Keys to Version A of Final Exam in MA 180/418, Fall 2010

Q1: **b**	Q2: **d**	Q3: **c**	Q4: **c**	Q5: **d**
Q6: **a**	Q7: **a**	Q8: **b**	Q9: **a**	Q10: **d**

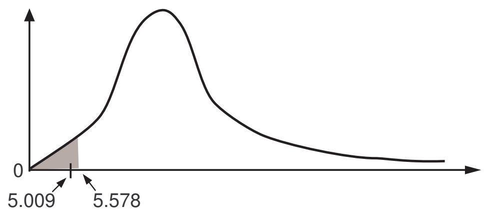
Q11: $z_{\text{SAT}} = 1.13$ and $z_{\text{ACT}} = 1.14$, so the ACT score is relatively better.

Q12: (a) 0.1922 by Table A-2 and 0.1912 by calculator function **normalcdf**
(b) 0.0002 by Table A-2 or by calculator function **normalcdf**
(c) either the population is normal or $n > 30$; here the population is normal
(d) the more relevant question is (b); the chance is 0.0002.

Q13: (a) (0.847,0.873) by Table A-2 or by calculator function **1-PropZInt**
(b) no, because the interval does not contain 0.9

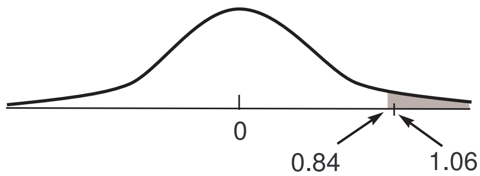
Q14: (a) $\bar{x} = 4331$ and $s = 374.5$.
(b) (4137,4525) by Table A-3 or by calculator function **TInterval**
(c) (3995,4667) by Table A-3 or by calculator function **TInterval**
(d) The second interval is wider because its confidence level is larger.

Diagram for Q15:



Q15: (a) $H_0: \sigma = 550$, $H_1: \sigma < 550$
(b) test statistic $\chi^2 = 5.099$
(c) critical value $\chi^2 = 5.578$ by Table A-4
(d) initial conclusion: accept H_1;
final conclusion: accept the original claim;
(e) The population must be normal. It is very strict.
[Bonus] interval for the P-value is (0.05,0.10)
Exact P-value=0.06927 by calculator function χ^2CDF

Diagram for Q16:



Q16: (a) $H_0: \mu = 90, \qquad H_1: \mu > 90$

(b) test statistic $z = 1.06$

(c) critical value $z = 0.84$ by Table A-2

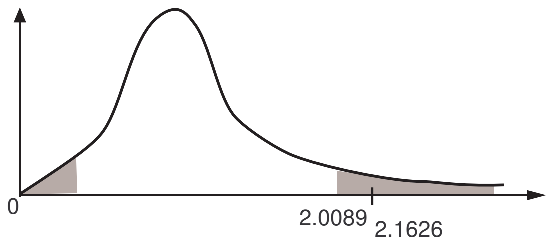
(d) initial conclusion: accept H_1;
final conclusion: accept the original claim;

(e) The P-value is 0.1446 by Table A-2 or
0.1450 by calculator function **Z-Test**

(f) Accept H_1 because the P-value is less than $\alpha = 0.20$.

(g) Either $n > 30$ or the population is normal. Not very strict.

Diagram for Q17:



Q17: (a) $H_0: \sigma_1 = \sigma_2, \qquad H_1: \sigma_1 \neq \sigma_2$

(b) test statistic $F = 2.1626$

(c) upper critical value: $F = 2.0089$ by Table A-5

(d) initial conclusion: accept H_1;
final conclusion: reject the original claim;

(e) no, it does not seem to improve. The standard deviation must decrease.

Q18: (a) $r^2 = 0.375$
(b) $r = -0.612$
(c) $s_e = 0.1299$
(d) the critical value is 0.632. There is no linear correlation.
The P-value is 0.06

Q19: (a) $\hat{y} = 17.154 - 0.01015\,x$
(b) the predicted y-value is $\bar{y} = 13.88$.
We use $\bar{y}$, because there is no linear correlation.
(c) 0.375, or 37.5%
(d) $\sum(y - \hat{y})^2 = (n-2)s_e^2 = 0.135$
[Bonus] We compute $\hat{y} = 17.154 - 0.01015 \cdot 340 = 13.703$ and

$$\begin{aligned} E &= t_{\alpha/2} s_e \sqrt{1 + \frac{1}{n} + \frac{n(x_0 - \bar{x})^2}{n(\Sigma x^2) - (\Sigma x)^2}} \\ &= 2.306 \cdot 0.1299 \cdot \sqrt{1 + \frac{1}{10} + \frac{10 \cdot (340 - 322.6)^2}{10 \cdot 1041494 - (3226)^2}} \\ &= 0.365. \end{aligned}$$

Now the interval is 13.703 ± 0.365.
Another form for the prediction interval: $(13.338, 14.068)$.

Q20: (a) LP, because of the smallest P-value
(b) LP+LA; two pairs (LP+LA and LP+Lot) have the smallest P-value, but LP+LA has a larger R^2 than LP+Lot does
(c) Either LP+LA+Lot or LP+LA, there is no clear decision...
(the former has a little larger R^2, but it uses an extra variable)
(d) $341,920 (the same prediction by both LP+LA+Lot and LP+LA)