

ERRATA

MATHEMATICS FOR AUSTRALIA 12

Mathematical Methods

Worked Solutions

First edition - 2018

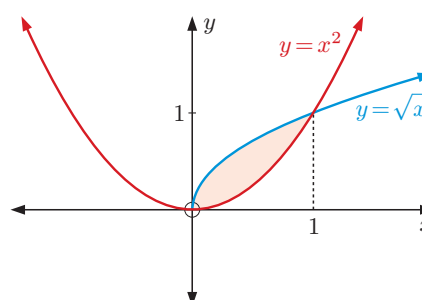
The following errata were made on 06/Mar/2020

page 226 **EXERCISE 5B** Question **3 b**, should not consider $x = -1$:

$$\begin{aligned}
 \mathbf{3 \quad b} \quad y = \sqrt{x} \text{ meets } y &= x^2 \\
 \text{where } \sqrt{x} &= x^2 \\
 \therefore x &= x^4 \\
 \therefore x^4 - x &= 0 \\
 \therefore x(x^3 - 1) &= 0 \\
 \therefore x &= 0 \text{ or } 1
 \end{aligned}$$

$$\text{Area} = \int_0^1 [y_U - y_L] dx$$

....



page 320 **REVIEW SET 7A** Question **4 c**, should read:

4 c $X = 2$ has the highest chance of occurring, so 2 is the mode of this distribution.

The following errata were made on 21/Feb/2020

page 141 **EXERCISE 3E** Question **7 c**, should read:

- 7 c**
- i** The object is moving to the right when the velocity is **positive**.
 $\therefore$ the object is moving to the right for $t > \frac{1}{2}$ second.
 - ii** The object is moving to the left when the velocity is **negative**.
 $\therefore$ the object is moving to the left for $0 \leq t < \frac{1}{2}$ second.

page 231 **EXERCISE 5B** Question **13 b**, last line should read:

13 b $\therefore$ the **intersection points have x -coordinates -2 , 1 , and 3 respectively**.

page 233 **EXERCISE 5C.1** Question **2 b**, second line should read:

$$\begin{aligned}
 \mathbf{2 \quad b} \quad &\text{Total distance travelled} \\
 &= \text{total area between the graph and the } t\text{-axis} \\
 &= \text{area A} + \text{area B} + \text{area C} + \text{area D} + \text{area E} + \text{area F} \\
 &= \frac{1}{2}(0.1)(60) + (0.1)(60) + \frac{1}{2}(0.1)(60) + \frac{1}{2}(0.1)(20) + (0.1)(20) + \frac{1}{2}(0.1)(20) \\
 &= 3 + 6 + 3 + 1 + 2 + 1 \\
 &= 16 \text{ km}
 \end{aligned}$$

$$\begin{aligned} \mathbf{5 \quad b} \quad &= \frac{20}{\pi} + \frac{20}{\pi} \\ &= \frac{40}{\pi} \text{ units} \end{aligned}$$

- 1 a i** $\sum_{x=1}^4 P(X = x) = 0.2 + 0.4 + 0.15 + 0.25 = 1$
 Since $\sum_{x=1}^4 P(X = x) = 1$ and $0 \leq P(X = x) \leq 1$ for all x , it is a valid probability distribution.
- ii** $\sum_{x=0}^3 P(X = x) = 0.2 + 0.3 + 0.4 + 0.2 = 1.1$
 Since $\sum_{x=0}^3 P(X = x) > 1$, it is not a valid probability distribution.
- iii** $\sum_{x=0}^4 P(X = x) = 0.2 + 0.2 + 0.2 + 0.2 + 0.2 = 1$
 Since $\sum_{x=0}^4 P(X = x) = 1$ and $0 \leq P(X = x) \leq 1$ for all x , it is a valid probability distribution.
- iv** Since $P(X = 5) = -0.2 < 0$, it is not a valid probability distribution.

- 3 b** Since $P(X = 0) \neq P(X = 1)$, X is not a uniform discrete random variable as the possible values of X are not equally likely to occur.

- 7 b** Let Y be the return on a game. The cost is $\$a$, so the expected gain is
 $E(Y) - a = \frac{a}{3} \times [P(X \leq 3) + P(7 \leq X \leq 9)] + 7 \times P(4 \leq X \leq 6) + 21 \times P(X \geq 10) - a$

- 2 a i** $\sum_{x=1}^3 P(X = x) = 0.6 + 0.25 + 0.15 = 1$
 Since $\sum_{x=1}^3 P(X = x) = 1$ and $0 \leq P(X = x) \leq 1$ for all x , it is a valid probability distribution.
- ii** $\sum p_i = 0.3 + 0.5 + 0.1 + 0.2 = 1.1$
 Since $\sum p_i > 1$, it is not a valid probability distribution.
- iii** Since $P(X = 1) = -0.2 < 0$, this is not a valid probability distribution.
- iv** $\sum_{x=2}^5 P(X = x) = 0.25 + 0.25 + 0.25 + 0.25 = 1$
 Since $\sum_{x=2}^5 P(X = x) = 1$ and $0 \leq P(X = x) \leq 1$ for all x , it is a valid probability distribution.
- v** $\sum_{x=2}^3 P(X = x) = 0.7 + 0.3 = 1$
 Since $\sum_{x=2}^3 P(X = x) = 1$ and $0 \leq P(X = x) \leq 1$ for all x , it is a valid probability distribution.
- vi** $\sum_{x=0}^1 P(X = x) = 0.28 + 0.72 = 1$
 Since $\sum_{x=0}^1 P(X = x) = 1$ and $0 \leq P(X = x) \leq 1$ for all x , it is a valid probability distribution.

