

Chapter 07 연습문제 정답

1.

- (a) 9
- (b) 0.0112
- (c) 0.9999

2.

- (a) $f(x) = \binom{10}{x} (0.2)^x (0.8)^{10-x}, \quad x = 0, 1, 2, \dots, 10$
- (b) $\mu = 2, \sigma^2 = 1.6$
- (c) 0.2013
- (d) 0.0328

3.

- (a) $f(x) = \binom{20}{x} (0.05)^x (0.95)^{20-x}, \quad x = 0, 1, 2, \dots, 20$
- (b) $\mu = 1, \sigma^2 = 0.95$
- (c) 약 0.3774
- (d) 약 0.2641

4.

- (a) $f(x) = \binom{15}{x} (0.85)^x (0.15)^{15-x}, \quad x = 0, 1, 2, \dots, 15$
- (b) $\mu = 12.75, \sigma^2 = 1.9125$
- (c) 0.8227
- (d) 0.0006

5.

- (a) $f(x) = \frac{\binom{5}{x} \binom{95}{20-x}}{\binom{100}{20}}, \quad x = 0, 1, 2, 3, 4, 5$
- (b) $\mu = 1, \sigma^2 \approx 0.7677$
- (c) 약 0.4201
- (d) 약 0.2606

6.

(a) $f(x) = \frac{\binom{3}{x}\binom{17}{5-x}}{\binom{20}{5}}, x = 0, 1, 2, 3$

(b) $\mu = 0.15, \sigma^2 \approx 0.5033$

(b) $\frac{35}{76}$

(c) $\frac{137}{228}$

7.

(a) $\mu = 0.05, \sigma^2 = \frac{16245}{23984} \approx 0.6773$

(b) 0.3657

(c) 0.1710

8.

(a) $f(x_1, x_2, x_3, x_4) = \frac{\binom{2}{x_1}\binom{3}{x_2}\binom{4}{x_3}\binom{6}{x_4}}{\binom{15}{10}}, x_1 + x_2 + x_3 + x_4 = 10, x_1 = 0, 1, 2, x_2 = 0, 1, 2, 3,$

$x_3 = 0, 1, \dots, 4, x_4 = 0, 1, \dots, 6$

(b) $\frac{120}{1001} \approx 0.1199$

(c) 4

9.

(a) 0.033

(b) 0.384

10.

(a) 0.061

(b) 0.08

(c) 0.156

(d) 0.371

11.

(a) 0.6

(b) 0.329

(c) 0.122

12.

- (a) $X \approx P(4)$
- (b) 0.433
- (c) 0.371

13.

- (a) 4
- (b) 0.156

14.

- (a) 0.157
- (b) 0.137
- (c) $e^{-0.5} \approx 0.6065$
- (d) 2(초)

15.

(a) X 의 확률질량함수 : $f_X(x) = \frac{4^x}{x!} e^{-4}, x = 0, 1, 2, \dots$

Y 의 확률질량함수 : $f_Y(y) = \frac{2^y}{y!} e^{-2}, y = 0, 1, 2, \dots$

T 의 확률밀도함수 : $f_T(t) = 4e^{-4t}, t > 0$

(b) $\mu_X = 4, \sigma_X^2 = 4, \mu_Y = 2, \sigma_Y^2 = 2, \mu_T = \frac{1}{4}, \sigma_T^2 = \frac{1}{16}$

(c) 0.762

(d) 0.323

(e) $e^{-6} \approx 0.0025$

(f) 약 0.9380

16. $2^5 \times e^{-10} \approx 0.0015$

17.

(a) (증명 생략)

(b) $f(x) = \begin{cases} \frac{2}{3} e^{-m} \frac{m^x}{x!} + \frac{1}{3} e^{-\mu} \frac{\mu^x}{x!}, & x = 0, 1, 2, \dots \\ 0 & , \text{ 다른 곳에서} \end{cases}$

(c) $E(X) = \frac{2m + \mu}{3}, \sigma^2 = \frac{1}{9} [2(m - \mu)^2 + 3(2m + \mu)]$

18.

(a) $f(x) = (0.01)(0.99)^{x-1}, x = 1, 2, 3, \dots$

(b) $(0.01)(0.99)^9 \approx 0.0091$

(c) $0.99^{19} \approx 0.8262$

(d) 100

(e) 200

(f) 약 0.0017

19.

(a) 200

(b) 0.04889

(c) 0.0049

(d) $P(X > 10 + 5 | X > 10) = P(X > 5) = P(X \geq 6) = (0.005)(0.995)^5 = 0.00488$

(e) 400

(f) $f(x) = \binom{x-1}{1} (0.005)^2 (0.995)^{x-2}, x = 2, 3, \dots$

(g) 약 0.0002

20.

(a) $f(x) = \frac{1}{10}, 95 < x < 105$

(b) $\mu = 100, \sigma^2 = \frac{25}{3}$

(c) 0.7

21.

(a) $\mu = 3.65, \sigma^2 = 0.00083$

(b) 0.7

(c) 4.2

22.

