SRout Assign 10

Smith is in jail and has 1 dollar; he can get out on bail if he has 8 dollars. A guard agrees to make a series of bets with him. If Smith bets A dollars, he wins A dollars with probability .4 and loses A dollars with probability .6.

Find the probability that he wins 8 dollars before losing all of his money if

(a) he bets 1 dollar each time (timid strategy).
(b) he bets, each time, as much as possible but not more than necessary to bring his fortune up to 8 dollars (bold strategy).
(c) Which strategy gives Smith the better chance of getting out of jail?

Answer

(a) he bets 1 dollar each time (timid strategy)

$$P = \frac{1 - \left(\frac{q}{p}\right)^s}{1 - \left(\frac{q}{p}\right)^M}$$

Given, q = 0.6 p = 0.4, s = 1, M = 8

$$P = \frac{1 - \left(\frac{q}{p}\right)^s}{1 - \left(\frac{q}{p}\right)^M} = \frac{1 - \left(\frac{0.6}{0.4}\right)^1}{1 - \left(\frac{0.6}{0.4}\right)^8} = 0.02$$

```
q <- 0.6
p <- 0.4
s <- 1
M <- 8
P <- (1 -  (q/p) ^ s) / (1 - (q/p) ^ M)
print(P)
```

```
## [1] 0.02030135
```

The probability of wining is 0.02.

(b) he bets, each time, as much as possible but not more than necessary to bring his fortune up to 8 dollars (bold strategy).

```
library(stats)
dbinom(3,3,0.4)
```

```
## [1] 0.064
```

The probability of wining is 0.064.

(c) The bold strategy is having higher probability than timid strategy, So, bold strategy has a better chance of getting out of jail.