Assignment 04 — Subhendu Bishal

Q1

Confidence = 95% — Population Normally distributed

$\alpha = 0.05$

$H_0: \mu \leq 30$ ns

Critical Value $Z_{\alpha/2} = 1.960$

t test

$$t = \frac{\bar{x} - \mu}{\left(\frac{s}{\sqrt{n}}\right)} \qquad df = n-1$$

$\bar{x}$ = Sample mean = 32.7 ns

μ = pop mean = 30 ns

s = Sample SD = 16 ns

n = Sample Size = 10

$df = 10 - 1 = 9$

$$= \frac{32.7 - 30}{\frac{4}{\sqrt{15}}} = 2.614$$

$$P\text{-value} = P\left(t_{df=9} > 2.614\right) = 0.014$$

$P = 0.014 < \alpha = 0.5$ — Reject the Null Hypothesis

$H_A: \mu > 30$

Q2

Testing Proportion

$P = 0.92$

$\hat{P} = 0.87$

$n = 200$

$$Z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} = \frac{0.87 - 0.92}{\sqrt{\frac{0.92 \times 0.08}{200}}} = \frac{-0.05}{0.0192} = -2.6$$

$H_0: P \geq 0.92$

$H_a: P < 0.92$

Pvalue = 0.0046 it less than $p < 0.05$

Reject Null Hypothesis

Type 1 — Reject the Null Hyp when null Hyp is true

Conclude fewer than 92% American adults own Phone, when fact 92% Americans do own phone

Type 2

To conclude the 92% American Adults own cell phones, when infact 92% fewer American own phones

Do not reject the null hyp, when null hyp is false

Q3

H – 60

T – 40

Total 100

H_0: $P = 0.5$ (fair)

H_a: $P > 0.5$ (towards Head)

P_0 = Proportion of Population

$$z = \frac{\hat{P} - P_0}{\sqrt{\frac{P_0(1-P_0)}{n}}} = \frac{0.6 - 0.5}{0.05} = 2$$

P value = 0.0227

which is less than 0.05

We can reject the null hypothesis

The coin is biased towards Head

Q4

H_0: Home ownership does not vary by Location

H_a: Homeownership varies by Location

	Home N	Home Y	
NW	40	89	129
SW	17	106	123

Exp %

NW	79	177	256
SW	34	210	244

$$\chi^2 = \frac{(40-79)^2}{79} + \frac{(89-177)^2}{177} + \frac{(17-34)^2}{34} + \frac{(106-210)^2}{210}$$

$$= 19.25 + 43.77 + 8.5 + 51.5$$

$$= 123.25$$

DF = (2-1) × (2-1) = 1

χ^2 is greater than Critical value

Reject Null Hypothesis

Critical value 95% Confidence Of = 1

= 19.67