Simple example

Let events be "grades in a class"

w_1 = Gets an A P(A) = ½

w_2 = Gets a B P(B) = μ

w_3 = Gets a C P(C) = 2μ

w_4 = Gets a D P(D) = ½-3μ

(Note $0 \leq \mu \leq 1/6$)

Assume we want to estimate μ from data. In a given class there were

a A's
b B's
c C's
d D's

A	B	C	D
14	6	9	10

What's the maximum likelihood estimate of μ given a,b,c,d ?

Maximize likelihood

P(A) = ½ P(B) = μ P(C) = 2μ P(D) = ½-3μ

P(*a,b,c,d* | μ) = K(½)^a(μ)^b(2μ)^c(½-3μ)^d

log P(*a,b,c,d* | μ) = log K + *a*log ½ + *b*log μ + *c*og 2μ + *d*log (½-3μ)

$$\text{FOR MAX LIKE } \mu, \text{ SET } \frac{\partial \text{LogP}}{\partial \mu} = 0$$

$$\frac{\partial \text{LogP}}{\partial \mu} = \frac{b}{\mu} + \frac{2c}{2\mu} - \frac{3d}{1/2 - 3\mu} = 0$$

$$\text{Gives max like } \mu = \frac{b+c}{6(b+c+d)}$$

A	B	C	D
14	6	9	10