- For the geometric distribution

$$M_x(t) = \dots = \frac{p}{1-qe^t}$$

so $\mu = q/p$ and $\sigma^2 = q/p^2$.

- For the negative binomial distribution

$$M_x(t) = \dots = p^r(1-qe^t)^{-r}$$

so $\mu = rq/p$ and $\sigma^2 = rq/p^2$.

Stochastic Processes

There's a particularly useful approach to modelling situations where things move amongst a small collection of states. Suppose we were composing a tune in C major, so using the notes...

C D E F G A B C′

We'll let the computer choose the notes according to our choice of 'transition probabilities'...

if 'in state' C go to 'state' C or E or G
with probability 0.2 each
go to state D or A or C′
with probability 0.1 each
go to state F or B
with probability 0.05 each

These transitions need to be specified for all possibilities, and of course the sum of the transition probabilities leaving each state must be 1.