

Tutorial Session 4 — Discrete Probability Distributions

Q 7.52 Given $n=15$, $p(s) = \frac{7}{10} = 0.7$, from table, Binomial Distribution

a) $P(X=4) = 0.001$

b) $P(X \leq 4) = P(1) + P(2) + P(3) + P(4)$
 $= 0.001 + 0.001 + 0.001 + 0.001$
 $= 0.004$

c) $n=15$, $p(s) = 1 - 0.7 = 0.3$ (not single vehicle)
 $P(X \leq 6) = 0.147$

Q 7.55 Express checkout
 Given $n=5$, $p(s) = 0.25$, from table, Binomial Distribution

a) $P(X=2) = 0.264$

b) $P(X \leq 1) = P(0) + P(1)$
 $= 0.237 + 0.396$
 $= 0.633$

c) $P(X \geq 2) = 1 - P(X \leq 1)$
 $= 1 - 0.633$
 $= 0.367$

d) $P(X \neq 2) = 1 - P(X=2)$
 $= 1 - 0.264$
 $= 0.736$

Q 7.62 Automobiles Inspection
 Given $n=15$, $p(s) = 0.3$, from table, Binomial Distribution

a) $P(X \leq 5) = P(0) + P(1) + P(2) + \dots + P(5)$
 $= 0.005 + 0.031 + 0.092 + \dots + 0.206$
 $= 0.723$

b) $P(5 \leq X \leq 10) = P(5) + P(6) + \dots + P(10)$
 $= 0.206 + 0.147 + \dots + 0.003$
 $= 0.484$

Q 7.67. Songs Playlist
 a) 'Until a song by this artist is played' \Rightarrow Geometric, $p(s) = \frac{8}{100} = 0.08$

b) $P(X=4) = (1-p)^{x-1} (p) = (1-0.08)^{4-1} \cdot 0.08$
 $= (0.92)^3 \cdot 0.08$
 $= 0.062$

bii) $P(X \leq 4) = P(1) + P(2) + P(3) + P(4) = (0.92)^0 \cdot 0.08 + (0.92)^1 \cdot 0.08 + (0.92)^2 \cdot 0.08 + (0.92)^3 \cdot 0.08$
 $= 0.08 + 0.0736 + 0.068 + 0.062$
 $= 0.284$

biii) $P(X > 4) = 1 - P(X \leq 4) = 1 - 0.284 = 0.716$

Cont'
bins.

Q7.67

$$\begin{aligned}P(X \geq 4) &= 1 - P(X < 4) = 1 - P(X \leq 3) \\&= 1 - (P(1) + P(2) + P(3)) \\&= 1 - (0.08 + 0.0736 + 0.0688) \\&= 1 - 0.221 \\&= 0.779\end{aligned}$$

Q7.68

Catches a Ball

a.

Geometric

b.

$$\begin{aligned}\text{Given } p(x) &= 0.1 \\P(X=2) &= (1-0.1)^{2-1} (0.1) \\&= 0.9 \cdot 0.1 \\&= 0.09\end{aligned}$$

c.

$$\begin{aligned}P(X > 3) &= 1 - P(X \leq 3) \\&= 1 - (P(1) + P(2) + P(3)) \\&= 1 - (0.1 + 0.09 + 0.081) \\&= 1 - 0.271 \\&= 0.729\end{aligned}$$