7. H_0: распред. Пуассона $\quad p(k) = \dfrac{\lambda^k e^{-\lambda}}{k!}$

$H_1 : \overline{H_0}$ $\quad \alpha = 0.05$

$n=5$	A_1	A_2	A_3	A_4	A_5
i	0	1	2	3	4
p_i	$e^{-\lambda}$	$\lambda e^{-\lambda}$	$\frac{\lambda^2}{2}e^{-\lambda}$	$\frac{\lambda^3}{6}e^{-\lambda}$	$\frac{\lambda^4}{24}e^{-\lambda}$
m_i	109	65	22	3	1

$\Delta \sim \chi^2(5-1-1) = \chi^2(3)$

ОМП

$$L = (e^{-\lambda})^{109} \cdot (\lambda \cdot e^{-\lambda})^{65} \cdot \left(\frac{\lambda^2}{2}e^{-\lambda}\right)^{22} \cdot \left(\frac{\lambda^3}{6}e^{-\lambda}\right)^{3} \cdot \frac{\lambda^4}{24}e^{-\lambda} = \frac{\lambda^{122}e^{-200\lambda}}{C}$$

$$\ln L = 122 \ln \lambda - 200\lambda - \ln C$$

$$\frac{\partial \ln L}{\partial \lambda} = \frac{122}{\lambda} - 200 \Rightarrow \hat{\lambda} = 0.61$$

$$\frac{\partial^2 \ln L}{\partial \lambda^2} = -\frac{122}{\lambda^2} \Rightarrow \max$$

nP_i 108.67 66.29 20.22 $\underbrace{4.11 \quad 0.63}_{\text{объединим}}$

$n=4$	A_1	A_2	A_3	A_4
i	0	1	2	3/4
p_i	$e^{-\lambda}$	$\lambda e^{-\lambda}$	$\frac{\lambda^2}{2}e^{-\lambda}$	$\frac{4\lambda^3+\lambda^4}{24}e^{-\lambda}$
m_i	109	65	22	4

$\Delta \sim \chi^2(4-1-1) = \chi^2(2)$

QMΠΓ

$$L = (e^{-\lambda})^{109} \cdot (\lambda e^{-\lambda})^{65} \cdot \left(\frac{\lambda^2}{2} \cdot e^{-\lambda}\right)^{22} \cdot \left(\frac{4\lambda^3+\lambda^4}{24} e^{-\lambda}\right)^4 =$$

$$= \frac{e^{-200\lambda}\,\lambda^{109}}{c}(4\lambda^3+\lambda^4)^4$$

$$\ln L = 109 \ln\lambda - 200\lambda + 4 \ln(4\lambda^3+\lambda^4)$$

$$\frac{\partial \ln L}{\partial \lambda} = \frac{109}{\lambda} - 200 + 4\,\frac{12\lambda^2+4\lambda^3}{4\lambda^3+\lambda^4} =$$

$$= \frac{109}{\lambda} - 200 + \frac{48+16\lambda}{4\lambda+\lambda^2} = 0$$

$$436 + 109\lambda - 800\lambda - 200\lambda^2 + 48 + 16\lambda = 0$$

$$-200\lambda^2 - 675\lambda + 484 = 0$$

$$\lambda^2 + 3.375\lambda - 2.42 = 0$$

$$D = 3.375^2 + 4 \cdot 2.42 = 21.0706$$

$$\tilde{\lambda} = \frac{-3.375 + \sqrt{21.0706}}{2} \simeq 0.608$$

$$\frac{\partial^2 \ln L}{\partial \lambda^2} = -\frac{109}{\lambda^2} + \frac{16(4\lambda+\lambda^2) - (4+2\lambda)(48+16\lambda)}{(4\lambda+\lambda^2)^2} =$$

$$= -\frac{109}{\lambda^2} + \frac{-(192+196\lambda+16\lambda^2)}{(4\lambda+\lambda^2)^2} < 0 \Rightarrow \max$$

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nP_i 108.93 66.19 20.11 4.70

$$\tilde{\Delta} = \frac{(108.93-109)^2}{108.93} + \frac{(66.19-65)^2}{66.19} + \frac{(20.11-22)^2}{20.11} + \frac{(4.70-4)^2}{4.70} \simeq 0.301$$

$$p\text{-value} = P(\Delta \geq \tilde{\Delta} \mid H_0) = \int_{0.301}^{\infty} q(t)\,dt \simeq 0.86 > 0.05$$

Нет оснований отвергать H_0.