

HW5_1910

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```
set.seed(1000)
n = 1000
p = 0.6

simulate_trial = function(p) {
  trial = 0
  consecutive_success = 0
  while (consecutive_success < 3) {
    trial = trial + 1
    outcome = rbinom(1, 1, 0.6)
    if (outcome == 1) {
      consecutive_success = consecutive_success + 1
    } else {
      consecutive_success = 0
    }
  }
  return(trial)
}

result_trials = replicate(n, simulate_trial())
result_trials
```



```
##      [1] 10 11  4  6 19 12 16  3  5  3  6  6 19 11  3  7 12 24  7  4 15  3 10  8
##      [25]  3 28  3 13  5  3 23 16  3 26 36  3 23  3  3  6  5  7  8 12  8 15 15  7
##      [49] 17 10 23  3  3  3 10  9  5  8  4 11  3  5  7 12  3 26  8  8  6  6 10  3
##      [73]  9 13 19 16 10  7  3 19  5 12  7 10  6  3  3  3  3  7 12 12  6  4  6 14
##      [97]  6  5 20  6 13  4 10  8  3 24  3  4 14  9 12  7 17  3  3 12  7  3  8  3
##     [121] 15  3 20  3 14 15  7 20  7  5  7 32  9  3  5  5  6 15 33  3  6  5 10  3
##     [145]  8  3  4  3 15  7  8  3  7  7 16  6  6  3  3 13 17  6  5  7  6 15  7  4
##     [169]  3 10 15 27  8  8  5  3  3  5  3  5 21 10 10 18  9  3  4  6  9 10  9 14
##     [193]  3  3 12  8  8  3  3  8 14  3  4  3  3  8  5  5 41 23 20 11  6  8 10  6
##     [217]  7  3  6  8 15  6 12 12  6 13  8  3 10  6  3  4 21  6  3  3 14  3  3  9
##     [241] 25  4  9  4  3  4 10  3  3  3 10  3  3  7 13 12 22 10  8  3  9  5  3  4
##     [265]  5  6  5  3  3  6  6 25 10  9  4  9  5  3  4  6 18 11  6 24  5  6  4  6
##     [289]  3  4 29 26  6 10  6  3  6  6 12  3  8 22 19  3  4  4  8  3 19  3  3  5
##     [313]  8 15  5  4  8  9  4  6  6  3 14  6  6  6  3  3  4  3  9  8  7  8  5  3
##     [337]  6 17 12  9  6  6 12  6 15  5  8  3  3  3  6  7  3 13  4  4  6  6 12 23
##     [361] 15  3 13  9  9  3  9 13 23 11  4  4  8  3  9 15  7  7  3  4  5  6  3 10
##     [385]  3 13  3  7  3  3  4 13  6  6  6  5 13  5  6 16 18  7 14 10  3  3  5  6
##     [409] 17  4  3  3 16  5 24 13 13  5 17  5  3  3 14  5  5 15 16  5  7  3  7  3
##     [433]  3  6  8 15 18  7  9  6 10 16 42  4  3 13  7  3 15 11  8 19 14  9 41 19
##     [457] 11  6  7  4  3 10 18  5  7  4 13  7  9  5 13 10  5  3  3 11  8  3  5  5
```

```
## [481] 3 3 5 31 3 19 12 7 3 7 16 12 18 9 3 3 22 6 32 11 17 5 19 5
## [505] 7 4 12 5 9 5 6 3 9 14 6 4 8 3 4 13 13 7 3 9 4 3 9 8
## [529] 12 6 5 6 6 5 8 9 9 12 4 4 21 11 9 3 3 19 21 12 7 3 8 3
## [553] 13 3 3 8 24 11 10 6 6 11 6 14 3 6 4 14 5 3 21 12 12 6 8 13
## [577] 4 4 4 13 13 3 15 11 7 9 5 3 3 3 5 5 10 14 3 4 4 6 5 9
## [601] 3 5 5 14 18 5 16 3 8 13 21 3 5 7 35 3 30 6 7 3 6 8 13 10
## [625] 5 8 25 9 42 5 3 3 3 8 7 26 5 10 19 7 22 3 3 5 26 7 14 7
## [649] 5 3 4 10 6 11 6 33 17 8 7 3 19 3 8 8 3 10 9 11 5 3 5 12
## [673] 5 22 9 5 6 7 11 5 3 4 5 13 21 7 5 3 15 13 17 3 30 19 9 10
## [697] 6 8 3 6 15 7 8 4 3 3 9 3 6 3 3 9 14 7 11 9 11 6 4 3
## [721] 43 3 11 17 4 15 28 6 5 16 3 3 3 7 5 10 6 10 24 21 16 19 11 18
## [745] 5 3 15 40 3 3 24 6 3 4 9 6 5 11 4 9 25 5 6 4 8 40 4 9
## [769] 6 3 7 3 3 6 5 5 6 5 4 15 4 8 11 6 10 10 3 7 7 3 7 4
## [793] 12 7 3 6 9 9 5 26 5 22 3 10 3 11 16 10 5 3 3 16 3 6 14 3
## [817] 6 3 19 5 6 4 16 3 13 3 11 10 11 3 4 5 5 4 5 5 14 3 25 3
## [841] 3 3 11 9 13 3 9 3 4 10 29 6 3 3 8 4 18 11 7 22 6 19 8 7
## [865] 12 16 3 15 3 13 23 12 3 3 8 19 3 10 6 7 3 3 3 3 17 6 33
## [889] 3 6 8 10 4 3 12 13 5 3 4 3 4 21 5 5 23 4 16 6 8 3 11 23
## [913] 3 10 6 7 3 24 5 34 6 8 3 3 10 5 6 36 5 4 3 16 6 13 5 3
## [937] 4 9 14 5 7 11 4 7 4 18 12 4 45 9 14 3 9 11 7 5 3 5 9 3
## [961] 4 6 9 3 15 16 3 20 6 6 8 7 6 3 3 11 5 4 3 5 3 3 3 13
## [985] 8 4 6 3 12 7 4 3 3 6 7 3 7 12 3 6
```

```
mean(result_trials)
```

```
## [1] 8.78
```

```
var(result_trials)
```

```
## [1] 46.53213
```

```
mean = (1 + p + p^2)/p^3
mean
```

```
## [1] 9.074074
```

```
variance = (1 + 2 * p + 3 * p^2 - 3 * p^3 - 2 * p^4 - p^5)/p^6
variance
```

```
## [1] 49.19067
```