Problems for exercises in Random phenomena course - 8th set

1. In the research of the grinding wheel wear we are interested in the volume of the removed material before the grinding wheel is worn down. The measurements are in the table.

Volume [cm^3]	[5–8]	[8–10]	[10–11]	[11–13]	[13–16]
Number of wheels	8	17	18	15	7

   Can we say that the volume of the removed material is normally distributed? R: Yes. $\chi^2 = 4.13$, $p = 0.127$

2. We study the distribution of the highway accidents. The table shows number of accidents for different sections of the selected highway.

Section [km]	[0–20)	[20–35)	[35–45)	[45–60)	[60–80]
Number of accidents	21	13	15	17	24

   Can we say that the number of accidents is uniformly distributed? R: Yes. $\chi^2 = 2.34$, $p = 0.673$

3. The table shows frequencies of the daily average wind velocities at the Brnik airport.

Wind velocity [m/s]	[0, 1]	[1, 2]	[2, 3]	[3, 4]	[4, 6]
Frequency [day]	58	23	11	6	5

   Can we say that the daily average wind velocity is exponentially distributed? R: Yes. $\chi^2 = 0.90$, $p = 0.826$

4. In a repair shop we monitor the frequency of failures for different types of a product. A sample of 130 products with failures is sorted with respect to the type of product and the type of failure. The data is in the table.

		Failure		
		1	2	3
Product	A	22	11	8
	B	12	14	7
	C	16	14	26

   Can we assume that the type of failure is independent of the type of product? R: No. $\chi^2 = 13.16$, $p = 0.011$

5. In clinical tests of medication A we studied whether patients treated with the medication A recover more quickly than patients who do not receive this medication. The results of the study are in the table.

	Recovers quicker	Does not recover quicker
Medication	85	15
Placebo	64	36

   Can we say that the medication A significantly affects the speed of recovery? R: Yes. $\chi^2 = 11.61$, $p = 6.6 \cdot 10^{-4}$ or $z = 3.40$

Note: To solve the problems, tabulated normal and χ^2 probability distributions are required (Tables A.1 and A.3 in the textbook *Opis naključnih pojavov*).