Normal probabilities and inverse-normal values

6 questions | 14 marks

Equivalent correct methods earn the corresponding marks.

1. $X \sim N(100, 64)$. Find $P(X > 112)$. [2 marks]

$z = 1.5$; calculate $1 - \Phi(1.5)$.

Answer: 0.0668.

2. A normal model has mean 50 and SD 6. Find its 2.5th percentile. [2 marks]

$x = 50 + 6\Phi^{-1}(0.025)$.

Answer: 38.2402.

3. Find the central 90% interval for a normal model with mean 52 and SD 4. [3 marks]

There is 5% in each tail.

Use $52 \pm 4\Phi^{-1}(0.95)$.

Answer: $[45.4206, 58.5794]$.

4. A normal variable has SD 8 and $P(X < 80) = 0.90$. Find its mean. [3 marks]

$\frac{80 - \mu}{8} = \Phi^{-1}(0.90)$.

Solve $\mu = 80 - 8\Phi^{-1}(0.90)$.

Answer: 69.7476.

5. For standard normal Z, find $P(Z > 1 \mid Z > 0)$. [2 marks]

Divide $P(Z > 1)$ by $P(Z > 0) = 0.5$.

Answer: 0.3173.

6. A calculator returns -0.12 for an interval probability. What should you check? [2 marks]

Probabilities cannot be negative. Subtract the lower CDF from the upper CDF.

Answer: The calculation is invalid; check bound order and subtraction.