9 The Normal Distribution

Objectives:

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| Understand the use of the normal distribution to model a continuous random variable |
| Identify a normal distribution and learn how to standardise it |
| Learn to model real-world scenarios using the normal distribution |
| Learn the conditions under which a normal distribution can be used as an approximation to the binomial distribution |

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| Content | Teacher's Activity | Student's Activity | Assignments |
| 9.1 Modelling continuous variables | * + Review probability distributions covered so far and point out that they deal with discrete random variables   + Transition to continuous variables using dimensions and masses as examples   + Using the textbook example, explain how histograms can be gradually refined to arrive at a bell-shaped curve that better models several continuous variables | * + Differentiate between discrete and continuous random variables   + Understand how to plot a histogram with relative frequency density on the y-axis and class intervals of a continuous variable on the x-axis   + Understand how a bell-shaped curve serves as a model for several continuous variables |  |
| 9.2 The normal distribution | * + Introduce the terms "normal distribution" and "Gaussian distribution" with a bell-shaped curve as reference   + Point out the significant properties of the normal distribution that help in identifying it   + Explain how the area under this curve is the probability of the continuous variable for the specified interval   + Introduce the meaning of the notation X ~ N(µ, σ2 ) and explain the change in the shape of the curve as µ and σ change | * + Identify a normal distribution based on its chief characteristics and the Gaussian curve used to represent it   + Understand how the shape of a normal distribution changes with changes in µ and σ |  |
| 9.3 The standard normal distribution  9.4 Standardising a normal distribution | * + Diagrammatically explain the process of standardising a normal distribution such that it can be modelled by N(0, 1)   + Draw parallels with transformation/translation processes that shift the context of a problem statement to another familiar domain for which solutions are readily available (e.g. transform an oval to a circle with the same area and then calculate its area using the circle's area formula)   + Introduce the standard normal distribution tables used to calculate the probability for a given interval   + Through examples, calculate the probability of a continuous variable X ~ N(µ, σ2 ) by converting it to a standard normal distribution Z ~ N(0, 1) | * + Convert a given statement about N(µ, σ2 ) into an equivalent statement about a N(0, 1) distribution   + Using the standard normal distribution tables, calculate the probability for a given interval of a continuous variable   + Given the probability for an unknown interval, use the standard normal distribution tables to find the limits of the unknown interval | * + Ex 9A   + Ex 9B |
| 9.5 Modelling with the normal distribution | * + Through textbook examples, explain how to model a real-world problem using a normal distribution   + Demonstrate how the real-world problem is then solved using the standard normal distribution tables | * + Model a real-world problem using a normal distribution   + Solve real-world problems using the standard normal distribution tables | * + Ex 9C |
| 9.7 N(µ, σ2 ) as an approximation for B(n, p) | * + Explain the conditions under which a binomial distribution can be approximately represented by a normal distribution   + Solve sample B(n, p) problems using N(np, npq) | * + Understand when a normal distribution can be used to approximate a binomial distribution   + Identify situations where B(n, p) can be converted into N(np, npq) and find solutions using standard normal distribution tables | * + Ex 9 D |
| Catch-up class | Clear doubts |  |  |
| Test |  |  |  |