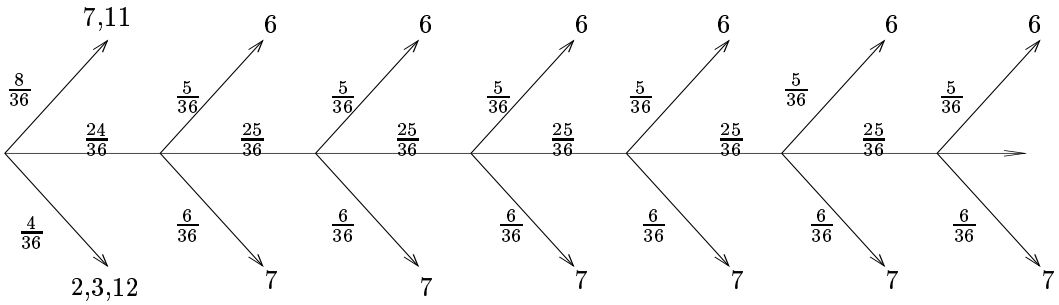
Rules of Craps: There are two six sided dice. For the dice thrower (shooter) the object of the game is to throw a 7 or an 11 on the first roll (a win) and avoid throwing a 2, 3 or 12 (a loss). If none of these numbers (2, 3, 7, 11 or 12) is thrown on the first throw (the Come-out roll) then a Point is established (the point is the number rolled) against which the shooter plays. The shooter continues to throw until one of two numbers is thrown, the Point number or a Seven. If the shooter rolls the Point before rolling a Seven he/she wins, however if the shooter throws a Seven before rolling the Point he/she loses. (http://mode.lanl.k12.nm.us/ chtmesqu/rules.html)

What is the probability that the shooter wins? The table below gives the probability for each value of the throw of two dice.

value	2	3	4	5	6	7	8	9	10	11	12
chance	1/36	2/36	3/36	4/36	5/36	6/36	5/36	4/36	3/36	2/36	1/36

The chart below models a craps game where the point is 6.



The probability of winning is thus,

$$\frac{8}{36} + \frac{24}{36}\frac{5}{36} + \frac{24}{36}\frac{25}{36}\frac{5}{36} + \frac{24}{36}\frac{25}{36}\frac{25}{36}\frac{5}{36} + \cdots$$

or,

$$\frac{8}{36} + \frac{24}{36}\frac{5}{36}\left(1 + \frac{25}{36} + \left(\frac{25}{36}\right)^2 + \left(\frac{25}{36}\right)^3 + \cdots\right)$$

which is,

$$\frac{8}{36} + \frac{24}{36}\frac{5}{36}\left(\sum_{n=1}^{\infty}\left(\frac{25}{36}\right)^{n-1}\right)$$

Thus, when the point is 6, the probability of winning is,

$$\frac{8}{36} + \frac{24}{36}\frac{5}{36}\left(\frac{1}{1-\frac{25}{36}}\right) = \frac{208}{396} = 0.\overline{52}$$

Extra Credit: Find the probability of the shooter winning craps. Show your work. Due by Tuesday October 14. This will replace your lowest quiz grade.