

Errata and Updates for ASM Exam S (Third Edition) Sorted by Date

[10/19/2017] On page 948, replace the last line of the solution to question 9 with

$$\Pr(N \geq 2) = 1 - p_0 - p_1 = 1 - e^{-0.191625}(1 + 0.191625) = \frac{0.191625^2}{2} = \boxed{0.016175} \quad (\mathbf{B})$$

[9/27/2017] On page 537, since “dispersion parameter” is not defined in the current syllabus, delete exercise 45.5.

[9/27/2017] On page 556, four lines above Example 47B, change $\frac{(-3)^2}{0.9}$ to $\frac{(-3)^2}{0.7}$.

[9/23/2017] On page 551, in the solution to exercise 46.7, on the fifth line, change 3.3479 to 3.2479.

[9/14/2017] On page 551, in the solution to exercise 46.10, on the fourth line, change $\Phi(1.01)$ to $\Phi(1.32)$.

[8/11/2017] On page 519, on the third line of the third paragraph, change “20th percentile” to “15th percentile”.

[8/11/2017] On page 576, in the solution to exercise 48.9, on the last displayed line, change 2(7) to 2(6).

[8/11/2017] On page 682, in the solution to exercise 56.7, on the fourth line, put an exponent 2 on 3.375.

[8/6/2017] On page 185, in the solution to exercise 16.5, in the second bullet, change the + before $1/(0.3 + 0.1)$ to =.

[6/25/2017] On page 95, on the third line of the answer to Example 9E, change $1/(n - i)$ to $1/(n - i + 1)$.

[6/13/2017] On page 630, 6 lines below the end of the answer to Example 53A, change $\mathbf{E}[Y_{ij} = \mu]$ to $\mathbf{E}[Y_{ij}] = \mu$.

[6/12/2017] On page 617, on the line above equation (51.2), change “ i^{th} variable” to “ i^{th} observation”.

[6/12/2017] On page 664, in the solution to exercise 54.7, on the first displayed line, replace the right side with

$$2 \left(\sum y_i \ln \hat{y}_i - \bar{y} \sum \ln y_i \right)$$

The answer key should be **(A)** instead of **(E)**.

[6/5/2017] On page 564, in the solution to exercise 47.12, replace the second line with $\mathbf{z} = \mathbf{X}\mathbf{b} + \mathbf{G}(\mathbf{y} - \boldsymbol{\mu})$.

[6/5/2017] On page 568, on the second line of Example 48C, the matrix must be symmetric, so replace the 4 in the first row with 1.

[5/28/2017] On page 692, in exercise 58.6, on the last line, delete the subscript 2 on α .

[5/28/2017] On page 698, in exercise 59.1, on the first line, change β_t to βt .

[5/28/2017] On page 703, on the second line of Example 60A, change w_{t+2} to w_{t-2} . On the last line, change “lag ‘1’ to “lag 2”.

[5/28/2017] On page 725, in exercise 62.5, on the first line, change the first w_t to y_t .

[5/28/2017] On page 726, in the solution to exercise 62.5, change \hat{w}_{41} to \hat{y}_{41} , \hat{w}_{42} to \hat{y}_{42} , and \hat{w}_{43} to \hat{y}_{43} . Do not change $\mathbf{E}[w_{42}]$.

[5/14/2017] On page 212, one line below Quiz 19-1, delete the word “not” both times it appears on that line. On the first line of Example 19D, replace “parallel set of series systems” with “series set of parallel systems”.

[5/14/2017] On page 563, in the solution to exercise 47.8, on the fourth line, the left side of the equation should be $\frac{\partial g}{\partial \pi_6}$

[5/11/2017] On page 545, on the second-to-last displayed line, replace the left side with

$$\frac{\sum_{k=1}^j \pi_k}{1 - \sum_{k=1}^j \pi_k}$$

[5/11/2017] On page 548, in the second equation under “Proportional odds model”, replace the left side with

$$\frac{\sum_{k=1}^j \pi_k}{1 - \sum_{k=1}^j \pi_k}$$

[5/11/2017] On page 571, replace Quiz 48-3 with the following:

For a linear model, the negative loglikelihood is 158.06. You are considering adding a 4-category categorical variable to the model.

