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Statistika 2 - A

Soal Distribusi Poisson

1. Diket : $n = 192$

probabilitas munculnya satu muka $= \frac{1}{2}$

probabilitas munculnya 6 muka adalah $\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{64} = p$

Maka $q = 1 - p = 1 - \frac{1}{64} = \frac{63}{64}$

Dg menggunakan Distribusi Binomial diperoleh

$$P(X = x) = \binom{192}{x} \left(\frac{1}{64}\right)^x \left(\frac{63}{64}\right)^{192 - x}, \quad x = 0, 1, 2, \ldots, 192$$

Dg menggunakan Distribusi Poisson $\mu = np = 192\left(\frac{1}{64}\right) = 3$.

$$P(X = x) = \frac{e^{-3}(3)^x}{x!}$$

$$P(X = 0) = \frac{e^{-3}(3)^0}{0!} = 0{,}0497$$

$$P(X = 1) = \frac{e^{-3}(3)^1}{1!} = \frac{(0{,}0497).(3)}{1} = 0{,}1493$$

$$P(X = 2) = \frac{e^{-3}(3)^2}{2!} = \frac{(0{,}0497)(9)}{2 \times 1} = 0{,}2240$$

$$P(X = 3) = \frac{e^{-3}(3)^3}{3!} = \frac{(0{,}0497)(\cancel{27})^{9}}{\cancel{3} \times 2 \times 1} = 0{,}2240$$

$$P(X = 4) = \frac{e^{-3}(3)^4}{4!} = \frac{(0{,}0497)(\cancel{81})^{27}}{4 \times \cancel{3} \times 2 \times 1} = 0{,}1680$$

$$P(X = 5) = \frac{e^{-3}(3)^5}{5!} = \frac{(0{,}0497)(\cancel{243})^{81}}{5 \times 4 \times \cancel{3} \times 2 \times 1} = 0{,}1006$$

$$P(X = 6) = \frac{e^{-3}(3)^6}{6!} = \frac{(0{,}0497)(\cancel{729})^{\cancel{243}\ 81}}{2\cancel{6} \times 5 \times 4 \times 3 \times 2 \times 1} = 0{,}0503$$

2. - Rata - rata $= \mu = n \cdot p = 192 \cdot \left(\frac{1}{64}\right) = 3$

- Simpangan baku $\sigma = \sqrt{np} = \sqrt{3} = 1{,}73$

- Variansi : $\sigma^2 = \lambda = np = 192\left(\frac{1}{64}\right) = 3$

- Koefisien kemiringan $\alpha_3 = \frac{1}{\sqrt{\mu}} = \frac{1}{\sqrt{3}} = \frac{1}{1{,}73} = 0{,}5780$

- Koefisien keruncingan $\alpha_4 = 3 + \frac{1}{\mu} = 3 + \frac{1}{3} = \frac{9}{3} + \frac{1}{3} = \frac{10}{3} = 3{,}33$

3. Diket : $n = 56$

probabilitas munculnya 1 muka $= \frac{1}{2}$

probabilitas munculnya 3 muka $= \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{8} = p$

Maka $q = 1 - p = 1 - \frac{1}{8} = \frac{7}{8}$

Dg menggunakan distribusi Poisson $\mu = np = 56 \cdot (\frac{1}{8}) = 7$

$P(x=x) = \frac{e^{-7}(7)^x}{x!}$, dg $e^{-7} = 0{,}000912$

$P(x=0) = \frac{e^{-7}(7)^0}{0!} = 0{,}0009$

$P(x=1) = \frac{e^{-7}(7)^1}{1!} = 0{,}0063$

$P(x=2) = \frac{e^{-7}(7)^2}{2!} = 0{,}0223$

$P(x=3) = \frac{e^{-7}(7)^3}{3!} = 0{,}0521$

4. - Rata-rata $\mu = n \cdot p = 56 \cdot (\frac{1}{8}) = 7$

- simpangan baku $\sigma = \sqrt{n \cdot p} = \sqrt{7} = 2{,}645$
- varians $\sigma^2 = n \cdot p = 56 (\frac{1}{8}) = 7$
- Koefisien kemiringan $: \sigma_3 = \frac{1}{\sqrt{\mu}} = \frac{1}{\sqrt{7}} = 0{,}3779$
- Koefisien keruncingan $: \sigma_4 = 3 + \frac{1}{\mu} = 3 + \frac{1}{7} = \frac{21}{7} + \frac{1}{7} = \frac{22}{7} = 3{,}14$.

