#10.9

(a) $n=12, p=0.7, \alpha = P(X>11)$

$= 0.0712 + 0.0138 = 0.0850$

(b) $n=12, p=0.9 \quad \beta = P(X \le 10) = 0.3410$

#10.15

(a) $\mu=200, n=9, \sigma=15, \sigma_{\bar{x}} = \frac{15}{3} = 5$

$z_1 = \frac{191-200}{5} = -1.8, \quad z_2 = \frac{209-200}{5} = 1.8$

$\alpha = 2P(z<-1.8) = 2 \times 0.0359 = 0.0718$

(b) $\mu = 215 \rightarrow z_1 = \frac{191-215}{5} = -4.8$

$z_2 = \frac{209-215}{5} = -1.2$

$\beta = P(-4.8 < z < -1.2) = 0.1151$

#10.20

$H_0: \mu = 5.5$

$H_1: \mu < 5.5$

$z = \frac{5.23-5.5}{0.24 \times 8} = -9. \quad P(z<-9) \approx 0$

∴ 5.5 oz 보다 가볍다.

#10-21

$H_0: \mu = 800$

$H_1: \mu \neq 800$

$z = \frac{788-800}{\frac{40}{\sqrt{30}}} = -1.64$ $\quad P(z < -1.64) \times 2$

$= 2 \times 0.0505 = 0.101$

평균을 800과 크게 차이나지 X

#10.26

$H_0: \mu = 220$

$H_1: \mu > 220$

$\alpha = 0.05,\ V = 19 \rightarrow t_0 = 1.729$

$t = \frac{224-220}{24.5\sqrt{20}} = 4.38$ $\quad t > t_0$ (O)

$\therefore H_0$를 기각하여 220보다 크다

#10.33

$H_0: \mu_1 - \mu_2 = 0.5$

$H_1: \mu_1 - \mu_2 > 0.5$

$\alpha = 0.01,\ V = 15+12-2 = 25,\ t_0 = 2.485$

$(t > 2.485)$

$S_p = \frac{14 \times 1.5^2 + 11 \times 1.2^2}{25} = 1.8936$ (O)

$\therefore t = \frac{(8.8-7.5)-0.5}{\sqrt{1.8936}\sqrt{1/15+1/12}} = 1.5$

$\therefore$ 주장을 뒷받침할 만한 충분한 근거 X

#10.36

$H_0: \mu_1 = \mu_2$ (차이가 없다)

$H_1: \mu_1 \neq \mu_2$, $v = 12 + 12 - 2 = (22)$

$S_p = \sqrt{\frac{5100^2 + 5900^2}{2}} = 5515$ ⓩ $= \frac{\mu_1 - \mu_2}{S_p \cdot \sqrt{n}}$

$= \frac{37900 - 39800}{5515\sqrt{1/12 + 1/12}}$

$= -0.84$

$P(T < -0.84) \approx 1 - 0.7995 = \underline{0.2005}$

$0.4 < P$값 < 0.6 $\therefore H_0$을 기각하지 않는다

#10.39

$H_0: \mu_2 - \mu_1 = 10$

$H_1: \mu_2 - \mu_1 > 10$

$\sigma_1 \neq \sigma_2$, $\alpha = 0.1$

$S_1^2 = 78.8 \quad S_2^2 = 913.333$

$$v = \frac{(78.8/5 + 913.333/7)^2}{\frac{(78.8/5)^2}{4} + \frac{(913.333/7)^2}{6}} = 7.38 \approx 7$$

$\alpha = 0.1$, $v = 7 \rightarrow t > 1.415$

$$t = \frac{(110 - 97.4) - 10}{\sqrt{78.8/5 + 913.333/7}} = (0.22) < 1.415$$ (기각)

H_0을 (기각)하지 않는다

#10.43

$H_0: \mu_1 = \mu_2$
$H_1: \mu_1 < \mu_2$
$\Big) \nu = 15+15-2 = 28.$

$\bar{d} = -54.13. \quad s_d = 83.002$

$t = \dfrac{-54.13}{83.002\sqrt{15}} = -2.53. \quad \alpha = 0.01$

$P(T(-2.53) = 1 - 0.9943 = 0.0057.$

$0.0057 \times 2 = 0.0114 > 0.01$ ⇒ 大

$\therefore H_0$를 기각

#10.55

1. $H_0: p = 0.4$
2. $H_1: p > 0.4$
3. $\alpha = 0.05$
4. 기각역 : z

$P(X \geq 9 \mid p = 0.4)$
$= 1 - \sum_{x=0}^{8} b(x; 20, 0.4)$
$= 1 - 0.5956 = 0.4044$