Determine the highest value of the negative loglikelihood for which the additional variable is accepted if the AIC is used to select models.

[5/11/2017] On page 576, replace the solution to Quiz 48-3 with the following:

A 4-category variable adds 3 parameters to the model. The AIC penalty added to twice the negative loglikelihood increases by 6, so the negative loglikelihood must decrease by at least 3, to **155.06**.

[5/11/2017] On page 663, in the solution to exercise 54.3, on the second line from the end, insert “ln” before the fraction $\frac{3.5}{4.667}$.

[5/9/2017] On page 495, on the second line of the answer to Example 41D part 1, change $\Phi(1.15)$ to $\Phi(-1.15)$.

[5/9/2017] On page 617, in Example 51B, on the second line, replace “That example says that $p = 2$ with “In that example, $p = 3$.”

[5/9/2017] On page 839, in the solution to question 17, on the third line, change “or e” to “or 3”.

[5/7/2017] On page 993, in the solution to question 26, on the third line, change σ_* to σ_*^2

[5/6/2017] On page 994, in the solution to question 34, on the second line, put a sum sign before $\frac{(y_i - \mu)^2}{\sigma^2}$.

[4/30/2017] On page 700, replace the solution to exercise 59.3 with

By formula (58.2), the variance of the time series is

$$\gamma_0 = \frac{\sigma_w^2}{1 - \alpha_1^2} = \frac{25}{1 - 0.4^2} = 29.7619$$

and the autocorrelations are

$$\rho_k = \alpha_1^k = 0.4^k$$

Using formula (59.1),

$$\text{Var}(\bar{x}) = \frac{\sigma^2}{n} (1 + 2(1 - 1/n)\rho_1 + 2(1 - 2/n)\rho_2 + \cdots + 2(1 - 4/n)\rho_4)$$

$$\begin{aligned}
&= \frac{29.7619}{5} (1 + 2(0.8)(-0.4) + 2(0.6)(0.16) + 2(0.4)(-0.064) + 2(0.2)(0.0256)) \\
&= \boxed{3.0419}
\end{aligned}$$

[4/28/2017] On page 588, in the solution to exercise 49.6, on the second line, replace $\sum y_i^2$ with $\sum (y_i - \bar{y})^2$.

[4/28/2017] On page 785, in question 35, change the seventh line to

$$\sum \ln y_i = 160.6 \qquad \sum \ln \hat{y}_i = 160.0$$

[4/28/2017] On page 864, in the solution to question 35, change the last 3 lines to

$$D = 2 \sum \left(-\frac{y_i}{y_i} + \frac{y_i}{\hat{y}_i} - (\ln y_i - \ln \hat{y}_i) \right)$$

Using the values we're given for the sums,

$$D = 2(-50 + 50.1 - (160.0 - 160.6)) = \boxed{1.4} \quad (\mathbf{E})$$

[4/28/2017] On page 876, replace the last sentence of the solution to question 39 with the following:

From the likelihood ratio chi-square statistic and the loglikelihood of the minimal model, with $l(\mathbf{b})$ being the loglikelihood of the model,

$$2(l(\mathbf{b}) - (-182)) = 20.2$$

So the loglikelihood of the model is $l((b)) = -171.9$. The AIC is $2(-171.9) - 2(10) = \boxed{-363.8}$. **(A)**

The AIC is $-2(-183) + 20.2 + 10(2) = \boxed{404.2}$. **(C)**

[4/27/2017] On page 690, in the answer to Example 58A, on the eighth line, change the w_t on the right side of the line to x_t .

[4/27/2017] On page 721, in the solutions to exercises 61.8–61.10, change (63.4) to (63.5).

[4/23/2017] On page 555, in Example 47A, replace the third line with

$$\mu_i = \beta_1 + \beta_2 x_i$$

[4/23/2017] On page 556, in Example 47B, replace the third line with

$$\ln \mu_i = \beta_1 + \beta_2 x_i$$

[4/23/2017] On page 557, in Quiz 47-1, on the second line, change $\mathbf{X}^T \mathbf{b}$ to \mathbf{Xb} .

