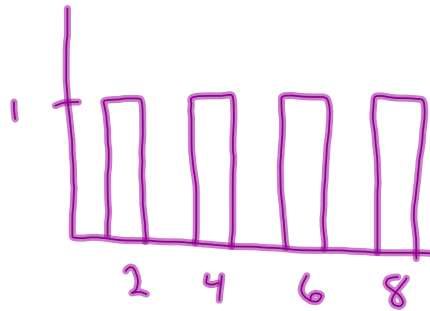


## Central Limit Theorem

A teacher gives an eight point quiz to a class of ~~students~~ students. The scores of the quiz are 2, 4, 6, & 8. Find the mean, standard deviation, and make a frequency distribution.

```

1-Var Stats
x̄=5
Σx=20
Σx²=120
Sx=2.581988897
σx=2.236067977
↓n=4
  
```



$$\bar{x} = 5$$

$$\sigma \approx 2.236$$

Now, take all samples of size 2 with replacement and find the means:

2, 4, 6, 8

$$2, 2 \rightarrow 2$$

$$2, 4 \rightarrow 3$$

$$2, 6 \rightarrow 4$$

$$2, 8 \rightarrow 5$$

$$4, 2 \rightarrow 3$$

$$4, 4 \rightarrow 4$$

$$4, 6 \rightarrow 5$$

$$4, 8 \rightarrow 6$$

$$6, 2 \rightarrow 4$$

$$6, 4 \rightarrow 5$$

$$6, 6 \rightarrow 6$$

$$6, 8 \rightarrow 7$$

$$8, 2 \rightarrow 5$$

$$8, 4 \rightarrow 6$$

$$8, 6 \rightarrow 7$$

$$8, 8 \rightarrow 8$$

Find the mean, standard deviation, and make a frequency distribution.

```

1-Var Stats
x̄=5
Σx=80
Σx²=440
Sx=1.632993162
σx=1.58113883
n=16

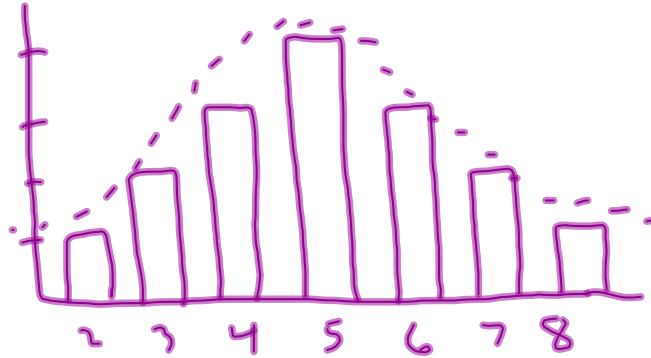
```

$$\bar{x} = 5$$

$$\sigma \approx 1.58$$

$$\rightarrow 2.236$$

$$\rightarrow \sqrt{2} \leftarrow$$



Central Limit Theorem: As  $n$  increases, the shape of the distribution of the sample means taken from a population with mean  $\mu$  and standard deviation  $\sigma$  will approach a normal distribution with mean  $\mu$  and standard deviation  $\frac{\sigma}{\sqrt{n}}$ .

$\frac{\sigma}{\sqrt{n}}$  ← original  
 $\sqrt{n}$  ← # in sample  
 $\frac{\sigma}{\sqrt{n}}$  ← same

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