

5.5 The normal distribution

Name: _____ Class: _____ Date: _____ **Total: 15 marks**

KEY WORDS approximation 近似 • normal distribution 正态分布
• continuity correction 连续性校正 • standardisation 标准化 • mean 平均数

Objective

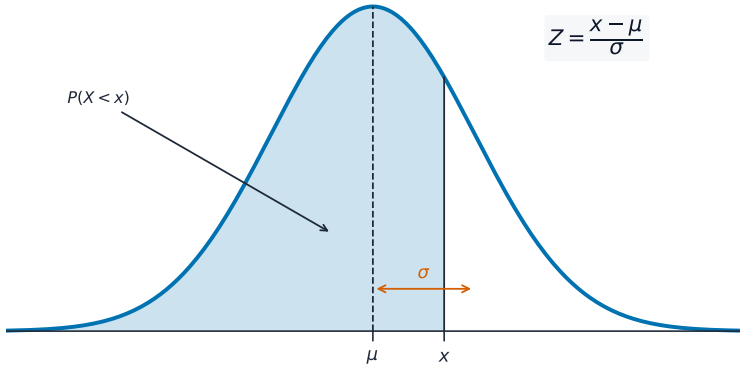
Build the skills to answer exam questions on the **normal distribution** 正态分布 — **standardisation** 标准化, reading the Φ table, finding an unknown μ or σ , and the **normal approximation to the binomial** 二项分布的正态近似.

You must be able to:

- standardise with $Z = \frac{X - \mu}{\sigma}$ and read Φ
- find an unknown mean or standard deviation from a given probability
- use the normal approximation with a **continuity correction** 连续性校正

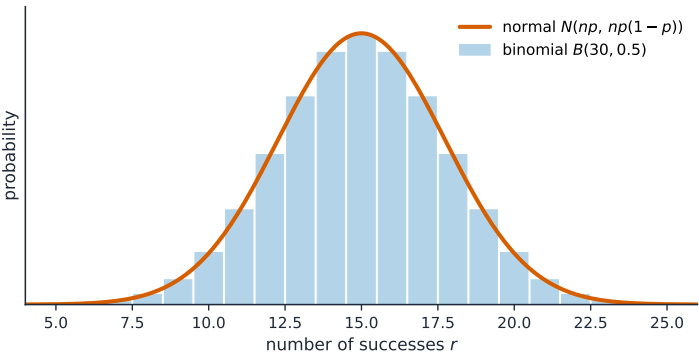
1 Worked examples

■ Standardise & find μ



A normal probability is an area under the bell curve; standardising rescales it to $Z \sim N(0, 1)$

$X \sim N(\mu, 0.14^2)$, $P(X < 1.48) = 0.22$. $\Phi^{-1}(0.22) = -0.772$, so $\frac{1.48 - \mu}{0.14} = -0.772 \Rightarrow \mu = 1.59$.



approx $N(np, np(1-p))$ when n large • continuity correction

For large n the binomial $\approx N(np, np(1-p))$ — add a ± 0.5 continuity correction

2 Practice

2.1 $X \sim N(50, 4^2)$. Find the Z value for $X = 56$. [2]

2.2 State the continuity correction used for $P(X \geq 20)$ in a normal approximation. [1]

3 Exam-style questions

3.1 $X \sim N(0, 1)$. Using $\Phi(1) = 0.8413$, $P(Z > 1)$ is: [1]

- | | |
|---|---|
| A | B |
| C | D |
- A** 0.8413
B 0.1587
C 0.3413
D 0.5

3.2 The heights of plants are $X \sim N(82, 5^2)$ cm.

(a) Find $P(X > 90)$. [3]

(b) Find the height exceeded by the tallest 10% of plants. [3]

3.3 A fair coin is tossed 100 times. Using a normal approximation, find the probability of obtaining at least 60 heads. [5]