[4/23/2017] On page 562, replace the last line of the page with

$$(\mathbf{Xb})_1 + G_{11}(y_1 - \mu_1) = 4.75 + e^{-4.75}(105 - e^{4.75}) = \boxed{4.6584}$$

[4/23/2017] On page 566, on the fourth line of the page, after the words "under consideration", change π to $\hat{\pi}$.

[4/23/2017] On pages 566–567, on the last two lines of page 566 and the first line of page 567, replace every θ with θ_i , since θ varies with y_i .

[4/20/2017] On page 369, in the solution to exercise 29.12, replace the second and third lines with:

$$10 + 1.645\sqrt{\frac{600}{n}} = 20 - 0.842\sqrt{\frac{600}{n}}$$

$$2.487\sqrt{\frac{600}{n}} = 10$$

[4/14/2017] On page 556, one line below equation (47.8), change $\beta_1\bar{x}$ to $\beta_2\bar{x}$.

[4/14/2017] On page 786, in question 36, on the third line, change 1.10 to 5.15.

[4/14/2017] On page 864, in the solution to question 36, each subscript 1 should be 2 and each subscript 2 should be 3. The solution then reads

The numerator of the Wald statistic is the square of $\mathbf{b}_2 - \mathbf{b}_3 - 1 = 3.28 - 5.15 - 1 = -2.87$. The denominator is the variance of $\mathbf{b}_2 - \mathbf{b}_3$, which is

$$\text{Var}(\mathbf{b}_2) + \text{Var}(\mathbf{b}_3) - 2\text{Cov}(\mathbf{b}_2, \mathbf{b}_3) = 1.60 + 1.32 - 2(0.85) = 1.22$$

The Wald statistic is $(-2.87)^2/1.22 = 6.7516$. Since there is one constraint only (namely, $\beta_2 - \beta_3 = 1$), there is 1 degree of freedom. The critical values of chi-square at 1 degree of freedom are 6.63 at 1% significance and 7.88 at 0.5% significance. **(B)**

[4/13/2017] On page 519 in the last paragraph, delete all sentences past the first sentence through the end of the paragraph on page 518.

[4/13/2017] On page 939, in the solution to question 18, two lines from the end, put a negative sign in front of $\frac{4}{\ln \prod x_i}$

[3/28/2017] On page 98, in the solution to exercise 9.3, replace the last line of the solution with:

Since the number of tomatoes is an integer, the integer generating maximum profit must be either 40 or 41. Computing profit for both:

$$180(1 - e^{-40/100} - 1.2(40)) = 11.34239$$

$$180(1 - e^{-41/100} - 1.2(41)) = 11.34295$$

We see that expected profit is maximized if **41** tomatoes are bought.

[3/28/2017] On page 111, replace the solution to exercise 10.3 with the following:

The probability that the number of reports in a time interval of size h is more than 1 is proportional to h , so it is not $o(h)$. The number of dollars of loss has the same problem, and also may not be an integer-valued random variable. **(A)**

[3/28/2017] On page 536, change the formula for Tweedie distributions to

$$\text{Var}(Y) = aE[Y]^p$$

[3/26/2017] On page 660, in part 2 of Table 54.1, switch “both columns” and “one column” between formulas (54.3) and (54.4).

[3/25/2017] On page 70, in the solution to exercise 5.2, on the second-to-last line, interchange 0.2/0.14 and 0.3/0.14 in the matrix.

[3/25/2017] On page 714 , replace the solution to Quiz 60-2 with the following:

$$\begin{aligned} x_t &= (1 - 0.7\mathbf{B}^2)w_t \\ w_t &= (1 - 0.7\mathbf{B}^2)^{-1}x_t \\ &= (1 + 0.7\mathbf{B}^2 + 0.49\mathbf{B}^4 + 0.343\mathbf{B}^6)x_t \\ x_t &= w_t - 0.7x_{t-2} - 0.49x_{t-4} + 0.343x_{t-6} - \dots \end{aligned}$$

[3/24/2017] On page 980, in the solution to question 45, on the second line, change the first root 1 to -1 .

