

1)

$$\lambda = 12$$

$$p < 14 \quad \vee \quad p \geq 18$$

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$$P\{X=k\} = \frac{\lambda^k}{k!} e^{-\lambda} \quad k=0,1,2,\dots,12$$

$$E(X) = \lambda \quad \text{wart. średnia}$$

$$\lambda = 12$$

$$P(13) = \sum_{k=0}^{13} \frac{12^k}{k!} \cdot e^{-12} \approx 0.6815$$

$$P(\geq 18) = 1 - \sum_{k=0}^{17} \frac{12^k}{k!} \cdot e^{-12} \approx 0.0630$$

$$P(A) = 0.6815 + 0.0630 = 0.7445$$

2)



$$P(A \cup B) > 7 \quad \wedge \quad P(A \cup B) \leq 11$$

$$\Omega = 6 \cdot 6 = 36$$

$$P(A) = \frac{\sum_{k=1}^5 k}{36} = \frac{\frac{1+5}{2} \cdot 5}{36} = \frac{15}{36}$$

(6,6)

$$P(B) = \frac{35}{36}$$

$$(P(A) \cap P(B)) = \frac{14}{36}$$

3)

$$p = 0.3$$

$$p = 0.7$$

$$P\{A\} = P\{X \leq 3\} = P\{(X=0) \cup (X=1) \cup (X=2) \cup (X=3)\} \quad \text{suma}$$

$$P(0) = \binom{6}{0} \cdot (0.3)^0 \cdot (0.7)^6$$

$$\text{ilosc realizacji zdarzen} \quad P(1) = \binom{6}{1} \cdot (0.3)^1 \cdot (0.7)^5$$

$$P(2) = \binom{6}{2} \cdot (0.3)^2 \cdot (0.7)^4$$

$$P(3) = \binom{6}{3} \cdot (0.3)^3 \cdot (0.7)^3$$

$$P(A) \approx 0.9295$$

4)

$$p = 0.8 \quad q = 0.2$$

$$P(X \geq 11) \wedge (P \leq 14)$$

$$P(A) \quad \text{no same values all vary} \quad P(C) = \binom{11}{11} \cdot (0.2)^0 (0.8)^{11} = 1 \cdot 1 \cdot \left(\frac{8}{10}\right)^{11} \approx 0.0859$$

$$P(\leq 14) = \binom{14}{1} \cdot 0.8^{13} \cdot 0.2^1$$

$$\binom{14}{2} \cdot 0.8^{12} \cdot 0.2^2$$

$$\binom{14}{3} \cdot 0.8^{11} \cdot 0.2^3$$

$$P(B) \approx 0.6542$$

$$0.6542 - 0.0859 = 0.5683$$

$$P(B|A) = \frac{P(A \cap B)}{P(A)} = \frac{0.6542 \cdot 0.0859}{0.0859} = 0.6542$$