AP EXAM FORMULAS

DESCRIPTIVE STATISTICS		
Formula	**Description**	**Calculator**
$\bar{x} = \frac{\sum x_i}{n}$	Mean	1-Var Stats
$s_x = \sqrt{\frac{1}{n-1}\sum (x_i - \bar{x})^2}$	Standard Deviation	
$s_p = \sqrt{\frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{(n_1-1)+(n_2-1)}}$	Pooled standard deviation for difference of means	2-Samp T Test
$\hat{y} = b_0 + b_1 x$	LSRL	LinReg (a + bx)
$b_1 = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sum (x - x_i)^2}$	Slope of LSRL	
$b_0 = \bar{y} - b_1 \bar{x}$	y-intercept of LSRL	
$r = \frac{1}{n-1}\sum \left(\frac{x_i - \bar{x}}{s_x}\right)\left(\frac{y_i - \bar{y}}{s_y}\right)$	Correlation	
$b_1 = r\frac{s_y}{s_x}$	Slope of LSRL	
$s_{b_1} = \frac{\sqrt{\frac{\sum (y_1 - \hat{y})^2}{n-2}}}{\sqrt{\sum (x_i - \bar{x})^2}}$	Standard deviation of LSRL slope	LinReg T Test

PROBABILITY		
Formula	**Description**	**Calculator**
$P(A \cup B) = P(A) + P(B) - P(A \cap B)$	Addition Rule	---
$P(A\|B) = \dfrac{P(A \cap B)}{P(B)}$	Conditional Probability	---
$E(X) = \mu_x = \sum x_i p_i$	Mean of a Random Variable	---
$\text{Var}(X) = \sigma_x^2 = \sum (x_i - \mu_x)^2 p_i$	Variance of a Random Variable	---
If X has a Binomial distribution with parameters n and p, then:		
$P(X = k) = \binom{n}{k} p^k (1-p)^{n-k}$	Binomial Probability $\binom{n}{k} = \dfrac{n!}{k!(n-k)!}$	binompdf (n, p, k) binomcdf if X < k
$\mu_x = np$	Mean (Expected Value) of X	---
$\sigma_x = \sqrt{np(1-p)}$	Standard Deviation of X	---
$\mu_{\hat{p}} = p$	Mean of a Sample Proportion	---
$\sigma_{\hat{p}} = \sqrt{\dfrac{p(1-p)}{n}}$	Standard Deviation of a Sample Proportion	---
If $\bar{x}$ is the mean of a random sample size n from an infinite population with mean μ and standard deviation σ, then:		
$\mu_{\bar{x}} = \mu$	Mean of a Sample	----
$\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}}$	Standard Deviation of a Sample	---

INFERENTIAL STATISTICS		
Formula	**Description**	**Calculator**
$\frac{\text{statistic} - \text{parameter}}{\text{standard deviation of statistic}}$	Standardized test statistic	invNorm invT
statistic ± (critical value) · (standard deviation of statistic)	Confidence interval	Z Interval T Interval 2-Samp Z Int 2-Samp T Int 1-Prop Z Int 2-Prop Z Int
Single-Sample (*Matched Pairs*)		
$\frac{\sigma}{\sqrt{n}}$	Standard Deviation of Sample Mean ($\bar{x}$)	Z-Test T-Test
$\sqrt{\frac{p(1-p)}{n}}$	Standard Deviation of Sample Proportion ($\hat{p}$)	1-Prop Z Test
Two-Sample		
$\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$	Standard Deviation of Difference of sample means	2-Samp Z Test 2-Samp T Test
$\sqrt{\frac{p_1(1-p_1)}{n_1} + \frac{p_2(1-p_2)}{n_2}}$	Standard Deviation of Difference of sample proportions	2-Prop Z Test
$\sum \frac{(\text{observed - expected})^2}{\text{expected}}$	Chi-square test statistic (X^2)	Matrix → X^2- Test