[3/21/2017] On page 632, two lines above the table, change “ $b - 1$ for SSTR, $k - 1$ for SSB” to “ $k - 1$ for SSTR, $b - 1$ for SSB. Replace the table with the following table:

Source	df	SS	MS	F
Treatments	$k - 1$	SSTR	$SSTR/(k - 1)$	$F_{k-1,(b-1)(k-1)} = MSTR/MSE$
Blocks	$b - 1$	SSB	$SSB/(b - 1)$	$F_{b-1,(b-1)(k-1)} = MSB/MSE$
Error	$(b - 1)(k - 1)$	SSE	$SSE / ((b - 1)(k - 1))$	
Total	$bk - 1$	SST		

[2/28/2017] On page 184, in the solution to exercise 16.1, on the second line, change “mean 1.5” to “mean $1/1.5$ ”.

[2/11/2017] On page 956, in the solution to question 14, on the fourth line, insert a 2 before $(828.37 - 826.23)$.

[2/5/2017] On page 455, in exercise 37.8, on the second to last line, add the word “mean” before “number”.

[1/17/2017] On page 414, in exercise 32.18, change the first line of the second bullet to

Sam submits X_i in premiums on day i , where X_i is expressed in millions. Summary statistics are:

Change the first line of the fourth bullet to

Vera submits Y_i in premiums on day i , where Y_i is expressed in millions. Summary statistics are:

[11/9/2016] On page 387, in the solution to exercise 30.19, on both displayed lines, change 150,000 to 15,000,000 (once apiece).

[11/9/2016] On page 544, on the fourth and fifth lines of Section 46.2, change X_j to X_i .

[11/9/2016] On page 565, on the third line of Section 48.1, replace $g(\mathbf{X}^T \mathbf{b})$ with $g^{-1}(\mathbf{X}^T \mathbf{b})$.

[11/9/2016] On page 586, in exercise 49.16, in the third bullet, change β to β_2 and $\hat{\beta}$ to $\hat{\beta}_2$.

[11/9/2016] On page 619, in exercise 51.6, add the following bullet after the two bullets listed there:

- The standard error of the regression is 3.000.

[11/9/2016] On page 620, in the solution to exercise 51.4, replace $(p + 1)/n$ with p/n .

[11/9/2016] On page 621, replace the solution to exercise 51.6 with the following, based on the revised exercise.

We standardize the residual

$$r_1 = \frac{\hat{\varepsilon}_1}{s\sqrt{1 - h_{11}}} = \frac{-0.135}{3\sqrt{0.85}} = -0.04881$$

Then

$$DFITS_1 = r_i \left(\frac{h_{ii}}{1 - h_{ii}} \right)^{1/2} = -0.04881 \left(\frac{0.150}{0.850} \right)^{1/2} = \boxed{-0.02050}$$

[11/9/2016] On page 641, in exercise 53.9 statement III, change I-percent to 1-percent.

[11/9/2016] On page 662, in the solution to exercise 54.1, on the third line, change 7.54 to 50.46.

[11/9/2016] On page 663, replace the solution to exercise 54.2 with

We will use formula (54.4) and therefore sum over both columns of the contingency table we developed when solving the previous exercise.

$$X^2 = \frac{(8 - 7.54)^2}{7.54} + \frac{(12 - 12.3)^2}{12.3} + \frac{(4 - 3.5)^2}{3.5} + \frac{(8 - 8.45)^2}{8.45} \\ + \frac{(50 - 50.46)^2}{50.46} + \frac{(70 - 69.70)^2}{69.70} + \frac{(31 - 31.50)^2}{31.50} + \frac{(57 - 56.55)^2}{56.55} = \boxed{0.147776}$$

Alternatively, we may use formula (54.3) and sum up over one column of the contingency table:

$$X^2 = \frac{(8 - 7.54)^2}{7.54(1 - 0.13)} + \frac{(12 - 12.3)^2}{12.3(1 - 0.15)} + \frac{(4 - 3.5)^2}{3.5(1 - 0.10)} + \frac{(8 - 8.45)^2}{8.45(1 - 0.13)} = \boxed{0.147776}$$

[11/9/2016] On page 693, in exercise 58.10, on the second line, replace $\hat{y}_{n+4|n}$ with $\hat{x}_{n+4|n}$.

[11/9/2016] On page 968, in the solution to question 5, on the third displayed line, the one for the second derivative, change $-\frac{x}{(1-\theta)^2}$ to $+\frac{x}{(1-\theta)^2}$.

[11/9/2016] On page 972, in the solution to question 23, on the last line, change 0.0002 to 0.002.

