CITY UNIVERSITY OF HONG KONG
STUDENTS' UNION
http://www.cityusu.net/
Name: CHAN King Yeung
SID: 11551193 94

STAT 3004

Assignment 1

Question 1

a) paired t-test

b) $H_0: \Delta = 0$ vs $H_1: \Delta \neq 0$

$t_0 = \frac{18.9}{26.4/\sqrt{10}}$

≈ 2.264

p-value ≈ 0.0498

Since p-value > 0.05, we do not reject H_0 at $\alpha = 0.05$

c) $18.9 \pm 2.262 \frac{26.4}{\sqrt{10}}$

$\approx [0.0159, 37.7841]$

d) $n = \frac{(1.96+0.84)^2(26.4)^2}{(10)^2}$

≈ 55

Question 2

a) $H_0: p = 0.005$ vs $H_1: p \neq 0.005$

$X_0^2 = \left[\frac{|0.003 - 0.005| - \frac{1}{10000}}{\sqrt{\frac{0.005(0.995)}{5000}}}\right]^2$

≈ 3.628

critical value = 3.841

Since X_0^2 < critical value, we do not reject H_0 at $\alpha = 0.05$

b) p-value ≈ 0.0568

c) $H_0: p = 0.25$ vs $H_1: p \neq 0.25$

$X_0^2 = \left[\frac{|\frac{1}{3} - 0.25| - \frac{1}{30}}{\sqrt{\frac{0.25(0.75)}{15}}}\right]^2$

$= 0.2$

p-value ≈ 0.6547

Since p-value > 0.05, we do not reject H_0 at $\alpha = 0.05$

d) Power $= \Phi\left[\sqrt{\frac{0.25(0.75)}{0.2(0.8)}}(-1.96) + \frac{0.05}{\sqrt{0.2(0.8)/150}}\right]$

$\approx \Phi(-1.2379)$

≈ 0.1079

e) $n = \frac{[\sqrt{0.25(0.75)}(1.96) + \sqrt{0.2(0.8)}(1.28)]^2}{(0.05)^2}$

≈ 741

Question 3

a) $H_0: \mu_{female} = \mu_{male}$ vs $H_0: \mu_{female} \neq \mu_{male}$

$t_0 = \frac{6.56 - 6.8}{\sqrt{\frac{24(0.64)^2 + 39(0.76)^2}{63}\left(\frac{1}{25} + \frac{1}{40}\right)}}$

≈ -1.314

p-value ≈ 0.1936

Since p-value > 0.05, we do not reject H_0 at $\alpha = 0.05$

b) $(6.56 - 6.8) \pm 1.998\sqrt{\frac{24(0.64)^2 + 39(0.76)^2}{63}\left(\frac{1}{25} + \frac{1}{40}\right)}$

$\approx [-0.6051, 0.1251]$

Question 4

a) F-test for equality of 2 Normal variances

$H_0: \sigma^2_{non\text{-}smokers} = \sigma^2_{smoker}$ vs $H_1: \sigma^2_{non\text{-}smoker} \neq \sigma^2_{smoker}$

$F_0 = \left(\frac{50.4}{26.3}\right)^2$

≈ 3.6724

p-value ≈ 0.0041

Since p-value < 0.05, we reject H_0 at $\alpha = 0.05$

b) t-test for independent samples with unequal variances

$H_0: \mu_{non\text{-}smoker} = \mu_{smoker}$ vs $H_1: \mu_{non\text{-}smoker} \neq \mu_{smoker}$

$t_0 = \frac{92.5 - 57}{\sqrt{\frac{(50.4)^2}{306} + \frac{(26.3)^2}{17}}}$

≈ 5.072

$d = \frac{\left[\frac{(50.4)^2}{306} + \frac{(26.3)^2}{17}\right]^2}{\frac{1}{305}\left[\frac{(50.4)^2}{306}\right]^2 + \frac{1}{16}\left[\frac{(26.3)^2}{17}\right]^2}$

≈ 23.1

p-value $\approx 3.855 \times 10^{-5}$

Since p-value < 0.05, we reject H_0 at $\alpha = 0.05$