

AP STATISTICS EXAM CHEAT SHEET

Comprehensive 9-Unit Formula & Concept Guide • DotPlotMaker.com

UNIT 1: ONE-VARIABLE DATA

- " **SOCS for Distributions:**
Shape (skewed/symmetric), Outliers, Center (median/mean), Spread (IQR/SD).
- " **Five-Number Summary & IQR:**
Min, Q1, Median (Q2), Q3, Max. IQR = Q3 - Q1.
- " **Tukey 1.5xIQR Outlier Fences:**
Lower = Q1 - 1.5(IQR) | Upper = Q3 + 1.5(IQR).
- " **Robustness Rule:**
Skewed data -> use Median & IQR (resistant). Symmetric -> Mean & SD.

UNIT 2: TWO-VARIABLE DATA & REGRESSION

- " **Least-Squares Regression Line (LSRL):**
 $y\text{-hat} = a + bx$ where $b = r(sy / sx)$ and $a = y\text{-bar} - b(x\text{-bar})$.
- " **Correlation (r) & Coefficient of Det (r^2):**
 r in $[-1, 1]$ (direction & strength). r^2 = % variation in y explained by x .
- " **Residuals:**
Residual = Actual - Predicted = $y - y\text{-hat}$. Random residual plot = linear.

UNIT 3: COLLECTING DATA

- " **Sampling Methods:**
SRS (equal chance), Stratified (groups->samples), Cluster (all in chosen groups).
- " **Experiments vs. Observational:**
Only randomized experiments establish CAUSATION (control, randomize, replicate).
- " **Biases:**
Undercoverage, Nonresponse, Voluntary Response, Response bias.

UNIT 4: PROBABILITY RULES

- " **Addition & Complement:**
 $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$. $P(A^c) = 1 - P(A)$.
- " **Conditional & Independence:**
 $P(A|B) = P(A \text{ and } B) / P(B)$. Independent if $P(A|B) = P(A)$ or $P(A \text{ and } B) = P(A) * P(B)$.
- " **Multiplication Rule:**
 $P(A \text{ and } B) = P(A) * P(B|A)$. (If independent: $P(A) * P(B)$).

UNIT 5: RANDOM VARIABLES

- " **Discrete RV Mean & Variance:**
 $\mu_X = E(X) = \sum[x * P(x)]$. $\sigma_X^2 = \sum[(x - \mu)^2 * P(x)]$.
- " **Binomial Distribution $B(n, p)$:**
 $\mu = np$, $\sigma = \sqrt{np(1-p)}$. $P(X = k) = \binom{n}{k} p^k (1-p)^{(n-k)}$.
- " **Geometric Distribution $Geom(p)$:**
First success on trial k : $P(Y = k) = (1-p)^{(k-1)} * p$. $\mu = 1/p$.

UNIT 6: SAMPLING DISTRIBUTIONS

- " **Central Limit Theorem (CLT):**
If $n \geq 30$, sample mean distribution is approx. normal regardless of shape.
- " **Proportions: $\mu_{\hat{p}} = p$, $\sigma_{\hat{p}} = \sqrt{p(1-p)/n}$.**
- " **Means: $\mu_{\bar{x}} = \mu$, $\sigma_{\bar{x}} = \sigma / \sqrt{n}$.**

UNIT 7: INFERENCE FOR PROPORTIONS

- " **1-Sample z-Interval & Test:**
 $CI = \hat{p} \pm z^* \sqrt{\hat{p}(1 - \hat{p})/n}$. $z = (\hat{p} - p_0) / \sqrt{p_0(1-p_0)/n}$.
- " **2-Sample z-Test (Pooled Proportion):**
 $p\text{-c} = (x_1 + x_2) / (n_1 + n_2)$. $SE_{\text{pooled}} = \sqrt{p\text{-c}(1-p\text{-c})(1/n_1 + 1/n_2)}$.
- " **Conditions:**
Random, 10% condition ($n < 0.10N$), Large Counts: $np \geq 10$, $n(1-p) \geq 10$.

UNIT 8: INFERENCE FOR MEANS

- " **When to Use t vs. z:**
Use t when population sigma is unknown (almost always in real life!). $df = n - 1$.
- " **1-Sample t-Interval & Test:**
 $CI = \bar{x} \pm t^* (s / \sqrt{n})$. $t = (\bar{x} - \mu_0) / (s / \sqrt{n})$.
- " **Conditions for Means:**
Random, 10% rule, Normal population or $n \geq 30$ (CLT) or no strong skew/outliers.

UNIT 9: CHI-SQUARE & SLOPE INFERENCE

- " **Chi-Square Test Statistic:**
 $\chi^2 = \sum[(\text{Observed} - \text{Expected})^2 / \text{Expected}]$. Expected = (Row * Col) / Total.
- " **Tests & Degrees of Freedom:**
Goodness of Fit ($df = k - 1$) | Independence/Homogeneity: $(r - 1)(c - 1)$.
- " **Regression Slope t-Test:**
 $t = (b - 0) / SE_b$ with $df = n - 2$.

MUST-KNOW AP STATS EXAM TIPS

- 1. ALWAYS Write in Context:**
Never say "the slope is 0.5". Say: "For each +1 mpg, car price drops \$500."
- 2. State Hypotheses with Parameters:**
 $H_0: \mu = 10$ (never $H_0: \bar{x} = 10$). Define μ in context.
- 3. Check ALL Conditions Explicitly:**
Show actual numbers: $40 * (0.3) = 12 \geq 10$ and $40 * (0.7) = 28 \geq 10$.