$\therefore$ 주장은 반박되지 않는다

#10.58

1. $H_0: p = 0.6$
2. $H_1: p < 0.6$
3. $\alpha = 0.05$

$\frac{110}{200} = \frac{55}{100}$

$p = P(x < 110 \mid p = 0.6)$ → n이 크므로 근사값 구하기

$$z = \frac{110 - 200 \times 0.6}{\sqrt{200 \times 0.6 \times 0.4}} = -1.44$$

$$P(z < -1.44) = 0.0749$$

∴ H_0 기각을 하지 X

#10.63

1. $H_0: P_1 = P_2$ $p_1 = 0.63$ $p_2 = 0.472$
2. $H_0: P_1 \neq P_2$
3. α X

$$\hat{p} = \frac{x_1 + x_2}{n_1 + n_2} = \frac{63 + 59}{100 + 125} = \underline{0.542}$$

$$z = \frac{0.63 - 0.472}{\sqrt{0.542 \times 0.458 \times \left(\frac{1}{100} + \frac{1}{125}\right)}} = 2.36$$

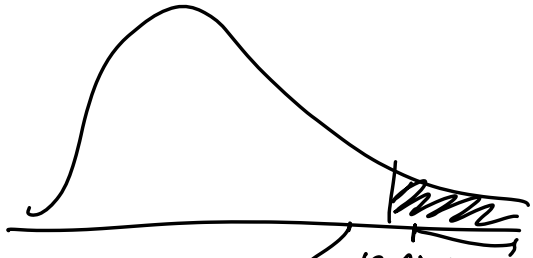
$$P = 2P(z > 2.36) = 2 \times 0.0091 = \underline{0.0182}$$

↓

차이는 유의하다

#10.68

1. $\sigma = 6$
2. $\sigma < 6$, σ^2
3. $\alpha = 0.05$
4. 기각역 : $\chi^2 = \frac{19 \times 4.51^2}{6^2} = 10.135$
5. 그래프



$= 0.95$

p-value

$0.05 \sim 0.1$ 사이

H_0을 기각하지 X

#10.14

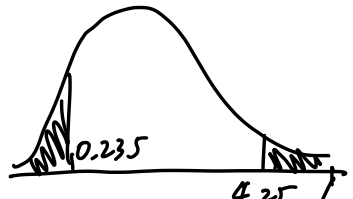
1. $\sigma_1^2 = \sigma_2^2$
2. $\sigma_1^2 \neq \sigma_2^2$
3. $\alpha = 0.02$

$\sigma_1 = 1814.329$

$\sigma_2 = 2419.503$

4. $f_{0.01}(15, 11) = 4.25$

$f_{0.99}(15,11) = \frac{1}{4.25} = 0.235$



5. $f = \frac{\sigma_1^2}{\sigma_2^2} = \frac{1814.329^2}{2419.503^2} = 10.09$

10.09

6. $f < 0.235$, $f > 4.25$ → 기각 H_0을 기각한다

#10.79

1. H_0: 5:2:2:1 이다
2. H_1: 5:2:2:1 이지 않다
3. $\alpha = 0.05$
4.

O_i	269	112	74	45
e_i	250	100	100	50

5. $\chi^2 = \frac{19^2}{250} + \frac{12^2}{100} + \frac{26^2}{100} + \frac{5^2}{50}$

$= 10.14$

6. $v=3$, $\alpha = 0.05 \rightarrow \chi^2_{0.05} = 7.815$

$\chi^2 = 10.14 > 7.815$ $\therefore$ H_0를 기각한다

#10.88

1. H_0: 과목수능 가장의 학력과 무관
2. H_1: 〃 유관
3. $\alpha = 0.05$, $\chi^2 > 9.488$, $v = 2 \times 2 = 4$
4. 전체: 200

	0~1	2-3	4↑	
중졸	14(18.7)	37(39.8)	32(24.5)	83
고졸	19(17.6)	42(37.4)	17(23.0)	78
대졸	12(8.7)	17(18.8)	10(11.5)	39
	45	96	59	200

$$\chi^2 = \frac{4.1^2}{18.7} + \frac{2.8^2}{39.8} + \frac{7.5^2}{24.5}$$

$$+ \frac{1.4^2}{11.6} + \frac{21.16^2}{31.4} + \frac{5^2}{23}$$

$$+ \frac{3.3^2}{8.7} + \frac{1.8^2}{18.8} + \frac{1.5^2}{11.5} = 7.54$$

$7.54 < 9.488$ 이므로
H_0을 기각하지 못

10.95

1. H_0 : 후보 A 지지율, 후보 B 지지율 및 미결정 비율은 동일
2. H_1 : 〃 다름
3. $\alpha = 0.05$, $V = 2$, $\chi^2 > 5.991$
4. χ^2 계산

	리치먼드	노팩	
A	204 (214.5)	225 (214.5)	429
B	211 (204.5)	198 (204.5)	409
None	85 (81)	77 (81)	162
	500	500	1000

$$\chi^2 = \frac{10.5^2}{214.5} + \frac{10.5^2}{214.5} + \frac{6.5^2}{204.5} + \frac{6.5^2}{204.5}$$

$$+ \frac{4^2}{81} + \frac{4^2}{81} = 1.84$$

$1.84 < 5.991$ → H_0을 기각하지 못