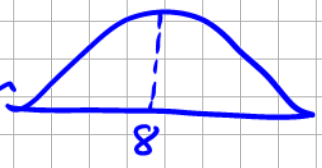
Central Limit Theorem.

Foot size of school is normal distribution

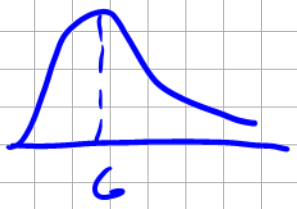


Mean of population $\mu = 8$

Group each year and do a sample.

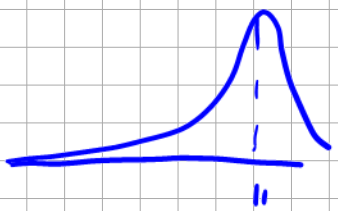
1st year = right skew

$\bar{x} = 5$



2nd : right skew.

$\bar{x} = 5$

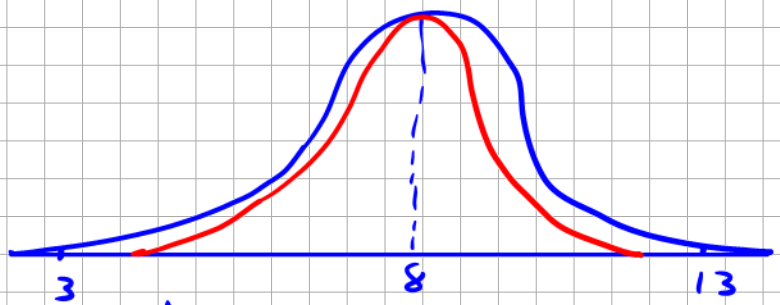


6th Left skew

$\bar{x} = 11$

Take all the MEAN marks it will form a normal distribution.

Mean of sample = mean of population.



Raw data for all school

Data for mean of each group. (Mean take out outliers)

3 concepts for Theorem.

(i) Distribution of sample MEANS is normal.

(ii) Mean of sample means = mean of population.

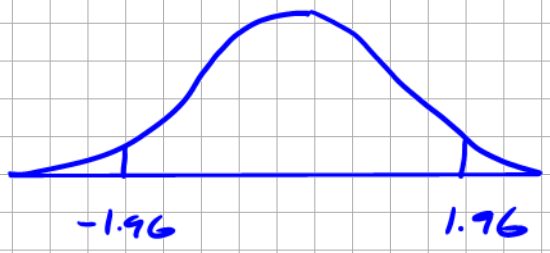
(iii) $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$

Standard deviation of means is the standard deviation of population divided by $\sqrt{n}$.

A company produces batteries with mean life of 500 hours and standard deviation of 6 hours. They test 103 batteries and find mean life of 498 hours. Form a null hypothesis and conduct a hypothesis test.

Not $\hat{p}$ question because question about population mean and standard deviation.

Find a z score at 95% confidence interval



$H_0 \Rightarrow \mu = 500$

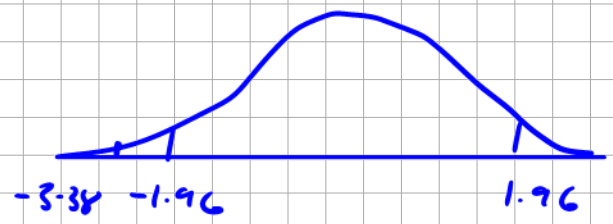
$H_A \Rightarrow \mu \neq 500$

$\mu = 500 \quad \sigma = 6 \quad \bar{x} = 498 \quad n = 103$

Test statistics

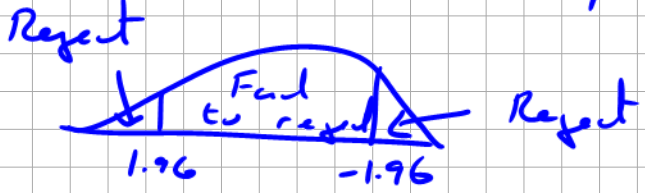
$$z = \frac{\bar{x} - \mu}{\left(\frac{\sigma}{\sqrt{n}}\right)}$$

$$z = \frac{498 - 500}{\left(\frac{6}{\sqrt{103}}\right)} = -3.39$$



Reject H_0

$\mu \neq 500$



Mean points in a school is 350pts. The standard deviation is 15pts A group of 47 results are investigated. The mean is 342. Conduct a hypothesis test for points.