[10/27/2016] On page 774, in question 43, replace the last line of the question with

Let T be the current time.

Calculate the variance of $\frac{\sum_{j=1}^{10} x_{T+j}}{10}$, the sample mean of the next 10 values.

[10/26/2016] On page 992, replace the solution to question 19 with the following:

The mean difference is $42/16 = 2.625$. The variance of the differences is

$$\frac{16}{15} \left(\frac{352}{16} - 2.625^2 \right) = 16.11667$$

The variance of the mean difference is $16.11667/16 = 1.00729$. Since we assume a normal distribution for the scores, a t test is appropriate. The t statistic is

$$\frac{2.625}{\sqrt{1.00729}} = \boxed{2.615} \quad (\text{D})$$

[10/14/2016] On page 592, in the solution to exercise 49.18, change the final answer from 1.4944 to 1.4918.

[10/14/2016] On page 633, 4 lines above the second table, change "Checking F tables" up to the second comma to

Checking the F tables, this is between the 2% critical value of 14.04 and the 1% critical value of 21.2,

[10/14/2016] On page 652, replace the solution to exercise 53.17 with

$$F_{2,8} = \frac{145/2}{70/8} = \boxed{8.286}$$

[10/14/2016] On page 995, in the solution to question 44, on the sixth line, change $(B - 2)(B + 1)$ to $(B - 2)(B - 1)$.
On the seventh line, change $B + 1$ to $B - 1$.

[10/12/2016] On page 550, in the solution to exercise 46.1, change the exponent from $3.56 + 12.42(5)$ to $3.56 + 0.42(5)$.

[10/12/2016] On page 976, in the solution to question 20, on the fourth line, change $x > \frac{k}{2}$ to $x > \frac{1}{2k}$.

[10/8/2016] On page 976, in the solution to question 17, on the fifth line, put a negative sign before $\frac{n}{\theta^2}$.

[10/6/2016] On page 695, on the last line, add $\rho_4 = 0$ after $\rho_3 = 0.1$.

[10/1/2016] On page 1000, replace the last line of the solution to question 16 with

$$\rho = 1 - \frac{6(1^2 + 2^2 + 1^2 + 1^2 + 1^2 + 2^2 + 2^2)}{10(99)} = \boxed{0.90303} \quad (\text{E})$$

[9/30/2016] On page 999, in the solution to question 13, the final answer is $\boxed{0.021}$. Remove the negative sign.

[9/28/2016] On page 884, replace the third and later lines of the solution to question 33 with

The standard error of the regression is $s = \sqrt{3.518817/(6 - 3)} = 1.083023$. The first standardized residual is $0.0923/(1.083023\sqrt{1 - 0.5626}) = 0.128862$.

$$\text{DFITS}_2 = 0.128862 \left(\frac{0.5626}{1 - 0.5626} \right)^{1/2} = \boxed{0.1461} \quad (\text{D})$$

[9/28/2016] On page 999, in the solution to question 11, on the second line, change $3/n$ to $9/n$.

[9/27/2016] On page 355, in the solution to exercise 28.2, on the first line, change μ to 4μ .

[9/26/2016] On page 998, in the solution to question 7, change $(1000 + 1500 + 5000)/3 = \boxed{2500}$ to $(1000 + 2500 + 5000)/3 = \boxed{2888\frac{1}{3}}$.

[9/24/2016] On page 802, in question 36, change the fifth bullet to

$$\bullet (\mathbf{X}^T \mathbf{W} \mathbf{X})^{-1} = \begin{pmatrix} 8.5498 & -3.5764 \\ -3.5764 & 1.6843 \end{pmatrix}$$

[9/24/2016] On page 876, replace the last 2 lines of the solution to question 36 with

Use the weighted regression formula (equation (47.8) with $\bar{x} = 7.5$, $\bar{y} = 10.5$,

$$b_1 = \frac{(-5.5)(-9.5) + (1/5^2)(-3.5)(-5.5) + (1/15^2)(1.5)(1.5) + (1/27^2)(7.5)(13.5)}{(-5.5)^2 + (1/5^2)(-3.5)^2 + (1/15^2)(1.5)^2 + (1/27^2)(7.5)^2} = \boxed{1.75631} \quad (\text{D})$$

[9/24/2016] On page 892, in the solution to question 37, on the line for age 30 in the table, exchange 8,950,901 and 9,501,381.

