

# Introduction to Probability and Statistics for Scientists and Engineers Errata

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## 1 Errata

There are errata in the text, including statements of the problems, errata in the Answers to Odd-Numbered Problems, and in the Instructor's Solutions Manual itself. These are listed separately in sections 2, 3, and 4.

## 2 Errata in text

p.61, Eq (2.14):

$$P(A_1 \cup A_2 \cup \dots \cup A_i \cup \dots) = \sum_{1 \leq i < \infty} P(A_i)$$

p.126: 3.37(b)  $P(X > 9) = 1 - B(9; 20, p)$

p.171, Problem 4.54: The random variable  $X$  has pdf  $f$  given by

p.175, line -5:

$$\begin{aligned} F(2000, 400) &= P(X \leq 2000, Y \leq 400) = f(1600, 400) + f(2000, 400) \\ &= 0.30 + 0.20 = 0.50. \end{aligned}$$

p.231: 3 lines down from Eq. 6.12:

$$P(\chi^2 \leq \chi_n^2(\alpha)) = 1 - P(\chi^2 > \chi_n^2(\alpha)) = 1 - \alpha.$$

p.257, problem 7.4(c): Compute the [estimated] standard error of your estimate.

p.273, lines -4 and -5 from the bottom:

$$L(\mathbf{x}; \hat{\boldsymbol{\theta}}) \geq L(\mathbf{x}; \boldsymbol{\theta}), \boldsymbol{\theta} \in \Theta.$$

p.274, line -12 from the bottom:  $\hat{p} = 0$  or 1

p.308, Problem 8.22 (correction)  $\{\bar{x} : \bar{x} > 210\}$  in part (c) of Prob. 8.1.]

p.332, line 6:

$$\beta(0.5) = \Phi\left(\frac{0.457 - 0.5}{\sqrt{0.5 \times 0.5/200}}\right) = \Phi(-1.22) = 0.1112.$$

p.345, Table 9.10.  $n_3 = 100$

p.345, Table 9.1. Column  $B_4$  sum = 32

p.348, Problem 9.14 (correction)  $n = 50$  tosses of the coin

p.349 The number of suburban voters who rate crime as the most important issue is 37, not 39. The correct table is given below.

Voter	Health Care	Crime	Economy	Taxes	Totals
Urban	113	62	75	25	275
Suburban	88	37	75	50	250
Rural	60	10	20	10	100
Totals	261	109	170	85	625

p.361,  $SSE = \sum (y_i - \hat{y}_i)^2$

p.381, Table 10.9, C Total DF= 17

p.397, Problem 10.27 (correction) Refer back to Prob 10.8 (not Prob 10.18)

p.409 Equation (11.13)  $(\mathbf{I} - \mathbf{H})\mathbf{Y}$

Equation (11.16)  $\mathbf{H}(\mathbf{I} - \mathbf{H})$

p.412 Equation (11.24)

$$\text{Cov}(\mathbf{Y}) = E[(\mathbf{Y} - E(\mathbf{Y}))(\mathbf{Y} - E(\mathbf{Y}))']$$

p.413 lines -11 and -12 from the bottom of the page:

line -12:  $\text{Cov}(\mathbf{Y}) = \sigma^2 \mathbf{I}$

line -11:  $= \mathbf{A}\sigma^2 \mathbf{I}\mathbf{A}'$

p.414 (Just after Equation (11.31):  $\text{Cov}(\mathbf{Y}) = \sigma^2 \mathbf{I}$

p.423  $H_0 : \beta_1 = \cdots = \beta_k = 0$

p.423  $H_1 : \text{at least one } \beta_i \neq 0$

p.423, line -5:  $H_0 : \beta_1 = \cdots = \beta_k = 0$

p.424 line -12:  $H_0 : \beta_1 = \beta_2 = 0$

p.427 line -11:  $SSR(f) - SSR(r) = 39.58691 - 34.76792 = 4.81719$

p.435, Prob. 11.14.  $\mathbf{e} = (\mathbf{I} - \mathbf{H})\mathbf{Y}$ .

p.444, line 2: replace  $e_{ij}$  with  $\epsilon_{ij}$

p.457, line 15:

$$H_0 : \frac{\mu_1 + \mu_2}{2} = \frac{\mu_3 + \mu_4 + \mu_5}{3}.$$

p.459, Eq. (12.16):

$$\hat{\theta} = \sum_i c_i \bar{Y}_i.$$

p.464, Problem (12.17):

$$\hat{\theta} = \sum_i c_i \bar{Y}_i$$

Problem 12.18 (Continuation of Problem 12.7)

p.466, Equation (12.29): Replace  $\hat{V}(\bar{Y}_{..})$  by  $s^2(\bar{Y}_{..})$

p.466, line 12: Replace  $\hat{V}(\bar{Y}_{..})$  by  $s^2(\bar{Y}_{..})$

p.479, Table 13.3: Center DF over  $a - 1$ .

