

Answers to Selected Exercises

13. 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