https://v.gd/k2R3ry

#6 Orders of Growth & Linked Lists

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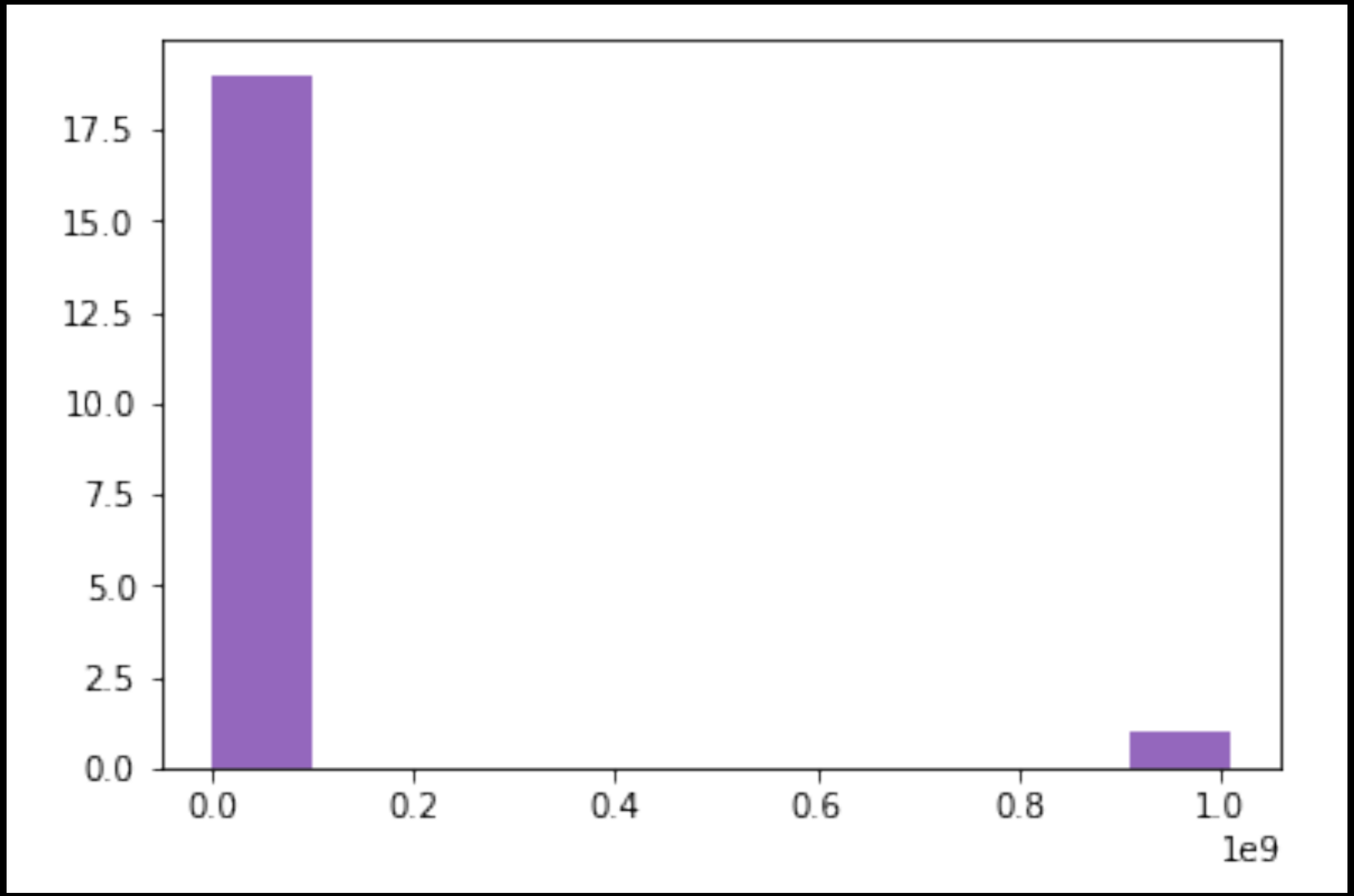
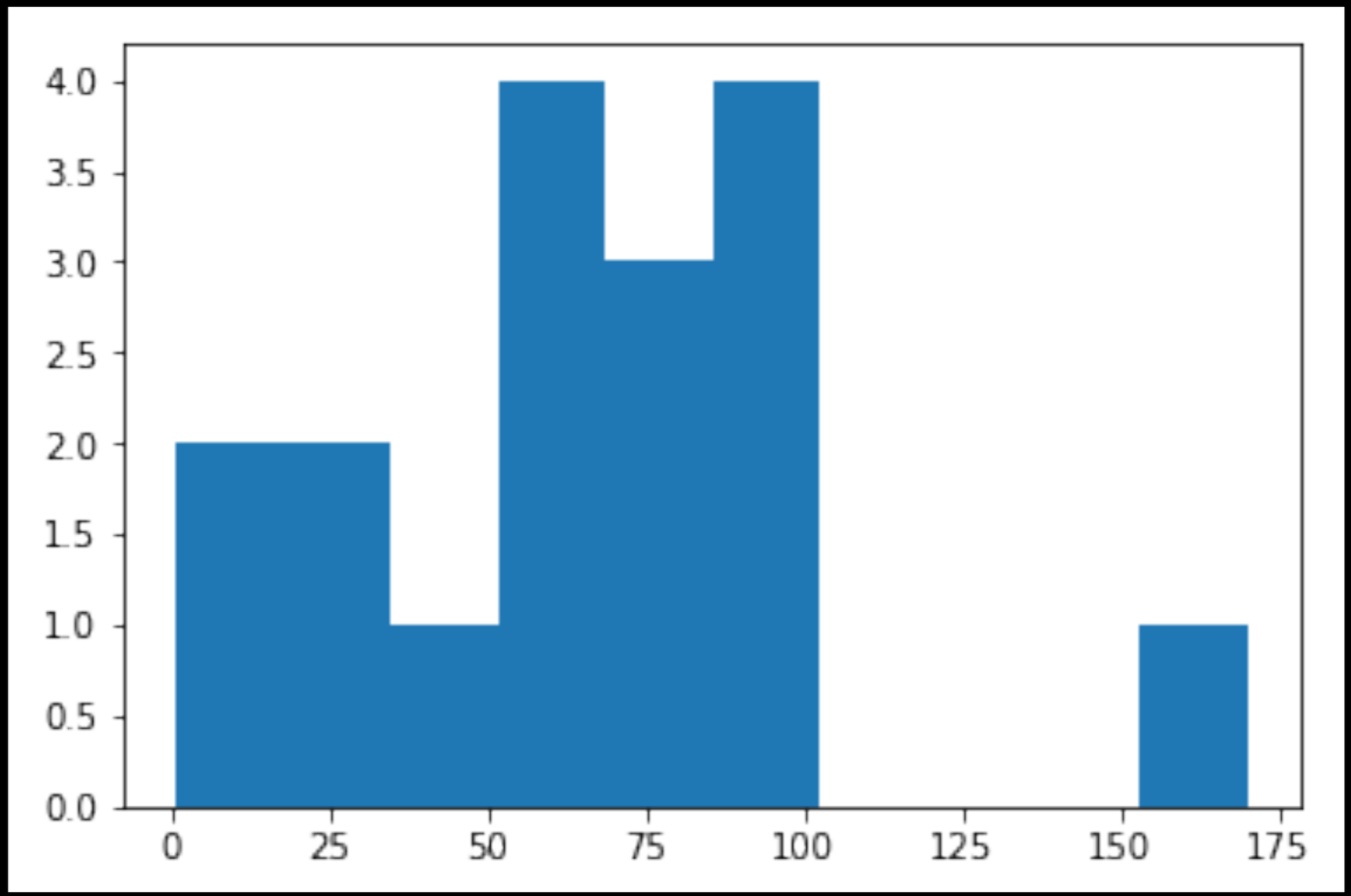
"*Testing shows the presence, not the absence of bugs.*"

