

AP Statistics · Binomial and Normal Distributions · Worksheet Answer Key

Common Core AP Statistics Unit 2 (2026-27) · mathovore.fr

This ap statistics binomial worksheet answer key solves all 24 problems of the binomial and normal distributions worksheet step by step.

Every solution shows the conditions, the formula and the numbers, so you can find the exact step where your work differs. Normal areas use Table A values for z-scores rounded to two decimals; a calculator may differ in the last digit.

AP Statistics Common Core: AP Statistics Unit 2 (2026-27)

AP Statistics Binomial Worksheet Answer Key: problems 1-5

Problem 1: Coin flips

Check BINS. Each flip is binary (heads or tails). Flips are independent. The number of flips is fixed at 12. The chance of heads is 0.5 on every flip.

All four conditions hold, so X is **binomial with $n=12$ and $p=0.5$** .

Problem 2: Cards without replacement

The trials are not independent. On the first card the chance of a heart is $\frac{13}{52} = 0.25$. If the first card is a heart, the second is a heart with probability $\frac{12}{51} \approx 0.2353$; otherwise it is $\frac{13}{51} \approx 0.2549$. The sample of 10 is also more than 10% of the 52 cards, so the 10% rule does not rescue independence.

Not binomial: the trials are dependent and the success probability changes.

Problem 3: Rolling until a six

A binomial count needs a fixed number of trials n chosen in advance. Here Ethan stops when the first 6 appears, so the number of rolls varies from one run to the next.

Not binomial: n is not fixed.

Problem 4: Exactly three successes

Use $P(X=k) = {}_nC_k p^k (1-p)^{n-k}$ with $k=3$.

$$P(X=3) = {}_8C_3(0.25)^3(0.75)^5 = 56(0.015625)(0.2373) \approx \mathbf{0.2076}$$

Calculator check: `binompdf(8, 0.25, 3)`.

Problem 5: No successes

Here $k=0$ and ${}_6C_0=1$, so only the failure factor remains.

$$P(X=0) = {}_6C_0(0.1)^0(0.9)^6 = (0.9)^6 = 0.531441 \approx \mathbf{0.5314}$$

AP Statistics Binomial Worksheet Answer Key: problems 6-10

Problem 6: At most two

$$P(X \leq 2) = P(0) + P(1) + P(2).$$

- $P(0) = (0.6)^5 = 0.07776$
- $P(1) = 5(0.4)(0.6)^4 = 0.2592$
- $P(2) = 10(0.4)^2(0.6)^3 = 0.3456$

Sum: $0.07776 + 0.2592 + 0.3456 = 0.68256$. $P(X \leq 2) \approx 0.6826$ (`binomcdf(5, 0.4, 2)`).

Problem 7: At least one

Use the complement: $P(X \geq 1) = 1 - P(X = 0)$.

$$P(X=0) = (0.95)^{10} \approx 0.5987, \text{ so } P(X \geq 1) = 1 - 0.5987 = \mathbf{0.4013}.$$

Problem 8: Mean and standard deviation

$$\mu = np = 40(0.35) = 14.$$

$$\sigma = \sqrt{np(1-p)} = \sqrt{40(0.35)(0.65)} = \sqrt{9.1} \approx 3.017.$$

Mean 14, standard deviation ≈ 3.017 .

Problem 9: Interpreting the mean

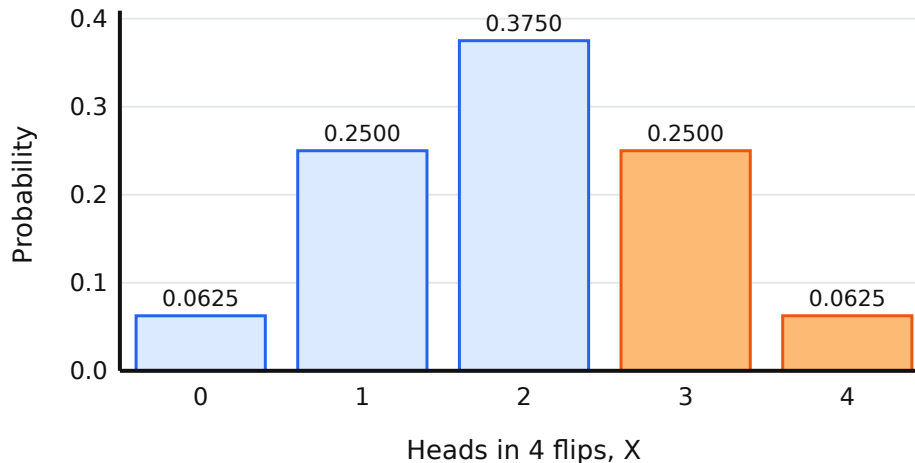
$$\mu = 200(0.02) = 4 \text{ and } \sigma = \sqrt{200(0.02)(0.98)} = \sqrt{3.92} \approx 1.980.$$

Interpretation: in the long run, shipments of 200 cases average 4 cracked cases per shipment. Individual shipments vary, typically by about 2 cases from 4.

