length in inches	2.54	
	conversion (cm)	count
0.4		average
0.33		max
1.37		min
0.68		modus
0.61		**median**
0.06		variance (population)
1.76		variance (sample)
0.75		stand. dev. (population)
1.91		stand. dev. (sample)
0.72		
0.79		
1.28		0.9 percentile
0.6		0.5 percentile
0.14		0.1 percentile
0.02		
1.2		
1.37		
0.27		
1.27		
1.01		
0.22		
0.72		
1.37		
0.22		
0.52		
0.09		
1.7		
0.83		
0.25		
1.41		
0.23		
0.14		

Drivers paid in a certain town 12 penalties in a week [EUR]:

1320	1500	200	1750	820	1000	900	400	4500

Evaluate by descriptive statistics, i.e.:

a. calculate mean, variance and standard deviation
b. calculate upper and lower quartile, interquartile range and median;
c. draw a box-and-whisker plot
d. divide the data into classes and make a histogram

penalties
1320
1500
200
1750
820

3100	180	120

Gaussian function

function =normsdist =NORM.S.DIST(z;cum

function =normdist =NORM.DIST(z;x0;s;0

x0=0 s=1

x	P(x)	CDF(x)
-4.0	0.000	0.000
-3.5	0.000	0.001
-3.0	0.001	0.004
-2.5	0.006	0.018
-2.0	0.023	0.054
-1.5	0.067	0.130
-1.0	0.159	0.242
-0.5	0.309	0.352
0.0	0.500	0.399
0.5	0.691	0.352
1.0	0.841	0.242
1.5	0.933	0.130
2.0	0.977	0.054
2.5	0.994	0.018
3.0	0.999	0.004
3.5	1.000	0.001
4.0	1.000	0.000

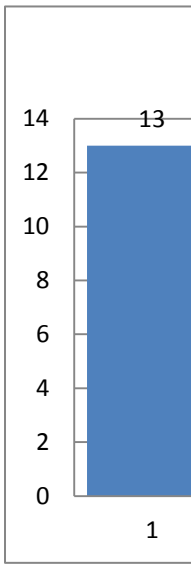
ıul)
/1)

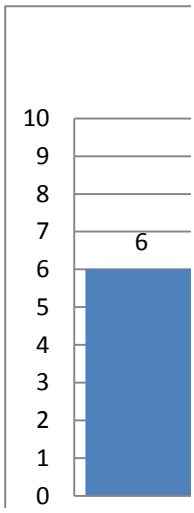
From a table you obtained by rolling a 6-sided die find out, if the die is fair (N=36).
Use chi-2 test with the usual significance level.

#	observed	expexted	chi2
1	**13**	6	8.166667
2	**5**	6	0.166667
3	**9**	6	1.5
4	**2**	6	2.666667
5	**7**	6	0.166667
6	**0**	6	6
	36	36	18.66667

alfa=	0.05
d.o.f.=	5
critical v.=	11.0705

H1=the die is false,



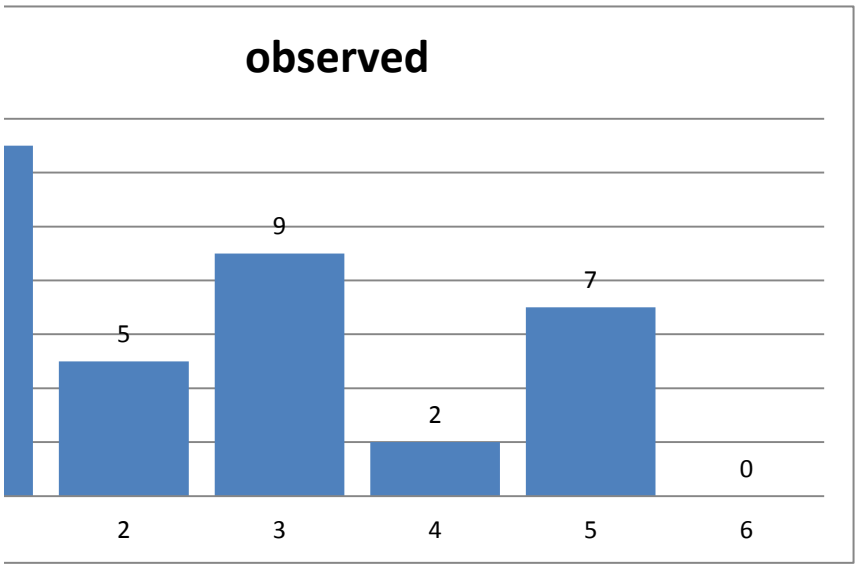


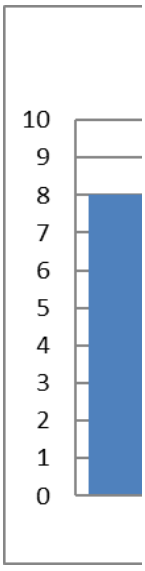
$$\chi^2 = \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i}$$

