**Question**

Two dice are rolled until either event happens:

A) A total of 2 is rolled.
B) A total of 7 is rolled twice consecutively.

What is the probability the total of 2 occurs first?

**Answer**

7/13 = apx. 53.85%

Scroll down for the solution.

**Solution**

The probability of rolling a total of 12 is (1/6)*(1/6) = 1/36

The probability of rolling a total of 7 is 1/6 (I hope I don't need to explain why. If I do, this problem is too hard for you).

Let x be the probability of the total of 2 happening first from the starting point or after any total other 2 and 7, which resets the state to the starting state.

Let y be the probability of a total of 2 happening first after a roll of 7.

Let pr(z) = Probability of rolling a total of z.

We can express x as follow:

x = pr(12)*1 + pr(7)*y + (1-pr(7)-pr(12))*x

x = 1/36 + (1/6)*y + (29/36)*x

(7/36)x = (1/36)+(1/6)*y

(1) 7x = 1 + 6y

We can express y as follows:

y=pr(12)*1 + pr(7)*0 + + (1-pr(7)-pr(12))*x

y = (1/36)*1 + (1/6)*0 + (29/36)x

(2) y = (1 + 29x)/36

Next, substitute the value of y in equation (2) into equation (1).

$7x = 1 + 6*(1+29x)/36$

$252x = 36 + 6*(1+29x)$

$252x = 36 + 6 + 174x$

$78x = 42$

$x = 42/78 = 21/39 = 7/13$

Not that it was asked, but $y = 6/13$