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)	lg(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 `n = 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)	lg(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 $T(n, k) = an^bk^c$ 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 less than 0.25 seconds?