

Keys to Version A of Midterm Test 2 in MA 180/418

Q1: **c** Q2: **b** Q3: **d** Q4: **c** Q5: **a**

Q6: (a) $n = \frac{(z_{\alpha/2})^2 \cdot 0.25}{E^2} = \frac{1.96^2 \cdot 0.25}{0.03^2} = 1067.1$, round up to 1068
(b) $n = \frac{(z_{\alpha/2})^2 \hat{p}\hat{q}}{E^2} = \frac{1.96^2 \cdot 0.08 \cdot 0.92}{0.03^2} = 314.15$, round up to 315

Q7: (a) $H_0 : \sigma = 0.022$ diagram:
 $H_1 : \sigma > 0.022$
Critical value: 67.505

(χ^2 -distribution with 50 degrees of freedom, right-tailed test)

(b) test statistics $\chi^2 = \frac{50 \cdot 0.0275^2}{0.022^2} = 78.125$. Reject H_0 , accept the original claim.

(Bonus) By Table A-4: $0.005 < \text{P-value} < 0.01$
By calculator: P-value = 0.0067.

Q8: (a) $\bar{x} = 134.8$ (more precisely: 134.83)
(b) confidence interval: (130.56, 139.11)
(c) margin of error: $E = 4.27$

Q9: (a) $H_0 : \mu = 5.3$ diagram:
 $H_1 : \mu < 5.3$
Critical value: -1.671

(t-distribution with 60 degrees of freedom, left-tailed test)

(b) test statistics $t = \frac{5.18 - 5.3}{0.58/\sqrt{61}} = -1.616$. Accept H_0 , reject the original claim.

(Bonus) By Table A-3: $0.05 < \text{P-value} < 0.1$
By calculator: P-value = 0.0557.

Q10: (a) $H_0 : p_1 = p_2$ diagram:
 $H_1 : p_1 \neq p_2$
Critical values: ± 2.575

(z-distribution (standard normal), two-tailed test)

(b) test statistics $z = 0.886$. Accept H_0 , accept the original claim.
(c) P-value = 0.3754
(d) The P-value is greater than $\alpha = 0.01$, so accept H_0