

N1.

$$Ex = 300$$

$$P(X > A) \leq \frac{Ex}{A} \text{ - нер-во Маркова}$$

$$a) P(X < 400) \leq \frac{300}{400} = 0,75$$

$$б) P(X \leq 500) = 1 - P(X > 500) = 1 - \frac{300}{500} = 0,4$$

N2.

$$n = 1600 \quad p = 0,3, \quad \varepsilon = 50$$

$$\xi \sim \text{Бернулли}$$

$$E\xi = np = 1600 \cdot 0,3 = 480$$

$$D\xi = np(1-p) = 336$$

$$P(|\xi - E\xi| < \varepsilon) \geq 1 - \frac{D\xi}{\varepsilon^2} \text{ - нер-во Чебышева}$$

$$P(|\xi - 480| < 50) \geq 1 - \frac{336}{50^2} = 0,866$$

N3.

$$DX = 1, \quad X \in \{9, 5, 7, 7, 4, 10\}$$

$$\bar{X} = \frac{\sum_{i=1}^k x_i}{k} = \frac{9+5+7+7+4+10}{6} = \frac{42}{6} = 7$$

$$1 - \frac{\alpha}{2} = 0,995 \quad z_{\alpha} = 2,58 \quad \Delta = \frac{\sqrt{6}}{\sqrt{n}} z_{\alpha} = \frac{2,58}{\sqrt{6}} = 1,053$$

$$99\% \text{ Довер. интервал : } (\bar{X} - \Delta, \bar{X} + \Delta) = (5,947; 8,053)$$

N4.

$$x_i \sim N(\mu, \sigma^2) \quad \text{ОМП } \hat{\mu} = \hat{\sigma}$$

$$f(\mu, \sigma^2)(x) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left(-\frac{(x-\mu)^2}{2\sigma^2}\right)$$

$$f(x, \mu, \sigma^2) = \prod_{i=1}^n \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left(-\frac{(x_i-\mu)^2}{2\sigma^2}\right) = \left(\frac{1}{\sqrt{2\pi\sigma^2}}\right)^n \exp\left(-\sum_{i=1}^n \frac{(x_i-\mu)^2}{2\sigma^2}\right)$$

$$L(x, \mu, \sigma^2) = -\ln(2\pi)^{\frac{n}{2}} - \frac{n}{2} \ln \sigma^2 - \frac{\sum (x_i - \mu)^2}{2\sigma^2}$$

$$\frac{\partial}{\partial \mu} L = \frac{2 \sum_{i=1}^n (x_i - \mu)}{2\sigma^2} = \frac{n(\bar{x} - \mu)}{\sigma^2} = 0$$

$$\frac{\partial}{\partial \sigma^2} L = -\frac{n}{2\sigma^2} + \frac{\sum (x_i - \mu)^2}{2\sigma^4} = 0$$

$$\Rightarrow \hat{\mu} = \bar{x}, \quad \hat{\sigma}^2 = \frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^2$$