(a) $f(x) = 2e^{-2x}, x > 0$

(b) $\mu = \frac{1}{2}, \sigma^2 = \frac{1}{4}$

(c) $S(x) = e^{-2x}$

(d) $h(x) = 2$

(e) $-\frac{1}{2} \ln 0.75 \approx 0.1438$

(f) $-\frac{1}{2} \ln 0.5 \approx 0.3466$

23.

(a) $\alpha = 1, \beta = 3$

(b) $f(x) = \frac{1}{3} e^{-y/3}, x > 0$

(c) $F(x) = 1 - e^{-x/3}, x > 0$

(d) $S(x) = e^{-x/3}, x > 0$

(e) $h(x) = \frac{1}{3}, x > 0$

(f) $e^{-2/3} - e^{-1} \approx 0.1455$

24.

(a) $f(x) = \frac{1}{250} x^2 e^{-x/5}, x > 0$

(b) 약 0.1665

(c) 약 0.3799

25.

(a) $f(x) = 0.4 e^{-0.4x}, x > 0$

(b) $\mu = 2.5, \sigma^2 = 6.25$

(c) $S(x) = e^{-0.4x}, x > 0$

$h(x) = 0.4$

(d) $e^{-0.8} \approx 0.4493$

(e) $e^{-4/5} \approx 0.4493$

26.

(a) 0.625

(b) $e^{-2.4} \approx 0.0907$

(c) 모수 8인 푸아송분포

(d) 0.986

27.

(a) $f(x) = \frac{1}{10} e^{-x/10}, x > 0$

(b) $f_Y(y) = \frac{1}{2000} y^2 e^{-y/10}, y > 0$

(c) 30

(d) $P(X \geq 25) = e^{-2.5} \approx 0.0821$

$P(Y \geq 50) = \frac{37}{2} e^{-5} \approx 0.1247$

28.

(a) $1 - e^{-4/3} \approx 0.7364$

(b) $e^{-5/3} \approx 0.1889$

(c) $e^{-1/3} \approx 0.7165$

29.

(a) $\mu = \frac{3\sqrt{\pi}}{2} \approx 2.6587$

(b) $S(x) = e^{-x^2/9}, h(x) = \frac{2}{9}x, x > 0$

(c) $1 - e^{-1/36} \approx 0.0274$

(d) $e^{-1} \approx 0.3679$

(e) 약 0.6969

30.

(a) $\alpha = \sqrt[3]{300}, \beta = 3$

(b) $f(x) = \frac{1}{100}x^2e^{-x^3/300}, x > 0$

(c) $F(x) = 1 - e^{-x^3/300}, x > 0$

(d) $S(x) = e^{-x^3/300}, x > 0$

(e) $\mu \approx 5.98$

(f) $e^{-10/3} \approx 0.0357$

31.

(a) 약 0.9817

(b) $e^{-4/2.25} \approx 0.169$

(c) $h(x) = \frac{2}{2.25}x, x > 0$

(d) $\mu = \frac{1.5\sqrt{\pi}}{2} \approx 1.33$

중앙값 : $\sqrt{-(2.25)\ln 0.5} \approx 1.2488$

32.

(a) $1 - e^{-3/2} \approx 0.7769$

(b) $e^{-2} \approx 0.1353$

(c) $h(x) = \frac{1}{4\sqrt{x}}, x > 0$

(d) $\mu = 8$

중앙값 : $(-2\ln 0.5)^2 \approx 1.92$

33.

(a) $1 - e^{-1/4} \approx 0.2211$

(b) $e^{-1} \approx 0.3679$

(c) $h(x) = \frac{1}{8}x, x > 0$

(d) $\mu = 2\sqrt{\pi} \approx 3.54$

중앙값 : $\sqrt{-16 \ln 0.5} \approx 3.33$

(e) $x_0 = \sqrt{-16 \ln 0.05} \approx 6.92$

해충의 95%가 약 6.9분 안에 죽는다.

34.

(a) $\mu \approx 2.5, \sigma^2 \approx 1.7168$

(b) $F(x) = 1 - e^{-x^2/8}, x > 0$

(c) $S(x) = e^{-x^2/8}, x > 0$

(d) $h(x) = \frac{x}{4}, x > 0$

(e) 약 0.3935

(f) 약 0.3347

35.

(a) $\mu = 0.75, \sigma^2 = 0.1875$

(b) $F(x) = 1 - \frac{1}{8x^3}, x \geq \frac{1}{2}$

(c) $S(x) = \frac{1}{8x^3}, x \geq \frac{1}{2}$

(d) $h(x) = \frac{6}{x}, x \geq \frac{1}{2}$

(e) 약 0.9277

(f) 0.008

36.

(a) $\mu = 0, \sigma^2 \approx 13.1595$

(b) $F(x) = \frac{1}{1 + e^{-x/2}}, -\infty < x < \infty$

(c) $S(x) = \frac{e^{-x/2}}{1 + e^{-x/2}}, -\infty < x < \infty$

(d) $h(x) = \frac{1}{2(1 + e^{-x/2})}, -\infty < x < \infty$

(e) 약 0.8808

(f) 약 0.1824

37.

(a) $\alpha = 3, \beta = 2$

(b) $f(x) = 12x^2(1-x), 0 < x < 1$

(c) $F(x) = (4-3x)x^3, 0 < x < 1$

(d) 0.6875

38.

(증명 생략)