

IE 324 - Simulation

Fall 2016

Homework #1

Due: Oct 19, 2016, 5:30 pm

1. A robot is used to change the tires of cars in a formula race. It was thought that the changing times followed a normal distribution. A sample of 50 changing times was automatically taken by the robot, with the following results, where the values are in seconds:

40.27897034	363.190033	82.95170018	68.42200839	161.94415299
19.450013894	5.867356419	655.0347238	677.6364742	189.39610222
405.6615294	8.605454025	32.148248344	252.40249105	52.52504641
17.811023728	142.08907455	13.423178603	604.5389069	45.04695544
90.08880465	43.79503807	76.17669253	458.3458285	329.71694758
457.5206069	383.8531295	54.53217177	38.18288006	140.31968018
251.28748233	169.70432033	58.35869143	71.57018767	158.90241633
118.63619443	17.303841436	183.97523935	225.77158248	85.798372
8.53566317	45.78811273	83.03048691	10.036922206	67.50017966
7.026038827	8.128449895	346.9508508	662.1275857	55.32589924

- Compute the sample mean and sample variance.
- Using the Q – Q plot of the changing times, decide whether the data is from a normal distribution.
- If the data is not from a normal distribution, propose a distribution and check it with its Q – Q plot.

2. The time required for 50 different employees to compute and record the number of hours worked during the week was measured, with the following results in minutes:

Employee	Time (Minutes)	Employee	Time (Minutes)
1	5,392044361	26	1,787801493
2	1,310604917	27	3,950298313
3	0,947304887	28	0,849122425
4	1,317009041	29	2,560570491
5	2,41548793	30	4,261427302
6	1,829651644	31	0,255983933
7	3,688820093	32	0,538722246
8	0,894017121	33	2,430383866
9	5,053375758	34	1,928076259
10	1,139564965	35	2,166427692
11	5,142034319	36	6,391477971
12	3,02780588	37	4,879973051
13	1,422423179	38	3,062868694
14	0,752646789	39	5,968888072
15	7,617623213	40	0,68832578
16	0,222094268	41	6,65384722
17	0,770246375	42	6,05027499
18	2,183364296	43	7,190051545
19	2,518541664	44	6,019025498
20	2,443460128	45	3,379073492
21	3,587877557	46	4,749034106
22	2,050993592	47	0,324219357
23	2,037527064	48	3,430659134
24	0,610646389	49	6,86708292
25	0,696406167	50	0,406527867

Use the chi-square test to test the hypothesis that these service times are exponentially distributed. Let the number of class intervals be $k=9$. Use the level of significance $\alpha = 0.05$.

3. Records pertaining to the monthly number of job-related injuries at an underground coalmine were being studied by a federal agency. The values for the past 100 months were as follows:

<u>Injuries per Month</u>	<u>Frequency of Occurance</u>
0	24
1	23
2	14
3	16
4	8
5	6
6	4
7	1
8	3
9	1

- Apply the chi-square test to these data to test the hypothesis that the underlying distribution is Poisson. Use the level of significance $\alpha = 0.05$.
- Apply the chi-square test to these data to test the hypothesis that the underlying distribution is Poisson with mean 2.5. Use the level of significance $\alpha = 0.05$.
- What are the differences between parts (a) and (b), and when might each case arise?