# Gamblers ruin and Markov chains

MathsNET
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## 0.1 Level 1

Consider a walker who takes a pace of length 1m forward once a second. Suppose the walker begins walking at a point 5 m from the origin and that s/he is walking away from the origin. Use the blocks below to draw a diagram showing the position the walker takes relative to the origin at $t = 0$ and during each of the next 20 seconds. Your graph should consist of a set of 20 points and time should be shown on the $x$ axis while position should be shown on the $y$ axis.

## 0.2 Level 2

Now suppose that the walker is drunk and that as such half of his/her one-meter-long strides are away from the origin and half of his one-meter-long strides are towards the origin. Use the blocks below and a bernoulli random variable to show one path that the walker might take during each of the next 20 seconds. Once again the first point in your graph should be the position of the walker at time $t = 0$. There should then be a further set of 20 points, time should be shown in the $x$ axis while position should be shown on the $y$ axis. As in the previous example the walker should starts from a point 5 m from the origin. Click here if you want to watch the explanatory video.

## 0.3 Level 3

Consider our drunk walker once more. The pub at which s/he did her/his night of drinking is at the origin and his home is a mere 10 m from the pub. Use the blocks below to generate an instance of a random walk once more. This time, however, the walk should only stop once the walker has arrived back at the pub or at his home. As in the previous questions assume that his/her walk begins at a point that is 5 metres from the origin. Output two random variables from your program. The first of these two random variables, $X$, should equal 0 if the walker finishes at home and 1 if the walker finishes at the pub and should be plotted at the coordinate $(1, X)$. The second of the random variables, $Y$, should be equal to the number of steps the walker took before arriving at either the pub or at his/her home. This random variable should be plotted at $(2, Y)$. Click here if you want to watch the explanatory video.

## 0.4 Level 4

Lets add one final complication. We are going to suppose that the probability our drunk walker moves towards his home is proportional to the distance he is from the pub. In particular, we will suppose that if he is $x$ meters from the pub his probablity of walking towards the home is $\frac{x}{10}$. Modify the code that code that you wrote for the previous exercise to take these revised probablities into account. Once again you should output two random variables from your program. The first of these two random variables, $X$, should equal 0 if the walker finishes at home and 1 if the walker finishes at the pub and should be plotted at the coordinate $(1, X)$. The second of the random variables, $Y$, should be equal to the number of steps the walker took before arriving at either the pub or at his/her home. This random variable should be plotted at $(2, Y)$. Click here if you want to watch the explanatory video.