

Quality Control Process

Alec Brooks

2024-10-20

A. Calculate the probability that a widget's diameter is less than 9.8 cm.

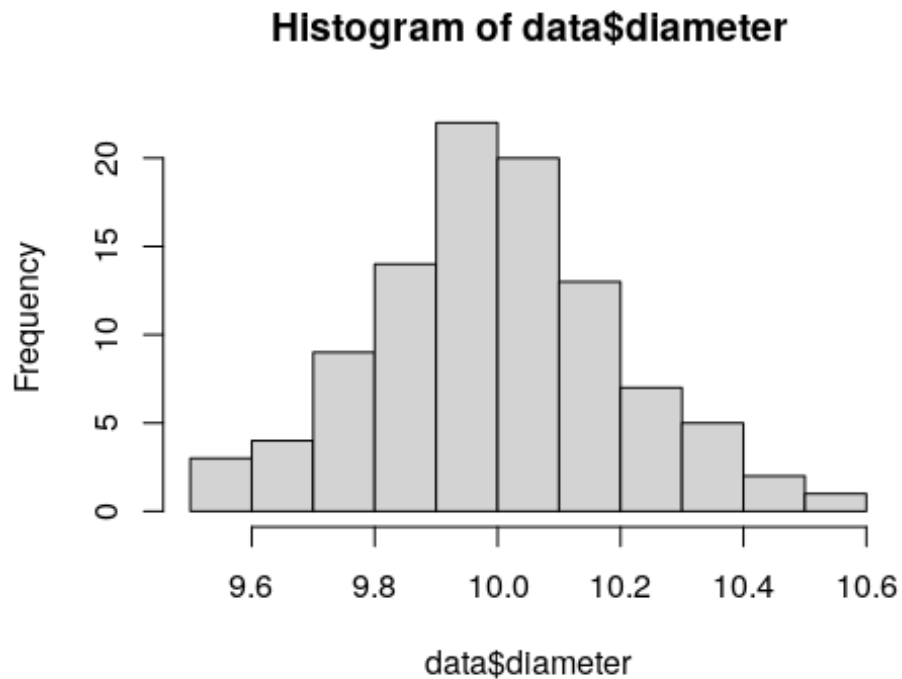
```
pnorm(9.8, mean(data$diameter), sd(data$diameter))  
## [1] 0.1629112
```

B. Find the diameter below which 95% of all widgets fall.

```
qnorm(0.95, mean(data$diameter), sd(data$diameter))  
## [1] 10.33637
```

C. Visualize the distribution of diameters using a histogram. Analyze it.

```
hist(data$diameter)
```



It appears to be a normal distribution with a positive skew

A. Determine how many widgets were tested until the first defect was found.

```
unique(data$defect) # its boolean
## [1] 0 1

data[data$defect == 1, "test_order"] #test # for each

## # A tibble: 5 × 1
##   test_order
##   <dbl>
## 1         2
## 2        24
## 3        52
## 4        70
## 5        88

min(data[data$defect == 1, "test_order"]) # fist one
## [1] 2

nrow(data[data$defect==1,]) / nrow(data) #get the probability
## [1] 0.05
```

B. Calculate the probability of finding the first defect on or before the 3rd widget.

```
pgeom(2, (nrow(data[data$defect == 1, ]) / nrow(data)))
## [1] 0.142625
```

Calculate the probability of getting less than 7 defects in batches of 10 widgets.

```
pbinom(6,10,(nrow(data[data$defect == 1, ]) / nrow(data)))
## [1] 0.9999999
```

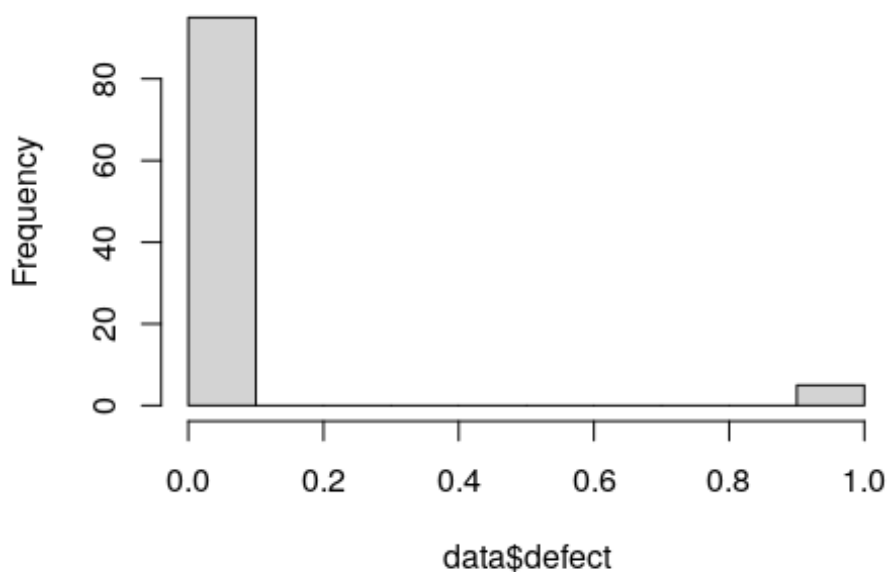
Calculate the probability of getting exactly 1 defect in a batch.

```
dbinom(1, 10, (nrow(data[data$defect == 1, ]) / nrow(data)))
## [1] 0.3151247
```

Plot the distribution of defects. Analyze it.

```
hist(data$defect)
```

Histogram of data\$defect



It's a Bernoulli distribution using binary values to denote widget defects, with 5% of the total 100 widgets being defective.

Full Code

```
library(readr)
data <- read_csv("quality_control_data.csv")

pnorm(9.8, mean(data$diameter), sd(data$diameter))
qnorm(0.95, mean(data$diameter), sd(data$diameter))
hist(data$diameter)

unique(data$defect) # its boolean
data[data$defect == 1, "test_order"] #test # for each
min(data[data$defect == 1, "test_order"]) # fist one
nrow(data[data$defect==1,]) / nrow(data) #get the probability
pgeom(2, (nrow(data[data$defect == 1, ]) / nrow(data)))
pbinom(6,10,(nrow(data[data$defect == 1, ]) / nrow(data)))
dbinom(1, 10, (nrow(data[data$defect == 1, ]) / nrow(data)))
hist(data$defect)
```