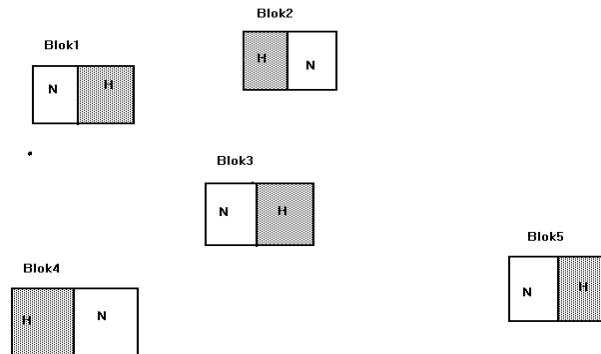


Practicals 7: *t*-distribution and *t*-tests

1. Import the data "people" used in the first practicals. Plot a dotchart displaying height means with 95% confidence intervals for each of the groups of people defined by sex and eye color.
2. Import the "lettuce" data again, used in the graph plotting workshops. Test whether green- and red-leaved lettuce varieties differ in harvest mass and harvest date. Check the patterns on corresponding plots.
3. Five blocks were divided into two plots, one of which was fertilized and the other not. The experiment looked like this in the field:



The resulting plant biomass was as follows

Block	1	2	3	4	5
Fertilized	23	25	36	19	22
Non-fertilized	20	24	33	18	21

Does fertilizer application affect biomass production?

A. 10 rats were fed nutrition enriched in magnesium since their birth. Ten additional control rats were fed the same nutrition except that no extra magnesium was added. The results of erythrocyte counting in the blood of each of the rats were the following:

+Mg: 85, 89, 79, 80, 91, 95, 79, 88, 89, 90.

Control: 79, 80, 75, 79, 80, 71, 75, 80, 76, 80.

Does Mg affect the number of erythrocytes?

B. Heights of siblings (brother and sister) were measured at their adult age in eight families. The results (height in cm) are summarized in the table below.

family	brother	sister
1	198	165
2	164	162
3	173	158
4	180	177
5	188	178
6	169	170
7	181	165
8	174	159

Is there any significant difference in height between siblings of different sex?

C. Days with snow cover per year were monitored in Brno in 15 successive years. The resulting numbers were as following.

year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
days with snow cover	32	50	58	39	49	44	42	48	39	75	28	69	50	64	48

Is the mean number of days with snow cover significantly different from 58 days predicted for Brno on the basis of a global climatic model?

D. Wine was cultivated on 8 wine-yards in the Niederösterreich region. Red grape varieties Cabernet Sauvignon and Zweigeltrebe were cultivated on each of the wine-yards. Grapes were harvested on the same date, pressed and glucose content in the resulting juice was measured. The results are summarized in the table below:

Vineyard	Glucose (kg per hectolitre)	
	Cabernet Sauvignon	Zweigeltrebe
1	19.5	19.2
2	17.5	18.4
3	19.7	20.3
4	17.2	17.4
5	18	20.1
6	19.8	19.5
7	17.9	17.9

8	18.4	18.9
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Do the two wine varieties significantly differ in mean glucose content?

E. Speed of swimming of two frog species was measured by a behavioral biologist. Following data were obtained.

Frog ID	Species	speed (cm s ⁻¹)
1	<i>Bufo bufo</i>	7.8
2	<i>Bufo viridis</i>	6.5
3	<i>Bufo viridis</i>	6.9
4	<i>Bufo bufo</i>	7.1
5	<i>Bufo bufo</i>	6.7
6	<i>Bufo viridis</i>	7.1
7	<i>Bufo viridis</i>	7.0
8	<i>Bufo viridis</i>	6.5
9	<i>Bufo bufo</i>	7.0
10	<i>Bufo viridis</i>	6.4
11	<i>Bufo bufo</i>	6.9
12	<i>Bufo viridis</i>	7.2
13	<i>Bufo bufo</i>	7.5
14	<i>Bufo bufo</i>	7.2

Do the two species significantly differ in speed of swimming?

F. A farmer tested the yield difference between two varieties of rye. He cultivated each of them on six fields and measured the grain yield (in tonnes per hectare). The following numbers were obtained:

Field	Variety	yield (tonnes per hectare)
1	<i>Champion</i>	5.5
2	<i>Miracle</i>	6.1
3	<i>Champion</i>	5.7
4	<i>Champion</i>	6.0
5	<i>Miracle</i>	5.3
6	<i>Miracle</i>	5.8
7	<i>Champion</i>	6.4
8	<i>Miracle</i>	6.0
9	<i>Miracle</i>	5.5
10	<i>Champion</i>	6.4
11	<i>Miracle</i>	5.5