Edsger Dijkstra

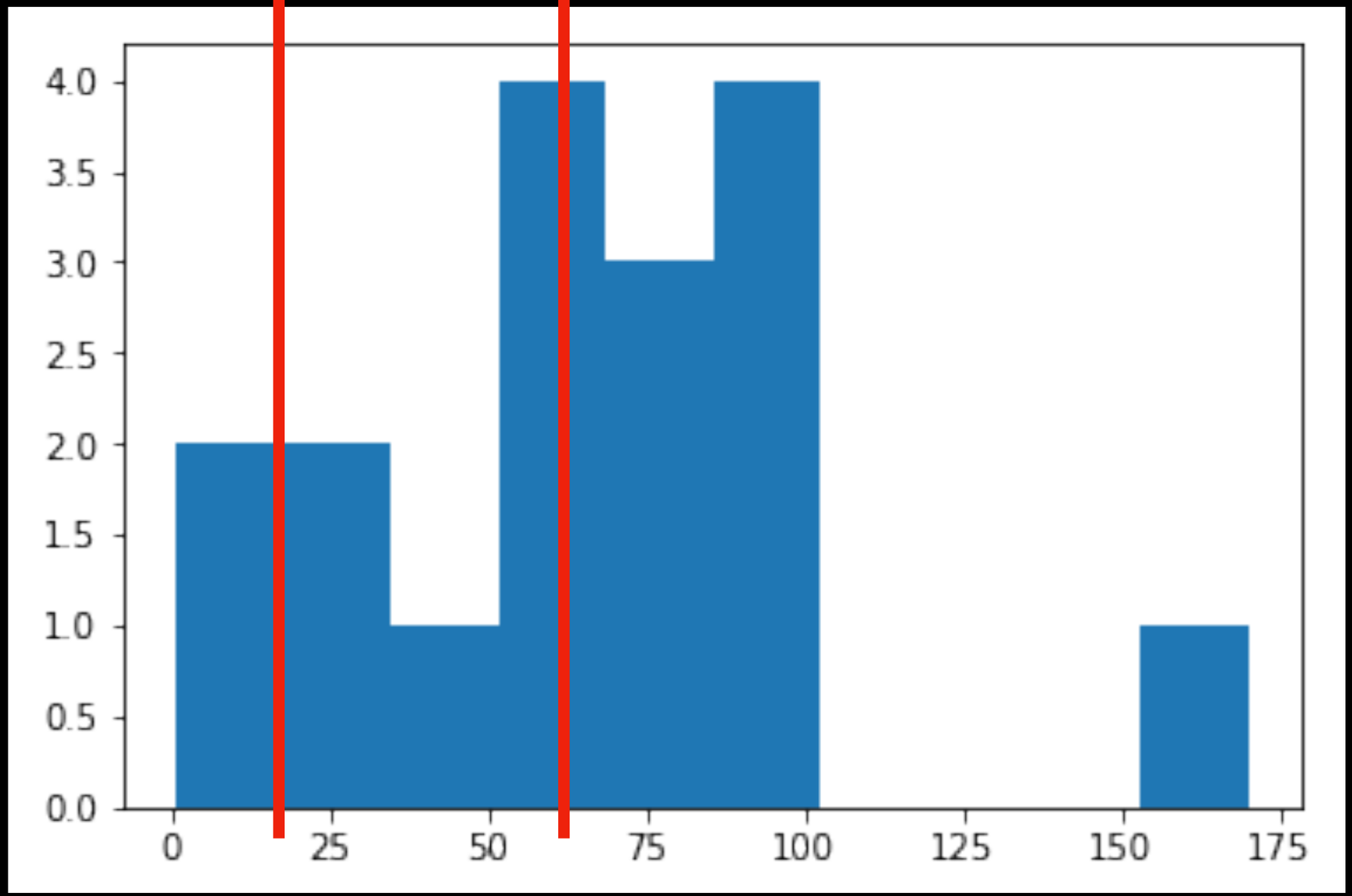

17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
0.0
0.2
0.4
0.6
0.8
1.0
1e9