Problem 10: Reading a distribution graph

The shaded bars are $X=3$ and $X=4$: $0.25 + 0.0625 = 0.3125$.

Check: ${}_4C_3(0.5)^4 = \frac{4}{16}$ and ${}_4C_4(0.5)^4 = \frac{1}{16}$, so $\frac{5}{16} = 0.3125$. $P(X \geq 3) = 0.3125$



Shaded: $0.25 + 0.0625 = 0.3125$.

AP Statistics Binomial Worksheet Answer Key: problems 11-15

Problem 11: Probability of a middle range

Each outcome has probability $\frac{{}_8C_k}{256}$. The counts are ${}_8C_3=56$, ${}_8C_4=70$ and ${}_8C_5=56$.

$$P(3 \leq X \leq 5) = \frac{56+70+56}{256} = \frac{182}{256} \approx \mathbf{0.7109}$$

Problem 12: z-score of a height

$$z = \frac{75-69}{3} = 2.00.$$

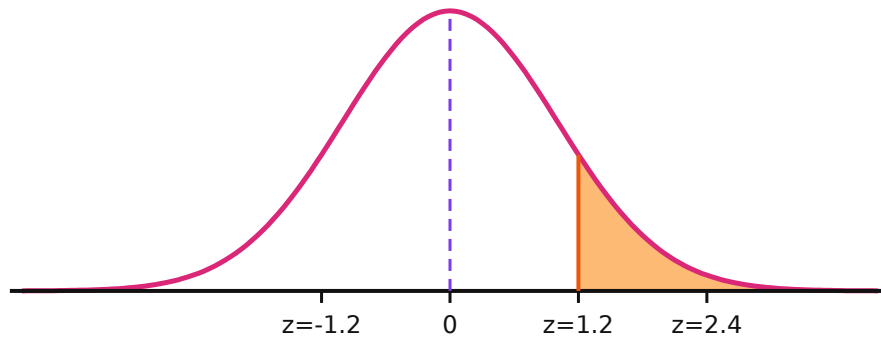
He is 2 standard deviations above the mean height. By the 68-95-99.7 rule, only about 2.5% of men are taller.

Problem 13: Area to the right

$$z = \frac{620-500}{100} = 1.20. \text{ Table A gives an area to the left of } 0.8849.$$

$$P(X > 620) = 1 - 0.8849 = \mathbf{0.1151}, \text{ so about } 11.5\% \text{ of students score above } 620.$$

Area = 0.1151



Exam score X

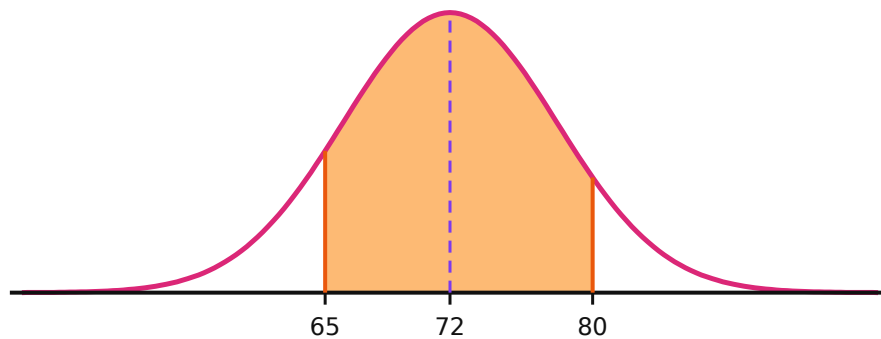
Right of $z = 1.20$: area 0.1151.

Problem 14: Area between two values

Lower: $z = \frac{65-72}{6} = -1.17$, area 0.1210. Upper: $z = \frac{80-72}{6} = 1.33$, area 0.9082.

$$P(65 < X < 80) = 0.9082 - 0.1210 = \mathbf{0.7872}.$$

Area = 0.7872



Delivery time X (minutes)

Between $z = -1.17$ and $z = 1.33$: 0.7872.