5. Diket : $n = 10$

probabilitas produk yg cacat $= 10\% = 0{,}1 = p = \frac{1}{10}$

Untuk memperoleh 2 alat yg cacat berarti $x = 2$

Dg menggunakan distribusi Poisson $\mu = np = 10 \cdot (\frac{1}{10}) = 1$

$P(x=x) = \frac{e^{-1}(1)^x}{x!}$, dg $e^{-1} = 0{,}367879$

$P(x=2) = \frac{e^{-1}(1)^2}{2!} = 0{,}1839$

6. Diket : $n = 3000$

$p = \frac{2}{2000} = 0{,}001$

Dg menggunakan distribusi Poisson $\mu = n \cdot p = (3000)(0{,}001) = 3$

a). Pak Tugar mendapat paling banyak 2 pasang sepatu, berarti $P(x \leq 2)$

$P(x \leq 2) = P(x=0) + P(x=1) + P(x=2)$

$P(X=0) = \frac{e^{-3}(3)^0}{0!} = 0,0497$

$P(X=1) = \frac{e^{-3}(3)^1}{1!} = 0,1493$

$P(X=2) = \frac{e^{-3}(3)^2}{2!} = 0,2240$

Maka $P(X \leq 2) = P(X=0) + P(X=1) + P(X=2)$

$= 0,0497 + 0,1493 + 0,2240$

$= 0,423$

b) Pak Yogar melempar lebih dari 3 pasang sepatu yg tdk memenuhi standar mutu, maka $P(X>3)$

$P(X>3) = 1 - P(X \leq 3)$

$P(X \leq 3) = P(X=0) + P(X=1) + P(X=2) + P(X=3)$

$= 0,0497 + 0,1493 + 0,2240 + 0,2240$

$= 0,647$

$P(X>3) = 1 - P(X \leq 3)$

$= 1 - 0,647$

$= 0,353 = 0,35$

c) - Rata-rata $= \mu = n \cdot p = 3000 \cdot 0,001 = 3$

- Simpangan baku $\sigma = \sqrt{\mu} = \sqrt{3} = 1,73$

7. Diket: $n = 1.000$

$p = \frac{50}{10.000} = 0,005$

Dg menggunakan distribusi Poisson $\mu = n \cdot p = 1000 \cdot 0,005 = 5$

a) Peluang toko mendapat komplain dari 7 pelanggan maka $P(X=7)$

$P(X=x) = \frac{e^{-5}(5)^x}{x!}$, Dg $e^{-5} = 0,006738$

$P(X=7) = \frac{e^{-5}(5)^7}{7!} = \frac{526,406}{5040} = 0,1044$

b) Mendapat komplain dari 5 pelanggan maka $P(X=5)$

$P(X=5) = \frac{e^{-5}(5)^5}{5!} = \frac{21,0562}{120} = 0,1755$

c) Mendapat komplain dari 2 pelanggan maka $P(X=2)$

$P(X=2) = \frac{e^{-5}(5)^2}{2!} = \frac{0,1684}{2} = 0,0842$

d) Tidak ada komplain maka $P(X=0)$

$P(X=0) = \frac{e^{-5}(5)^0}{0!} = \frac{0,0067}{1} = 0,0067$

e) Lebih dari 2 pelanggan maka $P(X>2) = 1 - P(X \leq 2)$

$P(x>2) = 1 - P(x \leq 2)$

$= 1 - [P(x=0) + P(x=1) + P(x=2)]$

$= 1 - [0{,}0067 + 0{,}0337 + 0{,}0842]$

$= 1 - 0{,}1246$

$= 0{,}8754$

8. Diket : $\mu = 4$

peluang pd hari esok yg akan terjual

a) lampu LED sebanyak 5 maka $P(x=5)$

$$P(x=5) = \frac{e^{-4}(4)^5}{5!}$$

$$= \frac{18{,}7552}{120}$$

$$= 0{,}1563$$

b) Lampu LED sebanyak 3 maka $P(x=3)$

$$P(x=3) = \frac{e^{-4}(4)^3}{3!}$$

$$= \frac{1{,}1722}{6}$$

$$= 0{,}1954$$

9. Diket : $n = 20$

$p = 0{,}02$

probabilitas dari 3 mesin yg mengalami gangguan maka $P(x=3)$

Dg menggunakan distribusi Poisson $\mu = n \cdot p = 20 \cdot 0{,}02 = 0{,}4$

$$P(x=3) = \frac{e^{-0{,}4}(0{,}4)^3}{3!}, \text{ Dg } e^{-0{,}4} = 0{,}67032$$

$$= \frac{0{,}04290048}{6} = 0{,}00715 = 0{,}0072$$

10. Diket : $n = 4000$

$p = 0{,}0005$

Dg menggunakan distribusi Possion $\mu = n \cdot p = 4000 \cdot 0{,}0005 = 2$

menghitung 3 orang akan shock maka $P(x=3)$

$$P(X=x) = \frac{e^{-2}(2)^x}{x!}, \text{ Dg } e^{-2} = 0{,}135335$$

$$P(x=3) = \frac{e^{-2}(2)^3}{3!}$$

$$= \frac{1{,}08268}{6}$$

$$= 0{,}18044$$