Q1

(a)

- hypothesis:

$H_0 : \mu = 3315$ → Null hypothesis

$H_1 : \mu < 3315$ → Alternative hypothesis

(b)

- Test stat

$$t = \frac{3218 - 3315}{512/\sqrt{50}} = -1.3396 \simeq \boxed{-1.340}$$

$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$$

(c)

$\alpha = 0.1$

Degrees of freedom $= 50 - 1 = 49$

$\therefore t_{0.149} \simeq 1.299$

- critical region

$t < 1.299$

$-1.340 < -1.299$

$\therefore$ Reject H_0 in $\alpha = 0.1$ sigfig value.

(d)

p-val = $\boxed{0.093}$

Q_2

(a)

$H_0 : p = 0.40$

$H_1 : p > 0.40$

(b)

$$z = \frac{\hat{p} - 0.40}{\sqrt{(0.40)(0.60)/n}}$$

$$= \frac{\frac{550}{1305} - 0.40}{\sqrt{(0.40)(0.60)/1305}}$$

$$= 1.582$$

(c)

$z \geq z_\alpha$

$= z_{0.1}$

≈ 1.285

$z \geq 1.285$

(d)

$\therefore 1.582 \geq 1.285$ Reject H_0 at the $\alpha = 0.1$ sig fig level

P-val ≈ 0.056

Q_3

(a)

$H_0 : m = 1.14$

$H_1 : m > 1.14$ $\quad 2.6 \Rightarrow 2.7$

X	S	R
1.12	−1	2.7
1.13	−1	5
1.19	+1	8
1.25	+1	12
1.06	−1	1
1.29	+1	13.5
1.12	−1	2.7
1.23	+1	10.5
1.29	+1	13.5
1.17	+1	6
1.20	+1	9
1.12	−1	2.7
1.18	+1	7
1.23	+1	10.5

$$W = \sum_{i=1}^{25} R_i S_i = 75.9$$

$$Z = \frac{75.9}{\sqrt{14 \cdot 15 \cdot 29/6}} \simeq 2.663$$

(b)

$P(Z > 2.663) \simeq 0.0038$ = p-Value

(c)

$z_{0.1} \simeq 1.285$ $\quad 2.663 = Z > z_{0.1} \simeq 1.285$ Reject H_0

Q4

X: 6.06 6.04 6.11 6.06 6.06 6.07 6.06 6.08 6.05 6.09

Y: 6.08 6.03 6.04 6.07 6.11 6.08 6.08 6.10 6.06 6.04

0.02 0.01 0.07 0.01 0.05 0.01 0.02 0.02 0.01 0.05

$V = 0.27$

$$Z = \frac{0.27 - 50}{\sqrt{100 \times \frac{21}{12}}} = -3.76$$

$P(Z > 3.76) \leq 0.0017$

$0.0017 < 0.1$

Reject H_0

Q_5

(a)

Let $Y_i = \text{sign}(X_i - m)$,

$\sum Y_i = n$

$\hat{p} = 0.68$, $p = 0.5$, $n = 25$

$$Z = \frac{0.68 - 0.5}{\sqrt{0.5 \times \frac{0.5}{25}}} = \frac{0.18}{0.1} = 1.8$$

$\alpha = 0.05$

critical region

$Z > z_{0.05} = 1.645$ · Reject H_0

(b)

(b)

X	Rank	S
5.625	21	−1
3.665	19	−1
5.699	17	−1
5.837	6	−1
5.863	5	−1
5.870	4	−1
5.878	3	−1
5.884	2	−1
5.908	1	+1
5.967	7	+1
6.019	8	+1
6.020	9	+1
6.029	10	+1
6.032	11	+1
6.037	12	+1
6.045	13	+1
6.049	14	+1
6.050	15	+1
6.079	16	+1
6.116	18	+1
6.159	20	+1
6.186	22	+1
6.199	23	+1
6.307	24	+1
6.387	25	+1

$$W = \sum_{i=1}^{25} R_i S_i = 171$$

$$Z = \frac{171}{74.33} \simeq 2.300$$

$2.300 > z_\alpha = 1.645$

$\therefore$ Reject H_0

Q6

(a)

$z_{0.1} \simeq 1.285$

$$W = \sum_{i=1}^{9} x_i \, \text{sign}(x_i - \mu_i) > 1.285 = z_{0.1}$$

(b)

Q_7

(a)

$K(\mu) = P(\bar{X} \leq 354.316)$

$= \phi\left(\frac{354.316 - \mu}{\frac{1}{\sqrt{3}}}\right)$

$\alpha = K(365)$

$= \phi(-1.184)$

$= 0.1190$

(b)

$K(354.316)$

$= \phi(0)$

$= 0.5$

$K(353.4371)$

$= \phi(1.522)$

$= 0.9357$