

Binomial and Normal Probability Models

Grade 12 – AP Statistics math · Test Answer Key · Standards: AP Statistics Unit 2 (2026-27)

The scoring guide gives the points for each part. Credit goes for the correct model, the correct parameters and a correct answer with context; a calculator command alone does not show the setup.

Standards: AP Statistics Unit 2 (2026-27) · **Level:** Grade 12 AP Statistics

Question 1 Binomial Setting (2 points)

Binary: each player passes or fails. Independent: players pass independently. Number: $n = 12$ is fixed. Success: $p = 0.8$ for every player. So $X \sim B(12, 0.8)$.

Binomial with $n = 12$ and $p = 0.8$

Scoring: 1 point for the four conditions, 1 point for the distribution with parameters.

Question 2 Binomial Calculations (3 points)

(a) $C(10, 4)(0.3)^4(0.7)^6 = 0.2001$. (b) $1 - 0.7^{10} = 1 - 0.0282 = 0.9718$. (c) $\mu = 3$, $\sigma = \sqrt{10 \times 0.3 \times 0.7} = 1.449$.

(a) 0.2001; (b) 0.9718; (c) $\mu = 3$, $\sigma \approx 1.449$

Scoring: 1 point each part.

Question 3 Shape and Tail Probability (2 points)

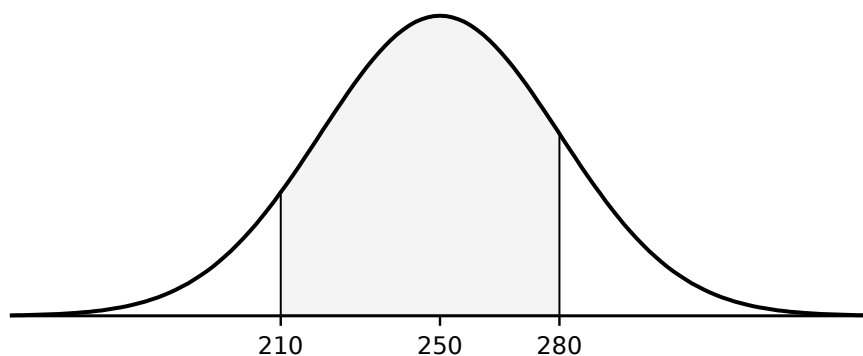
(a) The distribution is skewed right because p is small. (b) $P(X \geq 3) = 1 - P(X \leq 2) = 1 - 0.7969 = 0.2031$.

(a) skewed right; (b) 0.2031

Scoring: 1 point each part.

Question 4 Normal Probability (2 points)

$z = (210 - 250)/30 = -1.33$ and $z = (280 - 250)/30 = 1.00$. The area is $0.8413 - 0.0912 = 0.7501$.



Shaded area between 210 and 280.

≈ 0.7501

Scoring: 1 point for both z-scores, 1 point for the correct area.

Question 5 Percentiles and Unknown Parameters (3 points)

(a) $z = 1.036$, so $x = 68 + 1.036(7.2) = 75.46$. (b) The 20th percentile has $z = -0.842$. Solve $-0.842 = (63 - 70)/\sigma$: $\sigma = 7/0.842 = 8.32$.

(a) ≈ 75.5 bpm; (b) $\sigma \approx 8.3$ bpm

Scoring: 1 point for the z-score or invNorm use in (a), 1 point for the value, 1 point for (b).

Question 6 Tails of a Normal Model (3 points)

(a) $z = -1.50$, area 0.0668. (b) $z = 2.00$, area 0.0228. (c) $0.0668 + 0.0228 = 0.0896$.

(a) 0.0668; (b) 0.0228; (c) 0.0896

Scoring: 1 point each part.

Question 7 Normal Approximation (3 points)

(a) $np = 60 \geq 10$ and $n(1 - p) = 240 \geq 10$. (b) $\mu = 60$, $\sigma = \sqrt{(300 \times 0.2 \times 0.8)} = 6.928$. $z = (70 - 60)/6.928 = 1.44$. $P(X \geq 70) \approx 0.0745$.

≈ 0.074

Scoring: 1 point for the conditions, 1 point for μ and σ , 1 point for the probability.

Question 8 Normal Then Binomial (2 points)

$z = (5.00 - 5.15)/0.10 = -1.50$, so $p = 0.0668$. $P(\text{at least one of 5}) = 1 - (1 - 0.0668)^5 = 0.2923$.

0.0668; 0.2923

Scoring: 1 point for the rejection probability, 1 point for the at-least-one probability.