PRACTICE

MINI-QUIZ [CH 12, 13]

FORMULAS ~~20 PTS~~

AP ~~STATS~~

[AP REV]

NAME ____________________

PER ____

FORMULAS USING QUANTITATIVE VARIABLES

NORMALITY √'s

III. Inferential Statistics

z, t — Standardized test statistic: $\frac{\text{statistic} - \text{parameter}}{\text{standard deviation of statistic}}$

CI — Confidence interval: statistic ± (critical value) • (standard deviation of statistic)

Single-Sample

Statistic	Standard Deviation of Statistic
Sample Mean	$\frac{\sigma}{\sqrt{n}}$
~~Sample Proportion~~	$\cancel{\sqrt{\frac{p(1-p)}{n}}}$

Two-Sample

Statistic	Standard Deviation of Statistic
Difference of sample means	$\sqrt{\frac{\sigma_1^2}{n_1}+\frac{\sigma_2^2}{n_2}}$ ~~Special case when $\sigma_1 = \sigma_2$~~ $\cancel{\sigma\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}}$
~~Difference of sample proportions~~	$\cancel{\sqrt{\frac{p_1(1-p_1)}{n_1}+\frac{p_2(1-p_2)}{n_2}}}$ ~~Special case when $p_1 = p_2$~~ $\cancel{\sqrt{p(1-p)}\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}}$

~~Chi-square test statistic~~ $= \cancel{\sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}}}$

1-SAMPLE z-INTERVAL

① CI =

1-SAMPLE z-TEST

② z =

1-SAMPLE t-INTERVAL

③ CI =

1-SAMPLE t-TEST

④ t =

2-SAMPLE t-INTERVAL

⑤ CI =

2-SAMPLE t-TEST

⑥ t =

SIGNIFICANCE TESTS
CONFIDENCE INTERVALS
NORMAL DISTRIBUTION

III. Inferential Statistics $x, \bar{x}$ μ

z, t Standardized test statistic: $\dfrac{\text{statistic} - \text{parameter}}{\text{standard deviation of statistic}}$ $\sigma, \sigma/\sqrt{n}, s/\sqrt{n}$

CI Confidence interval: statistic ± (critical value) • (standard deviation of statistic)

$\bar{x}$ z^*, t^* $\sigma/\sqrt{n}, s/\sqrt{n}$

$\bar{x} \to$ SAMPLE MEAN
$\mu \to$ POPULATION MEAN

$s \to$ SAMPLE STAND DEV
$\sigma \to$ POPULATION STAND DEV

$n \to$ SAMPLE SIZE

Single-Sample

Statistic	Standard Deviation of Statistic
Sample Mean ($\bar{x}$)	$\frac{\sigma}{\sqrt{n}}$ ($s/\sqrt{n}$)
Sample Proportion	$\sqrt{\frac{p(1-p)}{n}}$

Two-Sample

Statistic	Standard Deviation of Statistic
Difference of sample means ($\bar{x}_1 - \bar{x}_2$)	$\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$ ($\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}$) ~~Special case when $\sigma_1 = \sigma_2$ $\sigma\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$~~
Difference of sample proportions	$\sqrt{\frac{p_1(1-p_1)}{n_1} + \frac{p_2(1-p_2)}{n_2}}$ Special case when $p_1 = p_2$ $\sqrt{p(1-p)}\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$

Chi-square test statistic = $\sum \dfrac{(\text{observed} - \text{expected})^2}{\text{expected}}$

FORMULAS USING
QUANTITATIVE VARIABLES

NORMAL DISTRIBUTION

CH 2 $z = \dfrac{x - \mu}{\sigma}$

CH 9 $z = \dfrac{\bar{x} - \mu}{\sigma/\sqrt{n}}$

NORMALITY ✓

POPULATION DISTRIBUTION MUST BE STATED AS NORMAL

CENTRAL LIMIT THM SAMPLE SIZE MUST BE LARGE $n \geq 25$

1-SAMPLE Z-INTERVAL

CH 10 $CI = \bar{x} \pm z^* \dfrac{\sigma}{\sqrt{n}}$

1-SAMPLE Z-TEST

CH 11 $z = \dfrac{\bar{x} - \mu_0}{\sigma/\sqrt{n}}$

NORMALITY ✓

IF SAMPLE SIZE IS SMALL ($n < 15$) ONLY OK IF THE GRAPH OF THE SAMPLE DATA IS CLOSE TO NORMAL

IF MEDIUM SAMPLE SIZE ($15 \leq n < 30$) ONLY OK IF GRAPH OF THE DATA IS NOT STRONGLY SKEWED & DOES NOT HAVE ANY OUTLIERS

IF LARGE SAMPLE SIZE, ($n \geq 30$) OK EVEN IF GRAPH OF DATA IS CLEARLY SKEWED

1-SAMPLE t-INTERVAL

CH 10 $CI = \bar{x} \pm t^* s/\sqrt{n}$

1-SAMPLE t-TEST

CH 12 $t = \dfrac{\bar{x} - \mu_0}{s/\sqrt{n}}$

$df = n - 1$

$\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}$

2-SAMPLE t-INTERVAL

CH 13 $CI = (\bar{x}_1 - \bar{x}_2) \pm t^* \sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}$