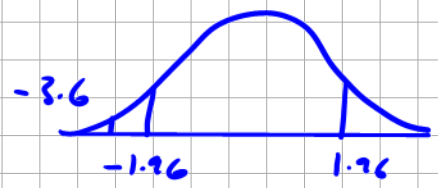
H_0 $\mu = 350$

H_a $\mu \neq 350$

$\mu = 350$ $\sigma = 15$ $n = 47$ $\bar{x} = 342$

$$z = \frac{\bar{x} - \mu}{\left(\frac{\sigma}{\sqrt{n}}\right)}$$

$$= \frac{342 - 350}{\left(\frac{15}{\sqrt{47}}\right)} = -3.6$$



Reject H_0

Conclusion $\mu \neq 350$

A company producing crisps states the mean weight is 350g. In 163 bags tested the mean weight was 348g. The standard deviation was 15g. Find

(i) Test statistic

(ii) p score

(iii) Conduct a hypothesis test.

EKKER

$\mu = 350 \quad \sigma = 15 \quad n = 163 \quad \bar{x} = 348$

$$z = \frac{\bar{x} - \mu}{\left(\frac{\sigma}{\sqrt{n}}\right)} = \frac{348 - 350}{\left(\frac{15}{\sqrt{163}}\right)}$$

$z = -1.7$

$p = 2\left(P(z \leq -1.7)\right)$

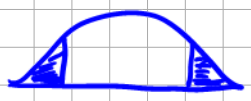
$P(z \leq -1.7) =$ 

$=$ 

$= 1 -$ 

$= 1 - 0.9554$

$= 0.0446$

p score is a two tail 

$p = 2(0.0446)$

$= 0.0892$

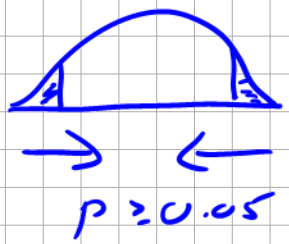
$H_0 \quad \mu = 350$

$H_A \quad \mu \neq 350$

$p = 0.0892 > 0.05 \Rightarrow$ fail to reject.

Conclusion $\mu = 350$

p = 2 tails if $> 0.05 \Rightarrow$ must be pushed into middle



$p > 0.05 \Rightarrow$ fail to reject

$p < 0.05 \Rightarrow$ reject.

Mean mark in exam is 60%. Standard deviation is 10%. In a school where 104 exams are conducted the mean mark was 63%. Form a hypothesis and find p score to test hypothesis.

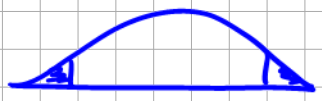
$H_0 \quad \mu = 60$

$H_A \quad \mu \neq 60$

$\sigma = 10 \quad \bar{x} = 63 \quad n = 104$

$$z = \frac{\bar{x} - \mu}{\left(\frac{\sigma}{\sqrt{n}}\right)} = \frac{63 - 60}{\left(\frac{10}{\sqrt{104}}\right)}$$

$$= 3.059$$



$P(z \geq 3.059)$ ⇒ Tail test

$= 1 -$ 

$= 0.0011$

$p = 2(0.0011) = 0.0022 < 0.05$

⇒ reject H_0

$\mu \neq 60$

Note Univariate = single data.

Bivariate = 2 variables ⇒ correlations.