*With outliers removed (you know who you are)

19 m

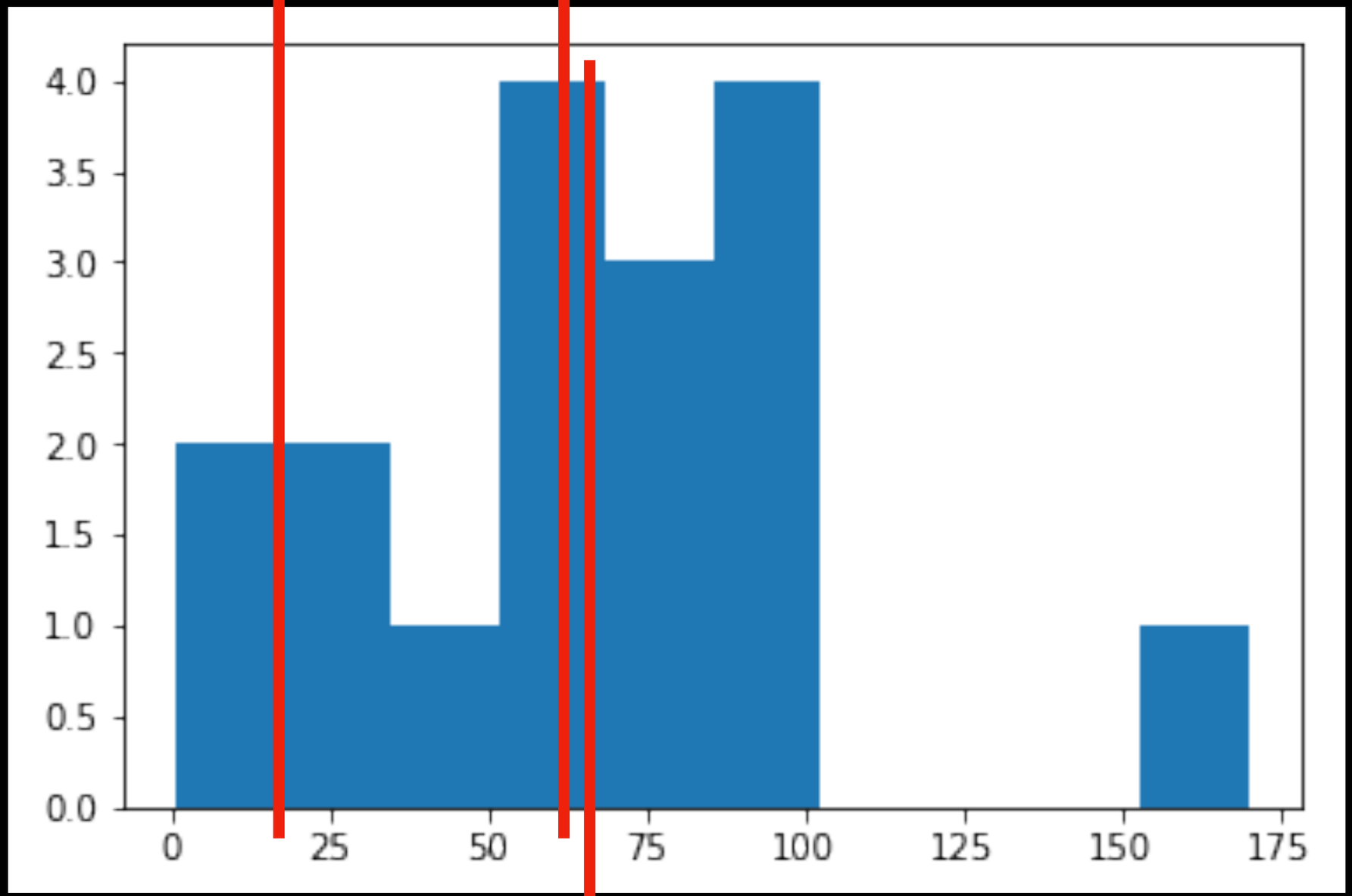
63 ft



*With outliers removed (you know who you are)