Problem 15: Finding a percentile

The 90th percentile has area 0.90 to its left. In Table A the closest area, 0.8997, goes with $z = 1.28$.

$$x = \mu + z\sigma = 100 + 1.28(15) = 100 + 19.2 = \mathbf{119.2}.$$

AP Statistics Binomial Worksheet Answer Key: problems 16-20

Problem 16: Empirical rule

(a) 15.6 and 16.4 are 2 standard deviations from 16.0 ($16.0 \pm 2(0.2)$). About **95%** of bags.

(b) 15.8 is 1 standard deviation below the mean. About 68% lie within 1 SD, leaving 32% in the two tails, so 16% lie below. About **16%** of bags.

Problem 17: Comparing z-scores

Maya: $z = \frac{84-75}{6} = 1.50$. Diego: $z = \frac{88-80}{8} = 1.00$.

Maya did better relative to her class: she is 1.5 SDs above the mean, Diego only 1.0 .

Problem 18: Checking the approximation

(a) $np = 150(0.2) = 30 \geq 10$ and $n(1-p) = 150(0.8) = 120 \geq 10$. **Reasonable.**

(b) $np = 40(0.1) = 4$, which is less than 10 (and $n(1-p) = 36$). **Not reasonable**, because the distribution is skewed right.

Problem 19: Normal approximation

(a) $np = 30 \geq 10$ and $n(1-p) = 70 \geq 10$. The approximation is reasonable.

(b) $\mu = 30$, $\sigma = \sqrt{100(0.3)(0.7)} = \sqrt{21} \approx 4.583$. $z = \frac{35-30}{4.583} = 1.09$, and $P(Z \geq 1.09) = 1 - 0.8621 =$
0.1379.

(c) The bar for $X = 35$ extends from 34.5 to 35.5, but the normal area starts at exactly 35, so it misses half of that bar. The approximation 0.1379 is therefore smaller than the exact 0.1629.

Problem 20: Free throws

Conditions: binary, independent, $n = 15$, $p = 0.7$.

$P(X \geq 12) = 1 - P(X \leq 11) = 1 - \text{binomcdf}(15, 0.7, 11)$.

$P(12) + P(13) + P(14) + P(15) = 0.2969$.

$P(X \geq 12) \approx 0.2969$, so she makes at least 12 of 15 only about 30% of the time.

AP Statistics Binomial Worksheet Answer Key: problems 21-24

Problem 21: Overbooked flight

$X \sim \text{binomial}$, $n = 54$, $p = 0.9$. $\mu = 54(0.9) = 48.6$; $\sigma = \sqrt{54(0.9)(0.1)} = \sqrt{4.86} \approx 2.205$.

More than 50 show up means $X \geq 51$: $P(X \geq 51) = 1 - \text{binomcdf}(54, 0.9, 50) \approx$ **0.1985**.

About 19.8% of flights like this would leave at least one passenger without a seat.

Problem 22: Recovering n and p

$$\mu = np = 24 \text{ and } \sigma^2 = np(1-p) = 9.6.$$

$$\text{Divide: } 1-p = \frac{9.6}{24} = 0.4, \text{ so } p = 0.6.$$

$$\text{Then } n = \frac{24}{0.6} = 40. \text{ } n = 40, p = 0.6. \text{ Check: } 40(0.6)(0.4) = 9.6.$$

Problem 23: Poll approximation

$$\text{Conditions: } np = 200(0.45) = 90 \geq 10 \text{ and } n(1-p) = 110 \geq 10.$$

$$\mu = 90, \sigma = \sqrt{200(0.45)(0.55)} = \sqrt{49.5} \approx 7.036. z = \frac{100-90}{7.036} = 1.42.$$

$$P(X > 100) \approx 1 - 0.9222 = \mathbf{0.0778}. \text{ (The exact binomial value is about 0.0681.)}$$

Problem 24: Is the claim believable?

$$(a) \mu = 150(0.03) = 4.5; \sigma = \sqrt{150(0.03)(0.97)} = \sqrt{4.365} \approx 2.089.$$

(b) No. $np = 4.5 < 10$, so the distribution is skewed and the normal approximation is not appropriate.

$$(c) \text{ Use the exact binomial: } P(X \geq 10) = 1 - \text{binomcdf}(150, 0.03, 9) \approx \mathbf{0.0155}.$$

If the claim were true, a result this extreme would occur only about 1.6% of the time. That is rare enough to cast real doubt on the claim.

How to use this ap statistics binomial worksheet answer key

Read this ap statistics binomial worksheet answer key after trying each problem yourself, and redo any problem you missed.