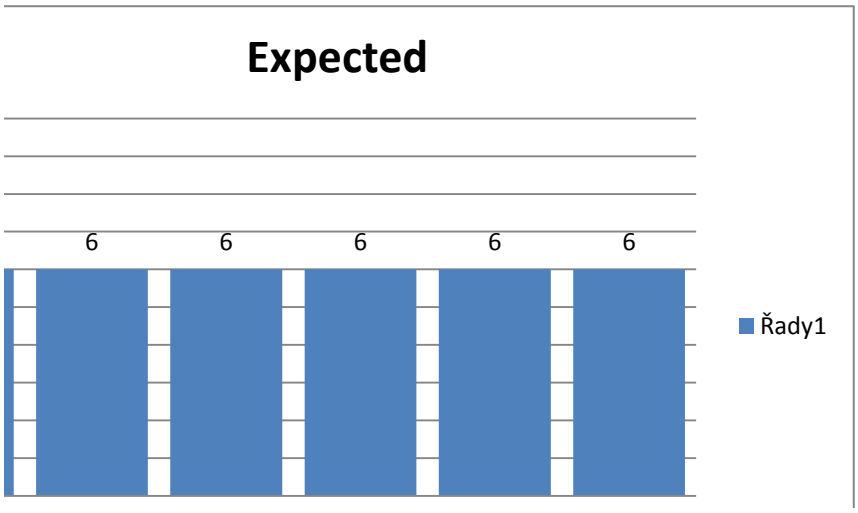
#	observed
1	8
2	5
3	9
4	2
5	7
6	5

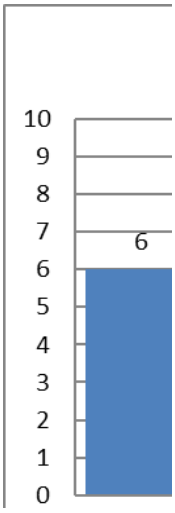
36

H0=the die









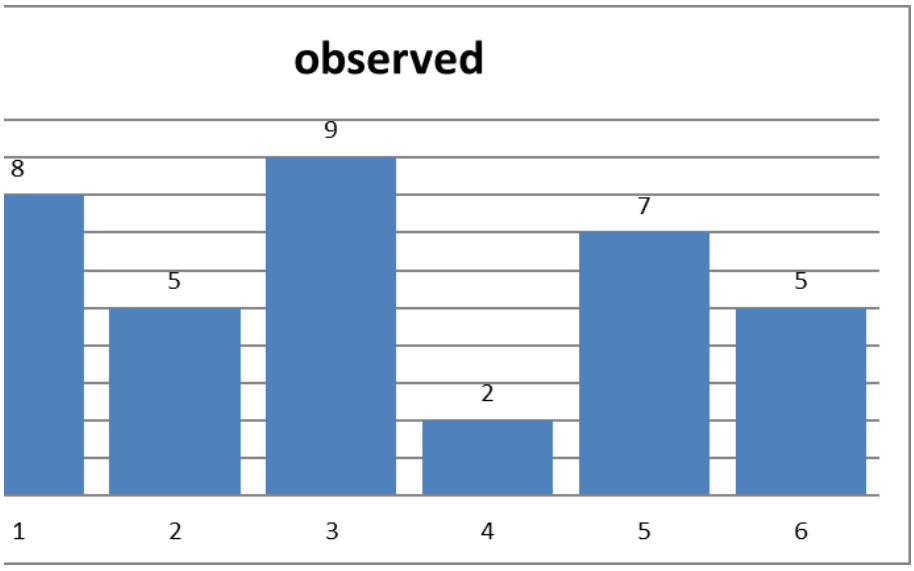
2 3 4 5 6

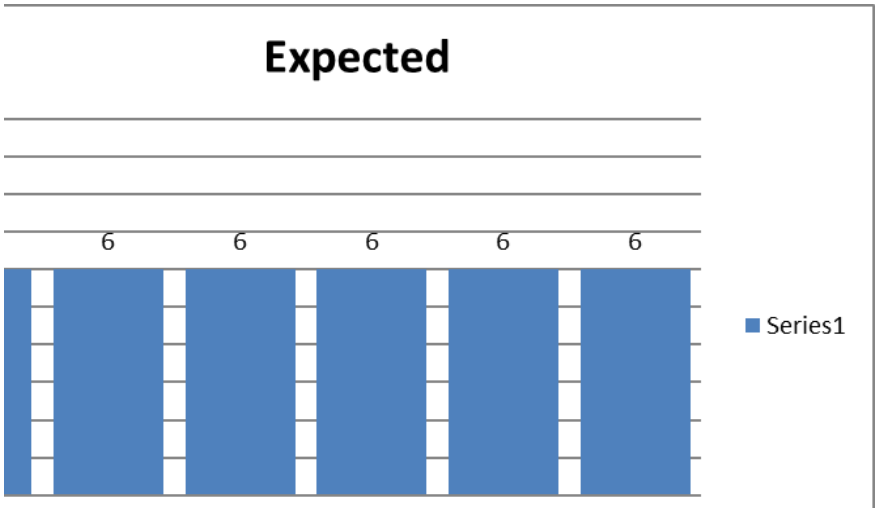
1

expexted	chi2	H0=the die is fair
6	0.666667	H1=the die is false
6	0.166667	
6	1.5	
6	2.666667	
6	0.166667	
6	0.166667	
36	5.333333	

alfa=	0.05
d.o.f.=	5
critical v.=	11.0705

is fair
Null hypothesis cannot be rejected.

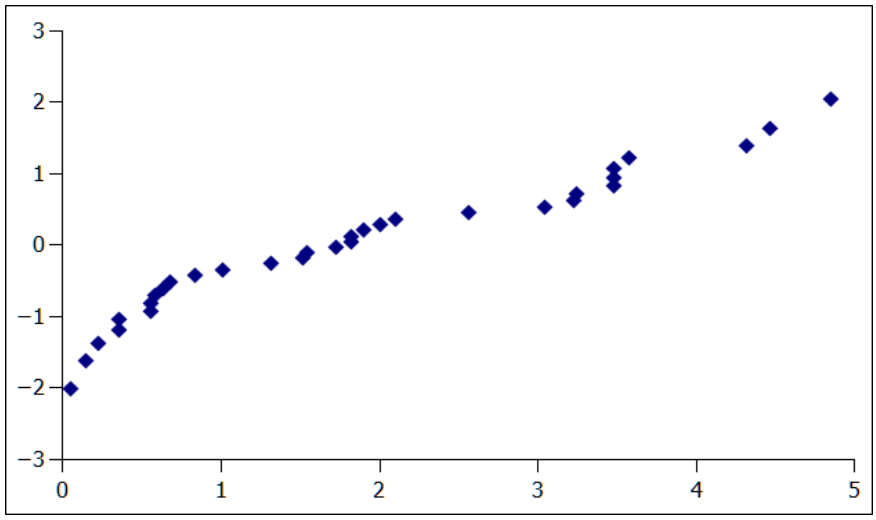





2
3
4
5
6

normality

gnumeric
Fagus sylvatica



find outlier with the method of inner fences!

No.	concentration of Pb [ng/ml]
1	37.9
2	22.8
3	13.4
4	31.6
5	50.8
6	20.2
7	9.5
8	26.7
9	76.1
10	22.0

- Lower inner fence: Q
- Upper inner fence: Q
- Lower outer fence: Q
- upper outer fence: Q

1 − (1.5 * IQR)

3 + (1.5 * IQR)

1 − (3 * IQR)

3 + (3 * IQR)

find an outlier by Grubbs´ test

# experiment	concentration of Pb [ng/ml]
1	37.9
2	22.8
3	13.4
4	31.6
5	50.8
6	20.2
7	9.5
8	26.7
9	76.1
10	22.0

n	g_{crit} α=0.05	n	g_{crit} α=0.05	n	g_{c} α=
3	1.1543	15	2.5483	80	3.
4	1.4812	16	2.5857	90	3.
5	1.7150	17	2.6200	100	3.
6	1.8871	18	2.6516	120	3.
7	2.0200	19	2.6809	140	3.
8	2.1266	20	2.7082	160	3.
9	2.2150	25	2.8217	180	3.
10	2.2900	30	2.9085	200	3.
11	2.3547	40	3.0361	300	3.
12	2.4116	50	3.1282	400	3.
13	2.4620	60	3.1997	500	3.
14	2.5073	70	3.2576	600	3.

crit F=0.05
3061
3477
3841
4451
4951
5373
5736
6055
7236
8032
8631
9109