Keys to Version A of Midterm Test 2 in MA 180/418, Spring 2011

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

Q6: $n = \left[\frac{z_{\alpha/2}\cdot\sigma}{E}\right]^2 = \left[\frac{1.96\cdot0.84}{0.07}\right]^2 = 553.2$, round up to 554

Q7: (a) mean $\bar{x} = 131.5$ and st. dev. $s = 7.5378$, round off to 7.5.
(b) The interval is $(125.6, 137.4)$ by formula and by calculator function **TInterval**.
The formula for E is $E = t_{\alpha/2}\frac{s}{\sqrt{n}} = 2.718 \times \frac{7.5378}{\sqrt{12}} = 5.9143$.
(c) $E = 5.9$.

Q8: (a) $\hat{p} = 967/1400 = 0.69$.
(b) The interval is $(0.67, 0.71)$ by formula or by calculator function **1-PropZInt**.
The formula for E is $E = z_{\alpha/2}\sqrt{\frac{\hat{p}\hat{q}}{n}} = 1.645 \times \sqrt{\frac{0.6907\times0.3093}{1400}} = 0.0203$.
[Bonus] The 99% interval is $(0.66, 0.72)$. It is wider because its confidence level is higher (it has a higher chance to capture the true population proportion).

Q9: (a) $H_0: \mu = 240$, $H_1: \mu < 240$; (b) test statistic: $z = \frac{229.75-240}{53.1/\sqrt{40}} = -1.22$

Diagram:
-1.28   -1.22   0
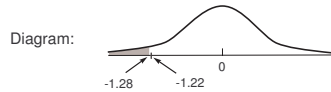
(c) critical value: -1.28.
(d) we accept H_0. We reject the original claim.
(e) P-value is 0.1112 by Table A-2 or 0.1111 by calculator function **Z-Test**.
We accept H_0 because P-value$> \alpha = 0.1$.

Q10: (a) $H_0: \sigma = 3.5$, $H_1: \sigma < 3.5$;
(b) test statistic: $\chi^2 = \frac{(n-1)s^2}{\sigma^2} = \frac{17\times 2.65^2}{3.5^2} = 9.746$

Diagram:
9.746   10.085
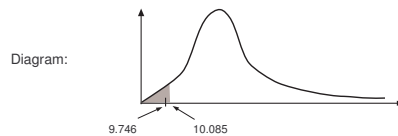
(c) critical value: 10.085 by Table A-4.
(d) We accept H_1. We accept the original claim.
(e) The population must be normal. It is strict.
[Bonus] P-value is $0.05 < P < 0.10$ (by Table A-4)
or 0.086 (by calculator function **χ^2cdf**).