№9.

	С.	Ч.	Ф.	
„5"	100. **85**	40 **51**	50. **51**	190.
„4"	65 **77**	60. **46**	50. **46**.	175.
	165.	100.	100.	365.

$P_5 = \frac{190}{365} = 0,52.$ $\qquad P_c = \frac{165}{365} = 0,45.$

$P_4 = \frac{175}{365} = 0,47.$ $\qquad P_ч = \frac{100}{365} = 0,27.$

$\qquad P_Ф = \frac{100}{365} = 0,27.$

$$\chi_н = \underbrace{\frac{225}{85}}_{2,64} + \underbrace{\frac{121}{51}}_{2,37} + \underbrace{\frac{1}{51}}_{0,02} + \underbrace{\frac{144}{77}}_{1,87} + \underbrace{\frac{196}{46}}_{4,26} + \underbrace{\frac{16}{46}}_{0,34} = 11,53.$$

$\chi_{crit_2} = 5,991.$

$\chi_{obs} > \chi_{crit} \Rightarrow$ Ho отвергается

№7.

$\hat{\gamma} = \frac{0,07 + 2,46 + 6,3 + 0,36 + 0,0025}{4} = 2,3.$

$\alpha = 0,05.$

$H_0: \mu_x = \mu_y.$

$H_1: \mu_x < \mu_y$

$\bar{x} = 1,26.$

$\bar{y} = 1,49.$

$t_{obs} = \frac{0,23 - 0}{1,49}, 2 = 0,3.$

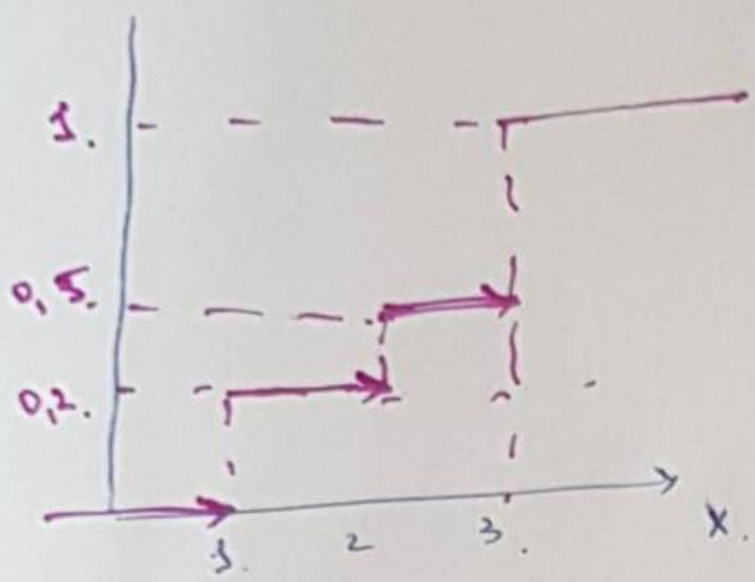
$\mu_y - \mu_x = 0,23.$

$t_{crit} = -13,27.$

$t_{obs} > t_{crit} \Rightarrow H_0$ не отв.

№8.

№1.



x	1	2	3.
P	0,2	0,3.	0,5.

№2.

$$E(X) = \int_0^\theta \frac{6x(\theta - x)}{\theta^3}\,dx = \int_0^\theta \frac{6x\theta - 6x^2}{\theta^3}\,dx = \frac{3x^2}{\theta^2} - \frac{2x^3}{\theta^3}\Big|_0^\theta = 3 - 2 = 1.$$

$$E(X) = \int_0^\theta \frac{6x^2(\theta - x)}{\theta^3} = \int_0^\theta \frac{6x^2\theta - 6x^3}{\theta^3}\,dx = \frac{2x^3}{\theta^2} - \frac{3}{2}\frac{x^4}{\theta^3}\Big|_0^\theta = 2\theta - \frac{3}{2}\theta = \frac{1}{2}\theta$$

$$E(X^2) = \int_0^\theta \frac{6x^3(\theta - x)}{\theta^3} = \int_0^\theta \frac{6x^3\theta - 6x^4}{\theta^3}\,dx = \frac{3}{2}\theta^2 - \frac{6}{5}\theta^2 = 0{,}3\theta^2$$

$$Var(X) = 0{,}3\theta^2 - 0{,}25\theta^2 = 0{,}05\theta^2$$

$$0{,}05\theta^2 = \bar{X} \rightarrow \hat{\theta}_{MM} = \sqrt{20\bar{X}}$$

№3.

$$L = \prod_{i=1}^{n} (\theta+1) X_i^{\theta+1} = (\theta+1)\cdot n \cdot \left(\sum x_i\right)^{\theta+1}$$

$$\ell = \ln(\theta+1) + \ln \cdot n + (\theta+1)\ln \sum x_i$$

$$\frac{\partial \ell}{\partial \theta} = \frac{1}{\theta+1} + \frac{1}{\sum x_i} + \theta = 0. \qquad (\theta+1)^2 + \sum x_i \cdot 0 \rightarrow \hat{\theta}_{ML} = -\sqrt{\sum x_i} - 1.$$

№4

a) $$E(X) = \int_0^\theta \frac{4x^4}{\theta^4}\,dx = \frac{4}{5}\cdot\frac{x^5}{\theta^4}\Big|_0^\theta = \frac{4}{5}\theta.$$; $E(\bar{X}) = E(X)$.

$E(\hat{\theta}) = \frac{4}{5}\hat{\theta} + \theta \rightarrow$ Смещена.

b) $c = \frac{5}{4}$

№5.

$$\int_0^\theta \frac{4x^4}{\theta^4}\,dx = \frac{4x^5}{5}\cdot\frac{1}{\theta^4}\Big|_0^\theta = 0{,}8\theta = E(X) \quad ; \quad E(X) = \frac{4}{5}\theta - \theta = -\frac{1}{5}\theta.$$

смещена.

№6.

$$E\left(\frac{5n+3}{4n-2}\bar{X}_n\right) = -\frac{1}{5}\cdot\frac{5n+3}{4n-2}\bar{X}_n = 0$$

$\lim_{n\to\infty} E(\hat{\theta}_n) = -\frac{5n}{20n-10}\bar{X}_n \rightarrow$ оценка

$$E(X^2) = \int_0^\theta \frac{4x^5}{\theta^4}\,dx = \frac{2}{3}\theta^2 \quad ; \quad Var(X) = \frac{2}{3}\theta^2 - \frac{16}{25}\theta^2 = \frac{2}{75}\theta^2.$$

$$\lim Var(X) = \frac{2}{75}\left(\frac{5n+3}{4n-2}\bar{X}_n\right)^2_{n\to\infty} = 0 \rightarrow \text{сост.}$$