

Answers to Selected Exercises

14. The Poisson Process

2. The Exponential Distribution
 3. The Gamma Distribution
 4. The Poisson Distribution
 5. Splitting a Poisson Process
 6. Bernoulli Trials and the Poisson Process
 7. Higher Dimensional Poisson Processes
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2. The Exponential Distribution

☑ 2.16.

- a. $G(t) = 1 - e^{-s t}$, $g(t) = s e^{-s t}$ for $t \geq 0$, where $s = \sum_{i=1}^n r_i$
- b. $H(t) = \prod_{i=1}^n (1 - e^{-r_i t})$ for $t \geq 0$
- c. $h(t) = n (1 - e^{-r t})^{n-1} r e^{-r t}$ for $t \geq 0$

☑ 2.21. Let X denote the call length.

- a. $\mathbb{P}(2 < X < 4) = 0.4237$
- b. $Q_1 = 1.4384$, $Q_2 = 3.4657$, $Q_3 = 6.9315$, $Q_3 - Q_1 = 5.4931$

☑ 2.22. Let T denote the lifetime

- a. $\mathbb{P}(T > 2000) = 0.1353$
- b. $Q_1 = 287.682$, $Q_2 = 693.147$, $Q_3 = 1386.294$, $Q_3 - Q_1 = 1098.612$

☑ 2.23. Let T denote the time between requests.

- a. $\mathbb{E}(T) = 0.5$, $\text{sd}(T) = 0.5$
- b. $\mathbb{P}(T < 0.5) = 0.6321$
- c. $Q_1 = 0.1438$, $Q_2 = 0.3466$, $Q_3 = 0.6931$, $Q_3 - Q_1 = 0.5493$

☑ 2.24. Let X denote the lifetime.

- a. $r = 0.02231$
- b. $\mathbb{E}(X) = 44.814$, $\text{sd}(X) = 44.814$
- c. $Q_1 = 12.8922$, $Q_2 = 31.0628$, $Q_3 = 62.1257$, $Q_3 - Q_1 = 49.2334$

☑ 2.25. Let X denote the position of the first defect.

- a. $r = 0.01$
- b. $\mathbb{P}(X < 200|X > 150) = 0.3935$
- c. $\text{sd}(X) = 100$
- d. $Q_1 = 28.7682, Q_2 = 69.3147, Q_3 = 138.6294, Q_3 - Q_1 = 109.8612$

3. The Gamma Distribution

- 3.4. 0.1991
- 3.5. 0.1746
- 3.10. 2, 0.6325
- 3.11. $r = \frac{1}{10}, k = 4$
- 3.15.

- a. 0.5302
- c. 0.4871

- 3.16. 0.5752
- 3.20. $r = 6.67$ hits per minute

4. The Poisson Distribution

- 4.6. 0.7798
- 4.7. 0.8153
- 4.12. 32, 5.657
- 4.19.

- a. 0.6157
- c. 0.6025

- 4.20. 0.8818
- 4.23. 0.6
- 4.26. 0.9452
- 4.30. $r = 5.7$ per minute

5. Splitting a Poisson Process

- 5.6. 0.5814
- 5.11.

- a. 515
- b. 50

6. Bernoulli Trials and the Poisson Process

6.9.

- a. 0.8245
- c. 0.8153

6.10. 0.7350

6.11.

- a. 0.2063
- c. 0.2149
- d. 0.2146

6.12.

- a. 0.6066
- c. 0.5837
- d. 0.6247

6.13.

- a. 0.1227
- b. 0.0803

7. Higher Dimensional Poisson Processes

7.4.

- a. 0.4562
- b. 2.5, 1.581

7.5.

- a. 0.2426
- b. 24, 4.899

7.6.

- a. $r = 80$ per square mile
- b. 0.0171

7.13. 0.0491

7.16. 0.2146

7.18.

- a. Mild: 7.854, 2.802; Moderate: 4.712, 2.171; Severe: 3.142, 1.772
- b. 0.7762