

HW: Geometric, Negative Binomial, Uniform,
Exponential Distributions

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3.2: 1, 2a, 5, 6a-c
4.1: 1, 2, 4
4.2: 2, 3

3.2

a) $P(X=4) = (1-.7)^3(.7) = 0.0189$

b) $P(X=1) = (1-.7)^0(.7) = 0.7$

c) $P(X \leq 5) = 1 - (1-.7)^5 = 0.9976$

d) $P(X \geq 8) = 1 - P(X \leq 7) = 0.0002$

2a) $P(X=5) = \binom{4}{2} (.6)^3 (1-.6)^{5-3} = 0.2074$

c) $P(X \leq 7) = P(X=3) + P(X=4) + P(X=5) + P(X=6) + P(X=7) = 0.9037$

5a) $P(X=4) = (1-.09)^3 (.09) = 0.0678$ binomial

b) $P(X=3) = \binom{9}{2} (.09)^3 (1-.09)^7 = 0.0136$ NB

c) Geometric $E(V) = \frac{1}{.09} = 11.11$

d) NB $E(V) = \frac{3}{.09} = 33.33$

6a) Geometric $E(V) = \frac{1}{.37} = 2.703$

b) NB $E(V) = \frac{3}{.37} = 8.108$

c) $P(X \geq 3) = 1 - P(X \leq 2) = 1 - \binom{10}{3} (.37)^3 (1-.37)^7 = 0.7794$

4.1

1a) $E(X) = \frac{a+b}{2} = \frac{5}{2} = 2.5$

b) $Var(X) = \frac{(b-a)^2}{12} = \frac{8-3}{12} = 3.175$

c) $P(X) = .75$, $.75 = \frac{x+3}{11}$, $x = 5.25$

d) $P(0 \leq X \leq 4) = F(4) - F(0) = \frac{4-3}{8-3} - \frac{3}{11} = 0.3636$

2a) $E(X) = \frac{1.43 + 1.6}{2} = 1.515$

b) $\sigma = \frac{1.6 - 1.43}{\sqrt{12}} = 0.0491$

c) $F(x) = \frac{x - 1.43}{0.17}$, for $1.43 \leq x \leq 1.6$

d) $F(1.48) = 0.2941$

e) $F(1.5) = 0.412$, Binomial $E(X) = n \cdot p = 50 \times .412 = 20.6$

$Var(X) = n \cdot p \cdot (1-p) = 50 \cdot .412 \cdot (1-.412) = 12.11$

0,25

4.1 cont

4a) $E(X) = \frac{2.5}{2} = 1.25$, $Var(X) = \frac{(b-a)^2}{12} = \frac{2.5^2}{12} = 0.5208$

b) indep, large or smaller, Binomial, $n=25, p=0.6$, $P(X \geq 20) = P(X=20) + P(X=21) + P(X=22) + P(X=23) + P(X=24) + P(X=25) = \binom{25}{20} \cdot 0.6^{20} \cdot (0.4)^5 + \dots = 0.0294$

2,3

4.2

2a) $E(X) = \frac{1}{\lambda} = \frac{1}{0.1} = 10$

b) $P(X > 10) = 1 - F(10) = 1 - (1 - e^{-1.0}) = 0.3679$

c) $P(X < 5) = F(5) = 0.3935$

d) Additional wait time has a distribution with $\lambda = 0.1$

$P(X > 15 | X = 5) = P(\text{Additional} > 10) = 0.3679$

e) $E(X) = \frac{20}{2} = 10$, 5 minutes less or $U(0, 15)$

3a) $E(X) = \frac{1}{0.2} = 5$

b) $\sigma = \frac{1}{0.2} = 5$

c) $F(x) = 0.5$, $1 - e^{-\lambda x} = 0.5$, $x = -\frac{1}{0.2} \ln(0.5) = 3.47$

d) $P(X \geq 7) = 1 - P(X \leq 7) = 1 - F(7) = 0.2466$

e) $P(X \geq 2) = 1 - P(X \leq 2) = 0.6703$