2-SAMPLE t-TEST

CH 13 $t = \dfrac{\bar{x}_1 - \bar{x}_2}{\sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}}$

df = SMALLER VALUE OF $n_1 - 1$ OR $n_2 - 1$

NORMALITY ✓

IF $n_1 + n_2 < 15$, ONLY OK IF BOTH GRAPHS OF SAMPLE DATA ARE CLOSE TO NORMAL

IF $15 \leq n_1 + n_2 < 30$, OK IF BOTH GRAPHS OF SAMPLE DATA NOT STRONGLY SKEWED & DO NOT HAVE OUTLIERS

IF $n_1 + n_2 \geq 30$, OK EVEN IF BOTH GRAPHS OF SAMPLE DATA ARE CLEARLY SKEWED

III. Inferential Statistics

Standardized test statistic: $\dfrac{\text{statistic} - \text{parameter}}{\text{standard deviation of statistic}}$

Confidence interval: statistic ± (critical value) • (standard deviation of statistic)

Single-Sample

Statistic	Standard Deviation of Statistic
~~Sample Mean~~	$\cancel{\frac{\sigma}{\sqrt{n}}}$
Sample Proportion	$\sqrt{\frac{p(1-p)}{n}}$

Two-Sample

Statistic	Standard Deviation of Statistic
~~Difference of sample means~~	$\cancel{\sqrt{\frac{\sigma_1^2}{n_1}+\frac{\sigma_2^2}{n_2}}}$ ~~Special case when~~ $\cancel{\sigma_1 = \sigma_2}$ $\cancel{\sigma\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}}$
Difference of sample proportions	$\sqrt{\frac{p_1(1-p_1)}{n_1}+\frac{p_2(1-p_2)}{n_2}}$ ~~Special case when~~ $\cancel{p_1 = p_2}$ $\sqrt{p(1-p)}\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}$

~~Chi-square test statistic~~ $= \cancel{\sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}}}$

$\boxed{\text{FORMULAS USING CATEGORICAL VARIABLES}}$

NORMALITY √'s

$\boxed{\text{1-PROPORTION Z-INTERVAL}}$

7 CI =

$\boxed{\text{1-PROPORTION Z-TEST}}$

8 Z =

$\boxed{\text{2-PROPORTION Z-INTERVAL}}$

9 CI =

$\boxed{\text{2-PROPORTION Z-TEST}}$

10 Z =

FORMULAS USING
CATEGORICAL VARIABLES

III. Inferential Statistics $\hat{p}$ p

$\boxed{z}$ Standardized test statistic: $\dfrac{\text{statistic} - \text{parameter}}{\text{standard deviation of statistic}}$ $\sqrt{\dfrac{p(1-p)}{n}}$

$\boxed{CI}$ Confidence interval: statistic ± (critical value) • (standard deviation of statistic)

$\hat{p}$ z^* $\sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}}$

$\hat{p} \rightarrow$ SAMPLE PROPORTION

$n \rightarrow$ SAMPLE SIZE

$p \rightarrow$ POPULATION PROPORTION

Single-Sample

Statistic	Standard Deviation of Statistic
Sample Mean	$\frac{\sigma}{\sqrt{n}}$
Sample Proportion ($\hat{p}$)	$\sqrt{\frac{p(1-p)}{n}}$ ($\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$)

Two-Sample

Statistic	Standard Deviation of Statistic
Difference of sample means	$\sqrt{\frac{\sigma_1^2}{n_1}+\frac{\sigma_2^2}{n_2}}$ Special case when $\sigma_1 = \sigma_2$ $\sigma\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}$
Difference of sample proportions $\hat{p}_1 - \hat{p}_2$	$\sqrt{\frac{p_1(1-p_1)}{n_1}+\frac{p_2(1-p_2)}{n_2}}$ CI ~~Special case when $p_1 = p_2$~~ $\sqrt{p(1-p)}\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}$ TEST

$\boxed{CH\ 14}$ Chi-square test statistic = $\sum \dfrac{(\text{observed} - \text{expected})^2}{\text{expected}}$

$$\chi^2 = \sum \frac{\left(\text{OBSERVED COUNTS} - \text{EXPECTED COUNTS}\right)^2}{\left(\text{EXPECTED COUNTS}\right)}$$

SAFE IF ALL EXPECTED COUNTS ≥ 5

OR IF ALL EXP COUNTS ≥ 1 WITH NO MORE THAN 20% OF EXP COUNTS < 5

NORMAL DISTRIBUTION | NORMALITY ✓

$\boxed{CH\ 9}$

$$z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} \longrightarrow \quad np \geq 10, \quad n(1-p) \geq 10$$

1-PROPORTION Z-INTERVAL

$\boxed{CH\ 10}$

$$CI = \hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \longrightarrow \quad n\hat{p} \geq 10, \quad n(1-\hat{p}) \geq 10$$

1-PROPORTION Z-TEST

$\boxed{CH\ 12}$

$$z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} \longrightarrow \quad np_0 \geq 10, \quad n(1-p_0) \geq 10$$

2-PROPORTION Z-INTERVAL

$\boxed{CH\ 13}$

$$CI = (\hat{p}_1 - \hat{p}_2) \pm z^* \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}} \longrightarrow \quad n_1\hat{p}_1 \geq 5, \quad n_1(1-\hat{p}_1) \geq 5, \quad n_2\hat{p}_2 \geq 5, \quad n_2(1-\hat{p}_2) \geq 5$$

2-PROPORTION Z-TEST

$\boxed{CH\ 13}$

$$z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}_c(1-\hat{p}_c)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$\hat{p}_c = \frac{x_1 + x_2}{n_1 + n_2}$$

$$\longrightarrow \quad n_1\hat{p}_c \geq 5, \quad n_1(1-\hat{p}_c) \geq 5, \quad n_2\hat{p}_c \geq 5, \quad n_2(1-\hat{p}_c) \geq 5$$