# Stat 320

# Key answer to Home assignment 2

# Dr. Bensmail

(A) 30 points, 10 point for each

A random sample (X) of size **n=400**, **average=35**, $S_X$ **=5**, $Z_{94\%}$**=1.56 or 1.55**

If we call $Y_{94th}$ =94[th] percentile of the average, then we have:

P(average < $Y_{94th}$ )=0.94

(1) $Y_{94th}$= average + $(S_X/\sqrt{n})*Z_{94\%}$ = $35+(5/\sqrt{400})*1.56$=35.38

(2)The 97% confidence interval of the average (since the std of the population is unknown and n is large, we use normal distribution ) is:

$1-\alpha=0.97$

$\alpha/2=0.015$

97% CI= Mean ± $z_{\alpha/2}$ * $(S_X/\sqrt{n})$ = 35 ± $2.17*(5/\sqrt{400})$ = [34.45 ; 35.54]

(3) When **n=20**, **average=32**, $S_X$ **=3**, $t_{0.025}$**=2.093**

The 95% confidence interval of the average (since the std of the population is unknown and n is small, we use t distribution) is:

$1-\alpha=0.95$

$\alpha/2=0.025$

df=n-1=19

95% CI= Mean ± $t_{(0.025,\ 19)}$ * $(S_X/\sqrt{n})$ = 32 ± $2.093*(3/\sqrt{20})$ = [33.59 ; 36.40]

## (B) 20 points, 10 each

(a)

Let X be the random for the weight of the candy bar

n=16, mean=4.85, sigma is unknown, $S_X$=0.1, df=n-1=15, $\alpha$=0.05

(i) We test $H_0$ : $\mu > 5$ versus $H_a$: $\mu < 5$

T-ratio =(mean- $\mu$)/ ($S_X / \sqrt{n}$)=(4.85-5)/0.025=-6

P-value=p(t < t-ratio)=P(t < -6)~almost 0

Since P-value < 0.05, then we reject the null hypothesis $H_0$ : $\mu > 5$

(b)
If the population is normally distributed, then:

Z-ratio =(mean- $\mu$)/ ($S_X / \sqrt{n}$)=(4.85-5)/0.025=-6

P-value=P(Z< -6)= almost 0< 0.05, so we reject the null hypothesis : $\mu > 5$

Conclusion: **FTC have grounds to proceed against the manufacturer for the unfair practice of short-weight selling**

## (C) 30 points, 10 point for each

| | | | | | | |
|---|---|---|---|---|---|---|
| X | 1 | 2 | 3 | 4 | 5 | 6 |
| Y | 3 | 5 | 7 | 9 | 11 | 13 |

(a) and (b) are easy

(c)Here we may use the formula of a line which is:

If a line is summarized by y=a+bx,
We choose two point that belongs to the line for example A=(x1, y1)=(1,3) and B=(x2, y2)=(2,5)
We estimate the slope b=rise/run=(y2-y1)/(x2-x1)=(5-3)/(2-1)=2
We estimate the intercept by looking at the point of intersection of the line with the y-coordinate which is 1
So
**Y=1+2x**

## (D) 20

**is looking at the 5 histogram, we should have some some kind of normal distribution for the last case (relatively largest sample)**