

Excl. 4. $\bar{x} = 409$

~~5x~~

$n = 9$

$1 - \alpha = 0,98 \Rightarrow \alpha = 0,02 \Rightarrow \frac{\alpha}{2} = 0,01$

$1 - \frac{\alpha}{2} = 0,99 \Rightarrow z_{0,99} = 2,328$

$$s^2 = \frac{1}{n-1} \left(\sum_{i=1}^n (x_i - \bar{x})^2 \right) = \frac{1}{8} \left((406-409)^2 + \dots + (417-409)^2 \right) = \frac{1}{8} \cdot 452 = 56,5 \Rightarrow \sqrt{s} \approx 7,5166 \approx 7,5$$

$N = \bar{x} = 409$

$1 - \alpha = 0,98 \Rightarrow \alpha = 0,02 \Rightarrow \frac{\alpha}{2} = 0,01$

$1 - \frac{\alpha}{2} = 0,99$

$t_{0,99; 8} = 2,8965$

~~$[409 - 2,8965 \cdot \frac{7,5}{\sqrt{9}} - 0,01 \cdot 8 \cdot \frac{7,5}{\sqrt{9}}]$~~

$[\bar{x} - t_{1-\frac{\alpha}{2}} \cdot \frac{s}{\sqrt{n}} \cdot (n-1) \cdot \frac{s}{n}, \bar{x} + t_{1-\frac{\alpha}{2}} \cdot \frac{s}{\sqrt{n}} \cdot (n-1) \cdot \frac{s}{n}]$

$[409 - 2,8965 - 0,01 \cdot 8 \cdot 7,5, 409 + 2,8965 - 0,01 \cdot 8 \cdot 7,5]$

$[405,9035, 411,6965]$

Quest. 2. $\bar{x} = 360,4302$

$n = 10$

$$s^2 = \frac{1}{9} \left((1304 - 302)^2 + (1295 - 302)^2 + \dots + (302 - 302)^2 \right) =$$

$$= \frac{1}{9} (1 + 17^2 + 5^2 + 1^2 + 11^2 + 6^2 + (-4)^2 + 8^2 + 3^2 + 0^2) =$$

$$= \frac{1}{9} (1 + 49 + 25 + 1 + 121 + 36 + 16 + 64 + 9) = \frac{1}{9} \cdot 322 =$$

$$\approx 35,78$$

~~1304~~ $s = \sqrt{35,78} \approx 5,98$

$1 - \alpha = 0,95 \Rightarrow \alpha = 0,05$

$\frac{\alpha}{2} = 0,025 \Rightarrow 1 - \frac{\alpha}{2} = 0,975$

$\chi^2_{\frac{\alpha}{2}, n-1} = \chi^2_{0,025, 9} = 19,0228$

$\chi^2 = 2,7004$

$$\left[\sqrt{\frac{(n-1)s^2}{\chi^2_{1-\frac{\alpha}{2}, n-1}}}, \sqrt{\frac{(n-1)s^2}{\chi^2_{\frac{\alpha}{2}, n-1}}} \right]$$

$$\left[\sqrt{\frac{9 \cdot 35,78}{19,0228}}, \sqrt{\frac{9 \cdot 35,78}{2,7004}} \right]$$

$$\left[4,1144, 17,8445 \right]$$

kelas	frekw.	jumlah \bar{x}_i	$n_i \cdot (\bar{x}_i - \bar{x})^2$
0-2	840	1	13820
2-4	4580	3	6320
4-6	2950	5	0
6-8	3060	7	12240
8-10	1540	9	24640

$$s^2 = \frac{1}{n-1} \cdot \sum n_i (\bar{x}_i - \bar{x})^2 =$$

$$= \frac{1}{8999} (13820 + 6320 + 0 + 12240 + 24640) \approx 5,7126$$

$$s^2 \approx 2,39$$

$$1-\alpha = 0,96 \Rightarrow \alpha = 0,04 \Rightarrow \frac{\alpha}{2} = 0,02$$

$$1 - \frac{\alpha}{2} = 0,98 \Rightarrow Z_{0,98} = 2,05375$$

$$\left[5 - 2,05375 \cdot \frac{2,39}{\sqrt{10000}} ; 5 + 2,05375 \cdot \frac{2,39}{\sqrt{10000}} \right]$$

$$\left[4,85,84625 ; 4,95,09375 \right]$$

$$\left[; 4,9509375 \right]$$

$$\left[4,9509375 ; 5,0490625 \right]$$

Zad. 3. (7)

p - prawdopodobieństwo nie przeżycia
osoby G_s przez obsłudzenie

$$n = 10000$$

$$X \sim \text{Bin}(n; p)$$

$k = 7550$ - liczba obsłużonych pacjentów
osoby G_s

$$\hat{p} = \frac{k}{n} = 0.755 \quad - \text{estymator } p \text{ (wartość)}$$

$$\left[\hat{p} - z_{1-\frac{\alpha}{2}} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}, \hat{p} + z_{1-\frac{\alpha}{2}} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \right]$$

$$1-\alpha = 0.999 \Rightarrow \alpha = 0.001 \Rightarrow \frac{\alpha}{2} = 0.0005$$

$$1-\frac{\alpha}{2} = 0.9995 \Rightarrow z_{0.9995} = 2.57582$$

$$\left[0.755 - 2.57582 \sqrt{\frac{0.755(1-0.755)}{10000}}, 0.755 + 2.57582 \sqrt{\frac{0.755(1-0.755)}{10000}} \right]$$

$$\left[0.743921727873087; 0.766078272126913 \right]$$