

Normal computations clinic

Lesson 50 · Module 3 — Continuous Random Variables · Probability & Statistics · daily-maths.uk/probstat

Practice problems

1. Apple weights are normally distributed with $\mu = 150$ g and $\sigma = 10$ g. Find the probability that a randomly selected apple weighs more than 165 g.
2. A battery's life is normally distributed with $\mu = 50$ hours and $\sigma = 5$ hours. What is the probability a battery lasts between 42 and 58 hours?
3. IQ scores are normally distributed with $\mu = 100$ and $\sigma = 15$. What is the minimum score required to be in the top 2.5% of the population?

Solutions

1. Apple weights are normally distributed with $\mu = 150$ g and $\sigma = 10$ g. Find the probability that a randomly selected apple weighs more than 165 g.

- Calculate the z-score: $z = (165 - 150)/10 = 1.5$.
- Find the cumulative probability for $z = 1.5$ from the table: $P(Z < 1.5) = 0.9332$.
- Since we want the probability of weighing more, use the complement: $1 - 0.9332 = 0.0668$.

Answer: 0.0668

2. A battery's life is normally distributed with $\mu = 50$ hours and $\sigma = 5$ hours. What is the probability a battery lasts between 42 and 58 hours?

- Calculate z-scores for both bounds: $z_1 = (42 - 50)/5 = -1.6$ and $z_2 = (58 - 50)/5 = 1.6$.
- Find cumulative probabilities: $P(Z < 1.6) = 0.9452$ and $P(Z < -1.6) = 0.0548$.
- Subtract the lower from the upper: $0.9452 - 0.0548 = 0.8904$.

Answer: 0.8904

3. IQ scores are normally distributed with $\mu = 100$ and $\sigma = 15$. What is the minimum score required to be in the top 2.5% of the population?

- The top 2.5% means the area to the left is $1 - 0.025 = 0.975$.
- Find the z-score for 0.975 in the table: $z = 1.96$.
- Use the inverse formula: $x = 100 + (1.96)(15)$.
- Calculate: $100 + 29.4 = 129.4$.

Answer: 129.4