The normal distribution as an approximation to the binomial distribution.

→ In a binomial distribution the parameters are n & p → can be approximated by a normal distribution. $X \sim N(np, npq)$. where $\mu = np$, $\sigma = \sqrt{npq}$.

✳ Normal approximation can only be used if $np \geq 5$ and $nq \geq 5$

Binomial distribution $\xrightarrow{\text{approximated}}$ Normal distribution

↓ ↓

discrete distribution $\xrightarrow{\text{must do continuous correction.}}$ "continuity correction" continuous distribution.

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1. $P(X = a) \rightarrow P(a - 0.5 < X < a + 0.5)$

Binomial Normal

$P(X = 0) \rightarrow P(-0.5 < X < 0.5)$

2. $P(X \geq a) = P(X > a - 0.5)$
3. $P(X > a) = P(X > a + 0.5)$
4. $P(X \leq a) = P(X < a + 0.5)$
5. $P(X < a) = P(X < a - 0.5)$
6. $P(a \leq X \leq b) = P(a - 0.5 < X < b + 0.5)$
7. $P(a < X < b) = P(a + 0.5 < X < b - 0.5)$

Normal approximation

- 把 Binomial 转変 Normal [illegible] $\sqrt{npq}$)
[illegible] Binomial [illegible] 要料关.
[illegible] 的 normal 方法 做.
- [illegible] 一开始 题目有 mean & standard d.
就不用做 correction.

✳ np & nq must ≥ 5

Example:

$P(2 < X < 5)$

$= P(2.5 < X < 4.5)$

↓ standardization process.

1. A regular tetrahedral shaped dice with it faces labelled 1, 2, 3 and 4 is tossed 200 times. Find the probability of obtaining

$X \sim$ Number of times to obtain digit 4.

$X \sim Bin(200, \frac{1}{4})$

since $np = 200 \times \frac{1}{4} = 50 > 5$

we can use normal distribution as an approximation.

$\mu = np = 50$, $\sigma = \sqrt{npq} = \sqrt{200 \times \frac{1}{4} \times \frac{3}{4}}$

$= 6.12$.