	Y13 Applied	**CH03** 3.1,3.2,3.3,3,3.4,3.5,		**Statistics** **Understand and use the Normal Distribution**	**Lessons** **3**
THE ACADEMY OF ST NICHOLAS					

Essential Knowledge Milestones	**Teaching Points**
• understand the properties of the Normal distribution; • be able to find probabilities using the Normal distribution; • know the position of the points of inflection of a Normal distribution. • be able to find the mean and variance of a binomial distribution;	• The Normal distribution needs to be linked to histograms and the mean. A good way to introduce the topic is to look at heights on a histogram and show how it can be smoothed into the Normal distribution curve, stating this is due to the Normal being a continuous distribution. • Discuss all the properties of the Normal distribution, making sure students are confident with the symmetry of the distribution, that mean = mode = median and the asymptotic nature of the bell-shaped curve. Cover the proportions of data within 1, 2 and 3 standard deviations of the mean and remind students that the area under the curve is 1. Students are expected to know that the points of inflection on the Normal curve are at $x = \mu \pm \sigma$ (they are not expected to be able to derive this). • As with notation for the binomial distribution, students should understand the notation $X \sim N(\mu, \sigma^2)$ for the Normal distribution. • Students are expected to find the probabilities from Normal distributions using their calculators. However, students do need to know the standardisation formula $Z = \frac{x-\mu}{\sigma}$ and be able to transform X values to Z values. Be clear that the denominator is the standard deviation rather than the variance which may be given. • Students should be encouraged to draw diagrams to represent the distribution and use this to check (at least for > or < 0.5) the probability they find using their calculator. • Diagrams will also help students when working backwards from a probability to find a Z value, a diagram will indicate whether the Z value is positive or negative. Again, students are expected to use their calculator to find these values. • Questions may involve the use of linear simultaneous equations to find for example both the mean and standard deviation of the Normal distribution. • You should recap the probability of independent events as this can be incorporated into questions involving the Normal distribution.

Success Criteria
☐ You can recognize the characteristics the Normal distribution curve.   ☐ You can find percentages point on a standard normal curve   ☐ You can calculate values on the standard normal curve   ☐ You can find unknown means and/or standard deviations for a Normal distribution

Assumed Prior Knowledge/ Links / Interleaving
GCSE (9–1) in Mathematics at Higher Tier   • Solve two simultaneous equations in two variables (linear/linear or linear/quadratic) algebraically   AS Mathematics – Statistics content   • Probability calculations, independent events   • Properties of the binomial distribution   • Probability is the area under a curve   • Use appropriate language of statistical hypothesis testing   • Be able to apply a hypothesis test to the binomial distribution

Opportunities for Reasoning/Problem Solving/Proofs	**Potential Barriers to Access /Misconceptions**
• Use plenty of reverse problem examples worded in a variety of ways. Ensure students can find Z values for quartiles and percentiles.	• Main errors are due to confusion between probabilities and Z values, particularly when it comes to notation, and not using the full four decimal place accuracy in calculations. • An emphasis on using diagrams alongside the calculations should help address some of the difficulties.

Key Mathematical Vocabulary	Binomial, discrete distribution, discrete random variable, uniform, cumulative probabilities Normal, mean, variance, continuous distribution, histogram, inflection, appropriate probability distribution.		
Personal Development		**Notes**	**Resources**
Pupils are taught to adopt a 'resilience' in their approach and work through an idea to modify answers to make sure it covers all aspects of the question asked			