[9/23/2016] On page 678, replace the answer to Example 56B, starting with the third line, with

$$(3 - 5)(12 - 13) + (7 - 5)(14 - 13) + (3 - 5)(11 - 13) = 8$$

Also, $5c_0(x, x) = 3^2 + (-1)^2 + (-2)^2 + 2^2 + (-2)^2 = 22$ and $5c_0(y, y) = (-1)^2 + 1^2 + (-2)^2 + 0^2 + 2^2 = 10$.
So

$$r_2(x, y) = \frac{8}{\sqrt{(10)(22)}} = \boxed{0.53936}$$

[9/21/2016] On page 549, in exercise 46.9, in the table, change 0.222 to 0.220 and change 0.054 to 0.056.

[9/20/2016] On page 540, replace the solution to exercise 45.10 with
Use formula (45.3)

$$\begin{aligned} b'(\theta) &= \frac{1.6}{\theta^3} \\ c'(\theta) &= -\frac{1.6}{\theta^2} \\ E[Y] &= -\frac{c'(\theta)}{b'(\theta)} = \frac{1}{\theta} = \sqrt{0.6} = \boxed{0.7746} \quad (\text{C}) \end{aligned}$$

[9/17/2016] On page 575, replace the first two lines of the solution to exercise 48.1 with

$$\begin{aligned} D &= 2(10 \ln(10/7) + 12 \ln(1) + 15 \ln(15/20) + 18 \ln(18/19) + 20 \ln(20/25) \\ &\quad - (10 - 7) - (12 - 12) - (15 - 20) - (18 - 19) - (20 - 25)) = 3.631 \end{aligned}$$

[9/17/2016] On page 575, in the solution to exercise 48.2, replace the final answer 0.03133 with 0.6166.

[9/17/2016] On page 575, in the solution to exercise 48.8, on the third line, change 4.804 to 4.808.

[9/17/2016] On page 576, in the solution to Quiz 48-2, change 19.92 in the final answer to 15.92.

[9/12/2016] On page 535, on the second line of exercise 45.1, the displayed line should read

$$f(y; \theta) = \exp(a(y)b(\theta) + c(\theta) + d(y))$$

[9/6/2016] On page 324, in the solution to Quiz 25-2, change 3θ to 5θ and change the final answer from $\boxed{20}$ to $\boxed{120}$.

[8/28/2016] On page 538, in exercise 45.10, replace the fourth bullet with $\theta = 1/\sqrt{0.6}$.

[8/28/2016] On page 576, the solution to exercise 48.11 is incorrect. The correct solution is
We want $2(110.52) - 2 \ln n > 2(105.34)$, so

$$\begin{aligned} -2 \ln n &> -10.36 \\ \ln n &< 5.18 \\ n &< 177.68 \end{aligned}$$

The highest n is $\boxed{177}$.

[8/18/2016] On page 593, in the solution to Quiz 49-1, change the last line to

$$R^2 = \frac{122}{285 + 122} = \boxed{0.2998}$$

- [8/18/2016] On page 652, in the solution to exercise 53.22, on the fifth line, change $200 - 10 - 30 - 80$ to $200 - 10 - 30 - 120$.
- [8/18/2016] On page 670, on the 7th line of the page, the line for m_6 , change the + before 30.875 to =.
- [8/5/2016] On page 95, 3 lines from the bottom, change $\sum_{j=1}^i 1/(n-j)^2$ to $\sum_{j=0}^{i-1} 1/(n-j)^2$.
- [8/5/2016] On page 679, in the heading for the last formula of Table 56.1, change cvf to ccf.
- [8/2/2016] On page 219, on the fourth displayed line, change the last summation index from $i < j$ to $i < j < k$.
- [8/2/2016] On page 226, in exercise 20.8, on the line below the diagram, change 0.9 to 0.8.
- [7/29/2016] On page 581, in the second bullet, change ‘ p degrees of freedom’ to ‘ $p - 1$ degrees of freedom’.
- [6/9/2016] On page 220, on the fifth line of the answer to Example 20E, change C_5 to C_4 .