page 320 **REVIEW SET 7A** Question **4 a**, should read:

4 c $X = 2$ has the highest chance of occurring, so 2 is the mode of this distribution.

page 326 **REVIEW SET 7B** Question **7 a**, should read:

7 a X is not a binomial random variable because the probability of rolling a two is not the same for each die.

page 327 **REVIEW SET 7B** Question **10 a**, should read:

10 a The probability of success (spinning a 3) is the same for each spin, and the number of spins is fixed.

page 361 **EXERCISE 8F.1** Questions **2 d, e, and f**, remove irrelevant middle lines between first and last lines:

10 d If $P(Z \geq k) = 0.95$
 $\therefore k \approx -1.64$

e If $P(Z \geq k) = 0.90$
 $\therefore k \approx -1.28$

f If $P(Z \geq k) = 0.41$
 $\therefore k \approx 0.228$

The following erratum was made on 22/Oct/2019

page 419 **EXERCISE 9F.2** Question **2**, should read:

$$\begin{aligned} \mathbf{2} \text{ The required sample size } n &= \left(\frac{2 \times 1.96}{w} \right)^2 p^*(1 - p^*) \\ &= \left(\frac{2 \times 1.96}{0.04} \right)^2 \times 0.1 \times 0.9 \\ &\approx 865 \quad \{\text{rounded up}\} \end{aligned}$$

So, 865 trial runs are needed.

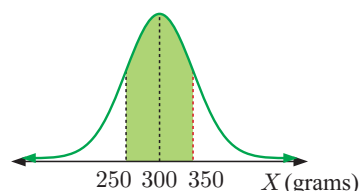
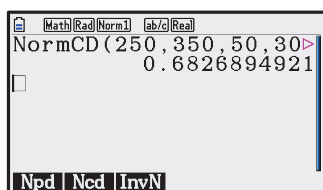
The following errata were made on 02/Sep/2019

page 352 **EXERCISE 8D** Question **8 c i**, should read:

8 c i $\therefore$ Enrique has the higher probability to spend at least 1 hour at the gym.

page 384 **REVIEW SET 8B** Question **11 a**, normal distribution diagram should appear symmetrical:

11 a Let X grams be the weight of an apple.
 $X \sim N(300, 50^2)$



$$P(250 \leq X \leq 350) \approx 0.682689$$

So, approximately 68.3% of apples are fit for sale.

The following erratum was made on 12/Jul/2019

page 209 **EXERCISE 4G** Question **5**, should have parts **k** and **l**:

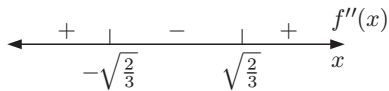
$$\begin{array}{ll} \mathbf{5} \quad \mathbf{k} \quad \int_0^1 e^{1-x} dx = [-e^{1-x}]_0^1 & \mathbf{l} \quad \int_0^{\frac{\pi}{6}} \sin 3x dx = \left[-\frac{1}{3} \cos 3x\right]_0^{\frac{\pi}{6}} \\ & = (-e^0) - (-e) \\ & = e - 1 \quad (\approx 1.72) & = \left(-\frac{1}{3} \cos\left(\frac{\pi}{2}\right)\right) - \left(-\frac{1}{3} \cos 0\right) \\ & & = 0 - \left(-\frac{1}{3}\right) \\ & & = \frac{1}{3} \end{array}$$

The following errata were made on or before 15/May/2019

page 108 **EXERCISE 3B** Question **8**, last line should read:

$$\mathbf{8} \quad \therefore \text{ if } f(x) \text{ is never increasing, then } -1 \leq k \leq 0.$$

page 125 **EXERCISE 3D.1** Question **4 g ii**, sign diagram should be:

$$\begin{array}{ll} \mathbf{4} \quad \mathbf{g} \quad \mathbf{ii} \quad f''(x) = 12x^2 - 8 & \therefore f''(x) \text{ has sign diagram:} \\ & = 4(3x^2 - 2) \\ & = 4(\sqrt{3}x + \sqrt{2})(\sqrt{3}x - \sqrt{2}) \end{array}$$


page 158 **EXERCISE 3G** Question **10**, change the lines before **Sign diagram test** to:

$$\begin{array}{l} \mathbf{10} \quad \dots \\ \quad \therefore -3x^2 + 40x - 100 = 0 \\ \quad \therefore -(3x - 10)(x - 10) = 0 \\ \quad \quad \therefore x = \frac{10}{3} = 3\frac{1}{3} \quad \{\text{as } 0 \leq x \leq 5\} \\ \quad \dots \end{array}$$

page 169 **REVIEW SET 3A** Question **11 b ii**, last line should read:

$$\mathbf{11} \quad \mathbf{b} \quad \mathbf{ii} \quad \therefore \text{ it will take } \approx 201 \text{ years for the tree to reach a height of } 300 \text{ cm.}$$

page 201 **EXERCISE 4E.2** Question **2 d**, last line should read:

$$\mathbf{2} \quad \mathbf{d} \quad \therefore f(x) = e^x + 3 \sin x - e^\pi$$

page 229 **EXERCISE 5B** Question **9 b**, diagram should have region filled for $0 \leq x \leq 2$:

$$\begin{array}{l} \mathbf{9} \quad \mathbf{b} \quad f(x) = -x(x-2)(x-4) \\ \quad \therefore y = f(x) \text{ cuts the } x\text{-axis at } 0, 2, \text{ and } 4. \\ f(x) = -x(x-2)(x-4) \\ \quad = -x(x^2 - 6x + 8) \\ \quad = -x^3 + 6x^2 - 8x \end{array}$$