19 m

63 ft



Average: 66.4

*With outliers removed (you know who you are)

Orders of Growth

Some quick rules

- In the class, we care about **average case performance** (big Θ)
- Simplify by removing constants
- Simplify by keeping largest terms

$$\Theta(\log n + n / 2)$$

$$\Theta(\log n + n)$$

$$\Theta(n)$$

$$\Theta(\log_{10} n)$$

$$\Theta(\log n / \log 10)$$

$$\Theta(\log n)$$

$\Theta(n \log n) < \Theta((\log n)^{\log n})$?

Disclaimer: this isn't a mathematically precise way of comparing growth functions. This is also probably beyond typical exam difficulty in this course.

$$\Theta(n \log n) <$$

$$\Theta((\log n)^{\log n})$$

$$\Theta(\log (n \log n)) <$$

$$\Theta(\log [(\log n)^{\log n}])$$

$$\Theta(\log n + \log \log n) <$$

$$\Theta(\log [(\log n)^{\log n}])$$

$\Theta(\log n + \log \log n) <$

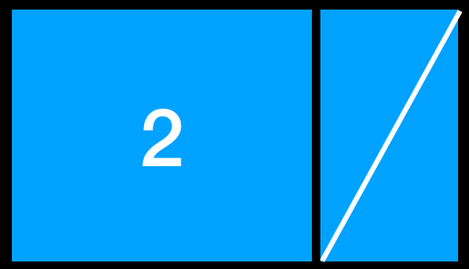
$\Theta(\log n \log \log n)$

$\Theta(\log n) <$

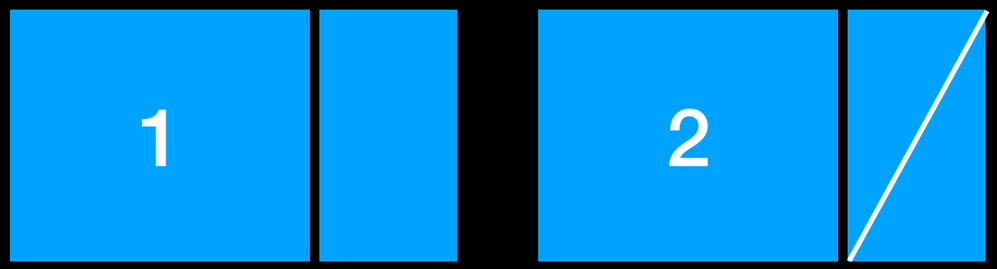
$\Theta(\log n \log \log n)$


First
Rest

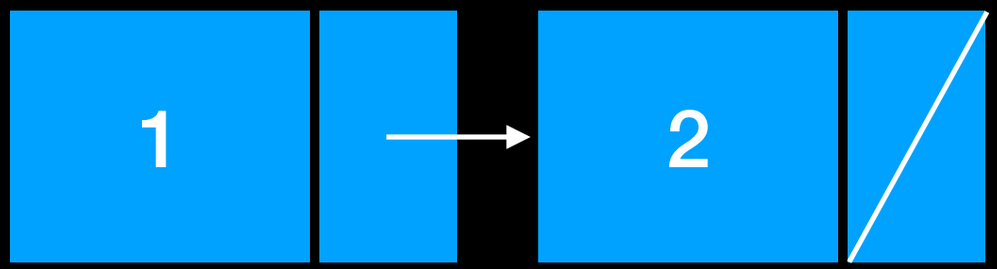
```
l = Link(2, Link.empty)
```



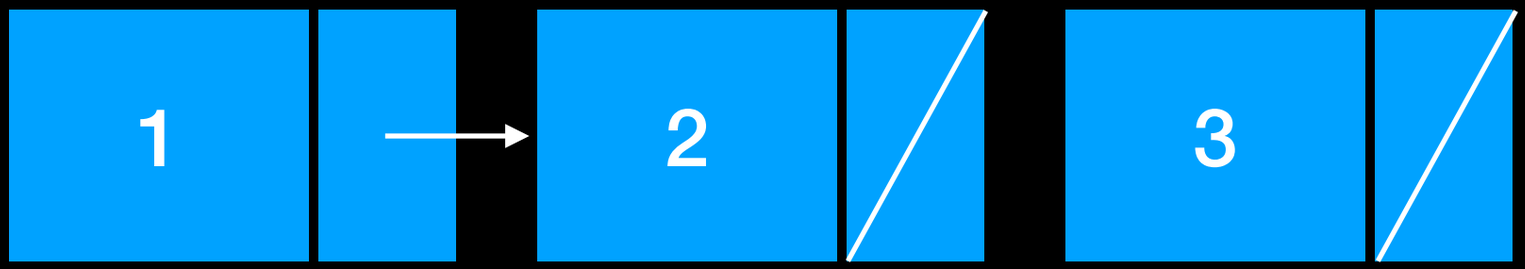
```
l = Link(1, l)
```



```
l = Link(1, l)
```

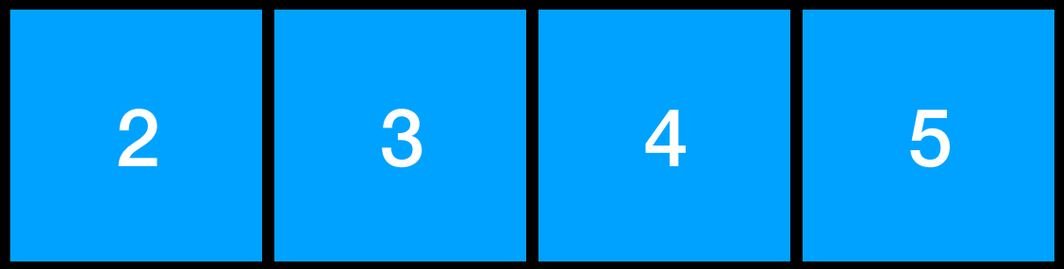


```
l.rest.rest = Link(3)
```



```
l.rest.rest = Link(3)
```

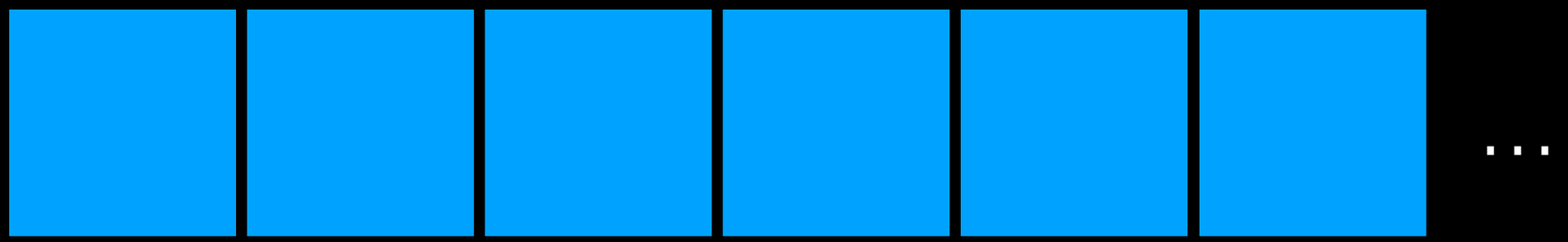
```
l = [2, 3, 4, 5]
```



```
l = [2, 3, 4, 5]
```

```
l.insert(0, 1)
```

```
l.insert(0, 1)
```



```
l.insert(0, 1)
```

```
l.insert(0, 1)
```