p.480, line -2:

$$\bar{Y}_i - \bar{Y}_k \pm q(\alpha; a, \nu) \sqrt{\frac{MSE}{b}} \quad (13.14)$$

p.486, line -10 from the bottom:

$$E(Y_{ijk}) = \mu_{ij} \text{ and } V(Y_{ijk}) = \sigma^2.$$

P.539, Problem 14.4: change  $\bar{R}_i$  to  $R_i$

### 3 Answers to odd numbered problems

p.567, Chapter 3

3.37(a)  $B(4; 10, 0.4) = 0.633$ ; (b)  $1 - B(9; 20, 0.20) = 0.003$ ,  
 $1 - B(9; 20, 0.5) = 0.58$ ,  $1 - B(9; 20, 0.7) = 0.983$ ,  $1 - B(9; 20, 0.90) \approx 1.00$

p.568, 3.43(c)  $P(Y > 4) = 1 - P(Y \leq 4) = 1 - 0.957 = 0.043$

p.569, 4.37(a)  $P(Y = y) = b(y; 100; 0.7)$

p.570, 5.25(a)  $\lambda t = 1.5 \times 2 = 3$ .  $P(X(2) \leq 3) = 0.647$

p.571, Chapter 6

6.11(c)  $P(T > 25) \approx 0.0375$

6.17(c)  $a = 3.247$ ,  $b = 20.483$

p.571, Chapter 7:

7.1(c) [73.25, 76.75]

7.13(a):  $L = 0.1490$   $U = 0.1552$  ( $0.152 \pm 0.0031$ )

p.572 Chapter 8:

8.7 (c)  $\beta(0.09) = 0.7257$

8.9 (c)  $P(|t_{24}| > 1.5)$ ;  $P(|t_{24}| > 2)$

8.29

$$\frac{\bar{X}_1 - \bar{X}_2}{s_p \sqrt{(1/12) + (1/12)}} = -1.852$$

P-value =  $P(|t_{22}| > 1.852) > P(|t_{22}| > 2.074) = 0.05$ . We do not reject  $H_0$ .

8.31(a):

$$\frac{\bar{X}_1 - \bar{X}_2}{s_p \sqrt{(1/7) + (1/6)}} = -9.1843$$

P-value =  $P(|t_{11}| > 9.1843) < P(|t_{11}| > 3.106) = 0.01$ . Test is significant at 5% level.

8.33

$$\frac{\bar{D}}{s_D/\sqrt{n}} = 2.142$$

$$P(|t_{14}| > 2.142) \geq P(|t_{14}| > 2.145) = 0.05$$

The P-value is greater than 0.05.

p.573 Chapter 9

9.1(b)  $\alpha = 0.02$

p.574 line 2: 9.5 (a)  $1 - B(8; 15, p)$

p.574 10.5(c)  $SSE = 25.64$

p.576 Chapter 11

Problem (11.3)

(a)

$$\begin{pmatrix} Y_1 \\ Y_2 \\ Y_3 \\ Y_4 \\ Y_5 \\ Y_6 \\ Y_7 \end{pmatrix} = \begin{pmatrix} 1 & 14 \\ 1 & 16 \\ 1 & 27 \\ 1 & 42 \\ 1 & 39 \\ 1 & 50 \\ 1 & 83 \end{pmatrix} \begin{pmatrix} \beta_0 \\ \beta_1 \end{pmatrix} + \begin{pmatrix} \epsilon_1 \\ \epsilon_2 \\ \epsilon_3 \\ \epsilon_4 \\ \epsilon_5 \\ \epsilon_6 \\ \epsilon_7 \end{pmatrix}$$

p.577 Problem 12.15 (a)

$LSD = 2.4085$ . The three 95% confidence intervals are:  $[13.3415, 18.1585]$ ,  $[12.2165, 17.0335]$ ,  $[15.2165, 20.0335]$ .

P.578-580 (Chapter 13)

The ANOVA tables for problems 13.3(b), 13.5(b), 13.7(a) and 13.9(a) are correct, but incomplete. In addition, the ANOVA tables 13.15(c), 13.17(c), 13.21(b) and 13.21(d) can be simplified and reformatted into one table.

