

$$1. \bar{x} = 37.5, \sigma = 7.7, n = 50$$

$$(a) \alpha = 0.01, Z_{\alpha/2} = 2.575$$

$$E = Z_{\alpha/2} \left(\frac{\sigma}{\sqrt{n}} \right) = 2.575 \left(\frac{7.7}{\sqrt{50}} \right) = 2.804$$

$$\text{Confidence interval} = \bar{x} \pm E$$

$$= 37.5 \pm 2.804$$

$$= (34.696, 40.304)$$

$$= 34.696 < \mu < 40.304$$

(b) We are 99% confident that the true population mean falls between 34.696 and 40.304.

$$(c) Z_{\alpha/2} = 2.575$$

$$E = 2.5$$

$$n = \left(\frac{Z_{\alpha/2} \sigma}{E} \right)^2 = \left(\frac{2.575 \times 7.7}{2.5} \right)^2$$

$$= 63$$

$$2. Z_{\alpha/2} = 2.575, n = 65, \bar{x} = 1075, \sigma = 270$$

$$(a) E = Z_{\alpha/2} \left(\frac{\sigma}{\sqrt{n}} \right) = 2.575 \left(\frac{270}{\sqrt{65}} \right) = 86.235$$

$$\text{Confidence interval} = \bar{x} \pm E$$

$$= 1075 \pm 86.235$$

$$= 988.765 < \mu < 1161.235$$

(b) No. Since the interval contains values below 1000

3(a) $z = 1.3$ $p > 0.3$

$H_0: p = 0.3$

$H_a: p > 0.3$ (claim)

Right-tailed

$P = 0.0968$

$z_c = 1.645$

Critical value method: $z < z_c$ P-value method: $P > 0.05$

Fail to reject the null hypothesis.

(b) $z = -2.57$ $p < 0.75$

$H_0: p = 0.75$

$H_a: p < 0.75$ (claim)

Left-tailed

$P = 0.0051$

$z_c = -1.645$

Critical value method: $z < z_c$ P-value method: $P < 0.05$

Reject the null hypothesis

(c) $z = -1.98$ $P = 0.475$

$H_0: p = 0.475$ (claim)

$H_a: p \neq 0.475$

Two-tailed

$P = 0.0477$

$z_c = -1.96, 1.96$

Critical value method: $z < -1.96$ P-value method: $P < 0.05$

Reject the null hypothesis.

4 (a) $\mu = 14$, $n = 14$, $t = -2.645$

$H_0: \mu = 14$ (claim)

$H_a: \mu \neq 14$

Two-tailed

$P = 0.0202$

$P > 0.01$

Fail to reject null hypothesis

(b) $\mu < 98$ $n = 5$ $t = -1.603$

$H_0: \mu = 98$

$H_a: \mu < 98$ (claim)

Left-tailed

$P = 0.0921$

$P > 0.01$ Fail to reject null hypothesis

5 (a) $\alpha = 0.05$ Right-tailed

(b) $n_1 = 78$ $\bar{x}_1 = 92.88462$ $s_1 = 15.34451$

$n_2 = 21$ $\bar{x}_2 = 86.90476$ $s_2 = 8.988352$

$\mu_1 - \mu_2 = 0$ $df = 20$

(c) $t = 2.282$

$P = 0.0132$

(d) $P < 0.05$, Reject null hypothesis

(e) There is a sufficient evidence to support the claim that the mean IQ score of people with low blood levels is higher than the mean IQ score of people with high blood levels

6 (a) $t = 0.034$

$P = 0.9737$

(b) $P > \alpha$. Fail to reject the null hypothesis

(c) There is not sufficient evidence to support the claim that there is a difference in height between fathers and their first sons

7 (a) $H_0: \rho = 0$
 $H_a: \rho \neq 0$ (claim)

(b) $r = -0.147$

(c) $P = 0.7275$

$P > \alpha$, fail to reject null hypothesis

(d) There is insufficient evidence to support the claim that heavier cars use more gasoline

$$(e) \hat{y} = -0.09x + 28.268$$

8 (a) Expected Frequency (E) = np

3248.532
391.027
464.076
163.286
30.079

(b) Test: Goodness - of - fit

$$\alpha = 0.01$$

(c)
$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

$$df = 5$$

(d) $\chi^2 = 524.713$
 $P = 0$

(e) H_0 : The distribution of clinical trial participants fit well with population distribution (claim)

H_a : The distribution of clinical trial participants ~~fit~~ does not fit well with population distribution.

(f) Since $P < \alpha$, reject null hypothesis.

(g) There is sufficient evidence to warrant the rejection of the claim that the distribution of clinical trial participants fit well with population distribution.

(h) E

9. (a) Test: Chi-square Independence test $\alpha = 0.05$

(b)
$$\chi^2 = \sum \frac{(O - E)^2}{E} \quad df = (2-1)(5-1) = 4$$

(c)	black	White	Yellow	Red	Blue	Total
Controls	491 (509.53)	377 (353.92)	31 (28.23)	170 (173.7)	55 (58.62)	1124
Cases	213 (193.47)	112 (135.08)	8 (10.77)	70 (66.3)	26 (22.38)	429
Total	704	489	39	240	81	1553

(d) $\chi^2 = 9.971$
 $P = 0.0409$

(e) H_0 : Injuries are independent of helmet colour (claim)
 H_a : Injuries are dependent of helmet colour.

(f) $P < \alpha$, reject null hypothesis

(g) There is sufficient evidence to warrant the rejection of the claim that injuries are independent of helmet colour.

10 (a) Test: One way ANOVA $\alpha = 0.05$

(b) $P = 0.4903$

(c) H_0 : The average temperature is the same in each greenhouse. (claim)
 H_a : Atleast the average temperature of one greenhouse is different.

(d) $P > \alpha$, fail to reject null hypothesis.

(e) There is insufficient evidence to warrant the rejection of the claim that the average temperature is the same in each greenhouse.