Probability: Non-Blue Marble

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English video

Simple Probabiliy: Non-Blue Marble

Probability "Drawing a Non-Blue Marble"

What is the probabiity of pulling a non-blue marble from a bag with 9 red, 2 blue and 3 green?

The set of all possibilities = { r,r,r,r,r,r,r,r,r,b,b,g,g,g} = Total Sample Space

The subset of non-blue possibilities = {r,r,r,r,r,r,r,r,r,g,g,g} = Non-Blue Sample Space

Theoretical P(picking non-blue) = Non-blue Sample Space/Total Sample Space = 12/14 = 0.857 = 85.7%

Now let's code this exercise in R

?rep Replicate Elements of Vectors and Lists

Create a vector of the total sample space

```
all_marbles <- c(rep("r", 9),rep("b",2),rep("g",3))
all_marbles
```

```
##  [1] "r" "r" "r" "r" "r" "r" "r" "r" "r" "b" "b" "g" "g" "g"
```

Simulate drawing one marble 10,000 times

```
n <- 10000
trial_1 <- sample(all_marbles, n, replace=TRUE)
trial_1 <- data.frame(trial_1) # Create a dataframe
class(trial_1)
```

```
## [1] "data.frame"
```

```r
head(trial_1) # Lokk at first 6 results
```

```
##   trial_1
## 1       r
## 2       b
## 3       r
## 4       r
## 5       g
## 6       r
```

```r
p_non_blue <- ifelse(trial_1 != "b", 1,0)
p_non_blue <- sum(p_non_blue) / n
p_non_blue
```

```
## [1] 0.8555
```

```r
p_non_blue <- round(p_non_blue * 100, digits = 1)
paste("Experimental Probability of drawing a Non-Blue Marble =", p_non_blue,"%")
```

```
## [1] "Experimental Probability of drawing a Non-Blue Marble = 85.5 %"
```

If a number is randomly chosen from the following list, what is the probability that it is a multiple of 5?

```r
list_of_numbers <- c(32,49,55,30,56,28,50,40,40,40,3,25)
list_of_numbers
```

```
##  [1] 32 49 55 30 56 28 50 40 40 40  3 25
```

Total possibilities = 12 numbers

Multiples of 5 = 7 (7 possiblities meet our constraints)

Theoretical P(picking multiple of 5) = Multiple of 5/Total Sample Space = 7/12 = 0.583 = 58.3 %

Simulate drawing one number 10,000 times

```r
n <- 10000
trial_2 <- sample(list_of_numbers, n, replace=TRUE)
trial_2 <- data.frame(trial_2) # Create a dataframe
head(trial_2) # Look at first 6 results
```

```
##   trial_2
## 1      50
## 2      40
```

```
## 3      40
## 4      40
## 5      55
## 6      30
```

```
mult_5 <- ifelse(trial_2$trial_2%%5 == 0, 1,0)
p_mult_5 <- sum(mult_5) / n
p_mult_5
```

```
## [1] 0.5706
```

```
p_mult_5 <- round(p_mult_5 * 100, digits = 1)
paste("Experimental probability of drawing a multiple of 5 =", p_mult_5,"%")
```

```
## [1] "Experimental probability of drawing a multiple of 5 = 57.1 %"
```

The circumference of a circle is 36 pi.

Contained in that circle is a smaller circle with an area of 16 pi.

A point is selected at random inside the larger circle.

What is the probability that the point also lies in the smaller circle?

```
r_larger_circle <- (36*pi)/(2*pi)
r_larger_circle
```

```
## [1] 18
```

```
r_smaller_circle <- sqrt(16*pi/pi)
r_smaller_circle
```

```
## [1] 4
```

```
area_larger_circle <- pi*(r_larger_circle)^2
area_larger_circle
```

```
## [1] 1017.876
```

```
area_smaller_circle <- 16*pi
area_smaller_circle
```

```
## [1] 50.26548
```

```
options(digits = 3)
P_point_also_in_smaller_circle <- (16*pi)/area_larger_circle
P_point_also_in_smaller_circle
```

```
## [1] 0.0494
```

Theoretical P(point in smaller circle) = (16 pi)/(324 pi) = 4/81 = 0.0494 = 4.94 %

Simulate picking aa random point in larger circle 10,000 times

Generate Random Number "Runif function"

```
n <- 10000
Point <- data.frame(point = runif(n,0,area_larger_circle ))
head(Point) # Look at first 6 results
```

```
##   point
## 1  24.1
## 2 659.2
## 3 963.3
## 4 859.4
## 5 331.0
## 6 497.1
```

```
in_small_circle <- ifelse(Point$point < area_smaller_circle , 1,0)
p_in_small_circle <- sum(in_small_circle) / n
p_in_small_circle
```

```
## [1] 0.0488
```

```
p_in_small_circle <- round(p_in_small_circle * 100, digits = 2)
paste("Experimental probability of random point in small circle =", p_in_small_circle,"%")
```

```
## [1] "Experimental probability of random point in small circle = 4.88 %"
```

Happy Learning