

In [1]:

```
%pylab inline

import scipy.stats as sps
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
```

Populating the interactive namespace from numpy and matplotlib

$$X_i \sim \exp(\lambda)$$

Сопряженное априорное к $Exp(\lambda)$ - $Gamma(\alpha_0, \beta_0)$

$$\Rightarrow \quad -p(\theta \mid X) \sim \text{Gamma}(\alpha_0 + n, \beta_0 + \sum_{i=1}^n X_i) \mid$$

$$\Rightarrow -\hat{\theta} = E(\theta|X) = \frac{\alpha_0+n}{\beta_0+\sum_{i=1}^n X_i} \Big|$$

In [2]:

```
# извлекаем данные
strs = open("/Users/evgeniatveritinoval/Downloads/file2.txt").read().split()
times = np.zeros(len(strs)-1)
for i in range(len(strs) - 1):
    times[i] = float(strs[i + 1])

s = times[1:] - times[:-1]
s = np.insert(s, 0, times[0])

est = (1. + np.arange(len(s) + 1)) / (1. + np.insert(s.cumsum(), 0, 0)) # байес

# число вышедших из строя
def pred(t):
    n = np.extract(times <= t, times).size
    return n + est[n] * (60 - t)

inf = pd.DataFrame({'t':np.sort(np.append(np.arange(61), times))})
inf['pred'] = np.array(['break' if i in times
                        else pred(i) for i in inf['t']])

print inf.to_string(index=False)
```

t	pred
0.000	60.0
1.000	59.0
2.000	58.0
3.000	57.0
4.000	56.0
5.000	55.0
6.000	54.0
6.420	break
7.000	15.2857142857
8.000	15.0161725067
9.000	14.7466307278
10.000	14.4770889488
11.000	14.2075471698
12.000	13.9380053908
12.931	break
13.000	12.1213121815
13.395	break
14.000	15.7822160472
14.223	break
14.830	break
15.000	22.0562223626
15.759	break
16.000	24.3781848559
17.000	23.9604988364
18.000	23.542812817
19.000	23.1251267975
20.000	22.7074407781
21.000	22.2897547586
22.000	21.8720687392
23.000	21.4543827197
23.970	break
24.000	18.5338406087
25.000	18.2134561474
26.000	17.893071686
27.000	17.5726872247
27.243	break
27.994	break
28.000	20.0367662275
29.000	19.6918672829
30.000	19.3469683383
30.053	break
30.701	break
31.000	21.9775716854
32.000	21.5990347308
33.000	21.2204977761
34.000	20.8419608214
35.000	20.4634238668
35.623	break
36.000	20.5192365453
37.000	20.164268356
38.000	19.8093001666
39.000	19.4543319772
40.000	19.0993637878
41.000	18.7443955984
42.000	18.389427409
42.586	break

Tveritina_497_7.4