EXERCISE 1: Experimental Analysis Review

(a) Suppose that you collect the following timing data for a program as a function of the input size n.

n	$T(n)$
100	15.2 sec
200	42.8 sec
400	121.5 sec
800	342 sec
1600	963 sec

Estimate the running time of the program as a function of n and use tilde notation.

(b) Suppose that you collect the following timing data for a program as a function of the input size n.

n	$T(n)$
125	0.03 sec
1,000	1.00 sec
8,000	32.00 sec
64,000	1,024.00 sec
512,000	32,768.00 sec

Estimate the running time of the program as a function of n and use tilde notation.

EXERCISE 2: Experimental Analysis Hands-on Activity

(a) Download the precept project folder (`precept1.zip`) from the precepts page and unzip it. Launch IntelliJ, click on open and then choose the project folder you have just unzipped.

(b) Discuss with your group about what the **`ErdosRenyi.java`** program does.

(c) Run **`ErdosRenyi.java`** with a fixed number of experiments $k = 100$. Start with the input size $n = 12500$ and double n as appropriate. Complete the table below. Compute b, assuming that the running time follows the form an^b.

n	$T(n)$	$\frac{T(2n)}{T(n)}$	$\lg \frac{T(2n)}{T(n)}$
`12,500`			
`25,000`			
`50,000`			
`100,000`			
`200,000`			

(d) Run **`ErdosRenyi.java`** with a fixed $n = 50000$. Start with $k = 25$ and double k as appropriate and complete the table below. Assuming that the running time follows the form ak^c, compute c.

k	$T(k)$	$\frac{T(2k)}{T(k)}$	$\lg \frac{T(2k)}{T(k)}$
`25`			
`50`			
`100`			
`200`			
`400`			

(e) Based on your answers in the two previous questions, come up with a formula in the form $T(n, k) = an^b k^c$ to express the running time of the program as a function of n and k.

(f) Why is it not a good idea to use data with running times that are too small (e.g. less than `0.25 sec`)?