Approximating a Binomial Distribution

If we're going to use a normal distribution to approximate a Binomial distribution, it makes sense that we set the mean and standard deviation of the normal distribution to match that of the original binomial distribution:

$\mu =$ ____

$\sigma =$ ____

If n is large and p close to 0.5, then the binomial distribution $X \sim B(n, p)$ can be approximated by the normal distribution $N(\mu, \sigma^2)$ where

$\mu =$

$\boldsymbol{\sigma} =$

Quickfire Questions:

$X \sim B(10,0.2) \rightarrow Y \sim$ ____

$X \sim B(20,0.5) \rightarrow Y \sim$ ____

$X \sim B(6, 0.3) \rightarrow Y \sim$ ____

Continuity Corrections

Examples

Discrete	→	Continuous
$P(X \leq 7)$		?
$P(X < 10)$		?
$P(X > 9)$		?
$P(1 \leq X \leq 10)$		?
$P(3 < X < 6)$		?
$P(3 \leq X < 6)$		?
$P(3 < X \leq 6)$		?
$P(X = 3)$		?

Full Example

[Textbook - Edited] For a particular type of flower bulbs, 55% will produce yellow flowers. A random sample of 80 bulbs is planted.

(a) Calculate the actual probability that there are exactly 50 flowers.

(b) Use a normal approximation to find a estimate that there are exactly 50 flowers.

(c) Hence determine the percentage error of the normal approximation for 50 flowers.

Test Your Understanding

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The discrete random variable X is distributed B(n, p).

(a) Write down the value of p that will give the most accurate estimate when approximating the binomial distribution by a normal distribution.
(1)

(b) Give a reason to support your value. **(1)**

(c) Given that $n = 200$ and $p = 0.48$, find P($90 \leq X < 105$). **(7)**