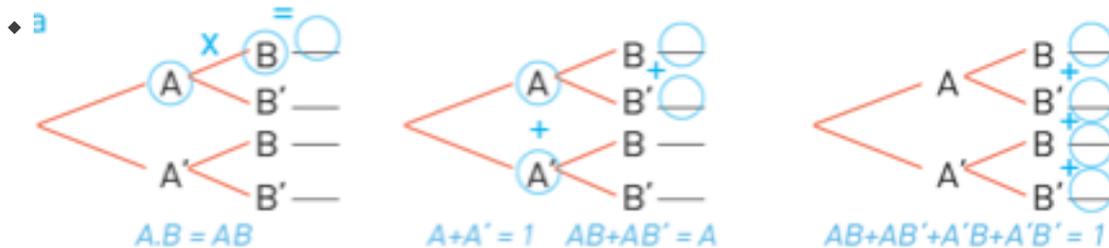


EXAM STRUCTURE

- ◆ There will be three questions: one will be mostly based around the normal distribution, one around probability trees, and one around two-way tables.
- ◆ Within those questions, you'll also encounter the concepts of conditional probability, relative risk, and experimental distributions (in the form of histograms).
- ◆ The questions will mostly be calculation based, with some explanation questions.

PROBABILITY TREES



- ◆ If you're going to be multiplying two probabilities together, you need them to be either decimals or fractions. If the probabilities are given as percentages, which is common for probability tree questions, the first thing you should do is convert them to decimals, which you can do by dividing the percentage by 100.
 - ◆ E.g., $65\% = 65/100 = 0.65$
- ◆ Branches coming off a particular notch need to add up to 1.
 - ◆ This gives you an easy way to check if all your answers are correct – once you're done labelling your tree, go back and check that your probabilities add up correctly.
- ◆ Multiply if you're going across the branches and add up if you're going down.

TWO-WAY TABLES

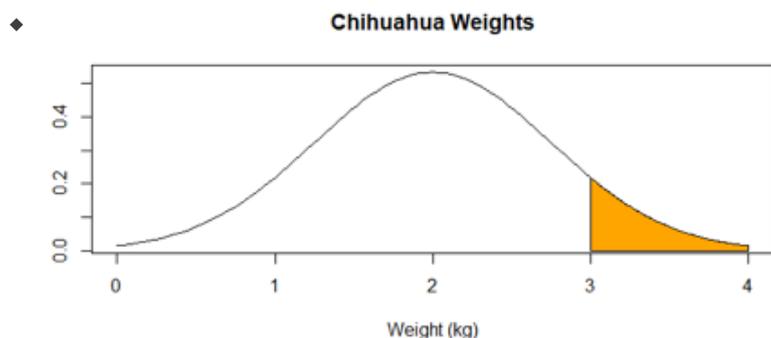
◆

	CAUGHT COLD	DIDN'T CATCH COLD	TOTAL
GROUP A	16	24	40
GROUP B	15	45	60
TOTAL	31	69	100

- ◆ Start off by filling in all the totals – even if there isn't a specific space for you to do this in the table.
- ◆ Two-way table questions will almost always include a question about relative risk. These are probably the easiest Excellence marks to get on the exam. The steps to answering these are:
 - ◆ Calculate the "absolute risk" for each group – just a fancy way of saying the probability for a particular group
 - ◆ Divide the risk for the first group by the risk for the second group to get the relative risk

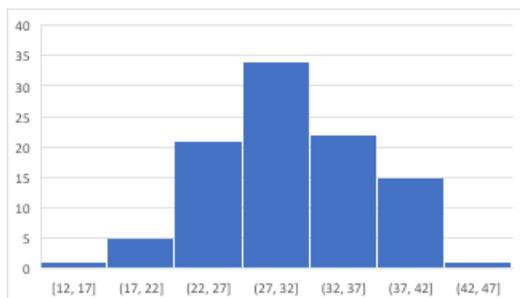
- ◆ Relative Risk = $\frac{\text{Group 1 risk}}{\text{Group 2 risk}}$
- ◆ Put the relative risk into a context sentence
- ◆ Relative risk questions will usually be phrased as a claim comparing one group to another. For example:
 - ◆ "A newspaper claims that people in group A are more than twice as likely to catch a cold compared to people in group B. Are they correct?"
 - ◆ The absolute risk of catching a cold for group A is 16/40, which is 0.4, and the absolute risk for group B is 15/60, which is 0.25.
 - ◆ To find the relative risk we divide one probability by the other. Since group A was mentioned first, it goes on the top of the fraction, and since we're comparing to group B, it goes on the bottom.
 - ◆ Relative Risk = $\frac{\text{Group A risk}}{\text{Group B risk}} = 0.4/0.25 = 1.6$.
 - ◆ So, to answer the question, we would say "People in group A are 1.6 times as likely to catch a cold compared to people in group B, which is less than twice as likely, so the newspaper was wrong".