Here are the completed and reformatted versions of these tables:

P.578, 13.3(b)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
A	2	248.4444444	124.2222222	48.61	0.0001
B	5	82.4444444	16.4888889	6.45	0.0063
Error	10	25.5555556	2.5555556		
Corrected Total	17	356.4444444			

P.578, 13.5(b)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
A	2	12857.20000	6428.60000	217.18	0.0001
B	4	308.40000	77.10000	2.60	0.1161
Error	8	236.80000	29.60000		
Corrected Total	14	13402.40000			

P.578, 13.7(a)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
SLAGS	6	731.0580952	121.8430159	1.54	0.2457
SOIL	2	5696.3400000	2848.1700000	36.07	0.0001
Error	12	947.433333	78.952778		
Corrected Total	20	7374.831429			

P.578, 13.9(a)

Source	DF	SS	Mean Square	F Value	Pr > F
FUNGCIDE	1	1.29323105	1.29323105	18.41	0.0001
PESTCIDE	2	0.64873201	0.32436600	4.62	0.0154
FUNGCIDE*PESTCIDE	2	0.71247627	0.35623813	5.07	0.0106
Error	42	2.94960161	0.07022861		
Corrected Total	47	5.60404094			

P.579, 13.15(c)

Source	DF	Type I SS	Mean Square	F Value	Pr > F
GAUGER	2	896450.000	448225.000	1.63	0.2142
BREAKER	2	2506116.667	1253058.333	4.56	0.0196
GAUGER*BREAKER	4	663833.333	165958.333	0.60	0.6629
Error	27	7415475.000	274647.222		
Corrected Total	35	11481875.000			

P.579, 13.17(c)

Dependent Variable: WARPING

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
TEMP	3	156.0937500	52.0312500	7.67	0.0021
COPPER	3	698.3437500	232.7812500	34.33	0.0001
TEMP*COPPER	9	113.7812500	12.6423611	1.86	0.1327
Error	16	108.5000000	6.7812500		
Corrected Total	31	1076.7187500			

P.580, 13.21(b)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
X8	1	0.08037225	0.08037225	5.05	0.0441
X4	1	2.79558400	2.79558400	175.82	0.0001
X8*X4	1	0.00036100	0.00036100	0.02	0.8827
Error	12	0.19080650	0.01590054		
Corrected Total	15	3.06712375			

P.580, 13.21(d)

Dependent Variable: Y2      Log of s-square

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
X8	1	1.28034883	1.28034883	18.55	0.0010
X4	1	0.24897605	0.24897605	3.61	0.0818
X8*X4	1	0.12122583	0.12122583	1.76	0.2097
Error	12	0.82812271	0.06901023		
Corrected Total	15	2.47867342			

## 4 Solutions manual

p.32, Problem 1.15b: There are four outliers: 5746, 5878, 6169, 7787

p.67 Problem 3.37(b)

$$\begin{aligned}
 1 - B(9; 20; 0.2) &= 1 - 0.997 = 0.003 \\
 1 - B(9; 20; 0.5) &= 1 - 0.412 = 0.588 \\
 1 - B(9; 20; 0.7) &= B(10; 20; 0.3) = 0.983 \\
 1 - B(9; 20; 0.9) &= B(10; 20; 0.1) = 1.00.
 \end{aligned}$$

p.86, Problem 4.26(b):  $\eta = 66 + 0.84 \times 15 = 77.6$ p.101, Problem 5.25(a):  $P(X(2) \leq 3) = P(2; 3) = 0.647$ .

p.120, Problem 7.37(a)

$$\hat{p}_1 = 0.04; \hat{p}_1 + 1.28 \times \sqrt{\frac{\hat{p}_1(1 - \hat{p}_1)}{500}} = 0.04 + 0.0112 = (0, 0.0512)$$

p.120, Problem 7.37(b)

$$\hat{p}_2 = 0.0667; \hat{p}_1 + 1.28 \times \sqrt{\frac{\hat{p}_1(1 - \hat{p}_1)}{600}} = 0.0667 + 0.0130 = (0, 0.0797)$$

p.130, Problem 8.29(a)

$$\frac{\bar{X}_1 - \bar{X}_2}{s_p \sqrt{(1/12) + (1/12)}} = -1.8522$$

P-value =  $P(|t_{22}| > 1.8522) > P(|t_{22}| > 2.074) = 0.05$ . We do not reject  $H_0$ .

p.130, Problem 8.33

$$\frac{\bar{D}}{s_D/\sqrt{n}} = 2.142$$

$$P(|t_{14}| > 2.142) > P(|t_{14}| > 2.145) = 0.05$$

The P-value is greater than 0.05.

p.131, Problem 8.35(b)

$$\frac{|W_1 - E(W_1)| - 0.5}{\sigma(W_1)} = \frac{185 - 130 - 0.5}{18.0243} = 3.0237$$

The P-value is  $Prob(Z > 3.0237) = 0.0012$ .