NORMAL DISTRIBUTION



- ◆ The first thing you need to do for any normal distribution question is draw it out and shade the relevant areas.
- ◆ The second thing to do is decide whether to use Ncd on your calculator, InvN on your calculator, or the Z-score formula from your formula sheet. To know which one to use:
 - ◆ If you're given the mean, the standard deviation and an x-value and you need to find the probability, then use Ncd
 - ◆ If you're given the mean, the standard deviation and a probability and you need to find the x-value, you'll use InvN
 - ◆ If you're given an x value, a probability, and only one of the mean or standard deviation, and you need to find the other one, things get trickier. You'll need to use the formula for the Z score, which is above the normal distribution table on your formula sheet.
 - ◆ $Z = \frac{X - \mu}{\sigma}$
 - ◆ Find your Z score by going to Inverse Normal in your calculator again. Put in the 'tail' and probability as normal, but put the mean as 0 and the standard deviation as 1. The answer you get is your Z value.
 - ◆ Plug your Z value, x value and whatever else you have into the equation and rearrange to solve for your missing value!

- ◆ A common question that can get you some marks anywhere from Achieved to Excellence is a question that asks you to discuss the features of a histogram, or to compare a histogram to a normal distribution.



- ◆ This is probably the biggest time sink in the exam, so answer this question effectively, you want to prioritise the most important points.
- ◆ Remember the key features of the normal distribution: it's symmetrical, it's unimodal – which means it only has one peak - and it's a 'bell curve' shape. Straight off the bat, you can lock in some marks for just saying whether the histogram matches those three things. For example, you could say "this data is fairly symmetrical, which is consistent with a normal distribution".
- ◆ If you're going for top marks and you have time in the exam, you can go on to state where the mode is, estimate where the median is, and estimate the mean and standard deviation. *Check out the StudyTime guides for more information on how to do this!*

GENERAL SKILLS

- ◆ Expected number calculations can come up in any question.
 - ◆ For example, in a normal distribution question about weights of chihuahuas, it might say "If 500 chihuahuas are weighed, how many of them would be expected to weigh over 3 kilos?".
 - ◆ To answer this question, you'd start by finding the probability that *any* random chihuahua weighs over 3 kilos, and then just multiply that by 500.
 expected number = probability × number of things being measured
 - ◆ For example, say you found $P(X > 3\text{kg}) = 0.2314$.
 You'd then do $0.2314 \times 500 = 115.7$
 - ◆ Then, round that to the nearest whole number, because you can't have half a chihuahua! The expected number of chihuahuas weighing over 3kg would be 116.
- ◆ Another concept that can come up in any kind of question is conditional probability. You can recognise these questions because they'll usually say the words "if" or "given that".
 - ◆ For example, the question might say "If you are late to class, what is the probability that you bought a coffee on your way?".
 - ◆ Let's say I'd already calculated that the probability of me being late to class was 0.25, the probability of me buying a coffee was 0.3, and the probability of me being late to class and buying a coffee on my way was 0.15
 - ◆ Conditional probability = $\frac{\text{probability of whatever we're interested in}}{\text{probability of known thing}}$
 - ◆ In this case, I *only* care about days where I'm late. So, my conditional probability calculation looks like this:

$$P(\text{coffee if late}) = \frac{P(\text{coffee and late})}{P(\text{late})} = \frac{0.15}{0.25} = 0.6$$

That comes out to 0.6, which is the answer!

- ◆ Some common avoidable mistakes students make on this paper are:
 - ◆ Rounding their answers wrong
 - ◆ Writing the wrong number of zeroes in a decimal (like writing 0.5 instead of 0.05)
 - ◆ Not giving their answer in the right form – like forgetting to turn the answer in to a percentage if the question asked for it.
 - ◆ These are really quick things to check your answers for when you're done to make sure you don't get penalised for silly mistakes!