

## Lesson 2.2: Do we have Normal test scores?

Here are the Chapter 1 Test scores for 4<sup>th</sup> and 5<sup>th</sup> Hour current AP Statistics students

27 4<sup>th</sup> Hour AP Students' Chapter 1 Test Scores

10	30	40	40	40	50	50	60	60
60	60	70	70	80	80	80	80	80
90	90	90	90	90	100	100	100	100

32 5<sup>th</sup> Hour AP Students' Chapter 1 Test Scores

20	30	40	50	50	50	50	50
60	60	70	70	70	70	70	80
80	80	80	80	80	80	80	90
90	90	90	100	100	100	100	100

Is the distribution of Chapter 1 Test scores approximately normal? Justify your answer using several different approaches. The group with the most convincing argument will win a prize.

4<sup>th</sup> Hour  $n=27$

Compare Mean + Median

68-95-99.7% Rule

$$\bar{x} = 70$$

$$s_x = 24.18$$

$$\text{min} = 10$$

$$Q_1 = 50$$

$$\text{med} = 80$$

$$Q_3 = 90$$

$$\text{max} = 100$$

$$\bar{x} = 70 \quad \text{median} = 80$$

$\bar{x} < \text{median}$   
mean is slightly  
less than  
median

$$\bar{x} \pm 1s_x = (45.82, 94.18) = \frac{18}{27} \approx 66.7\%$$

$$70 + 24.18 = 94.18$$

$$70 - 24.18 = 45.82$$

$$\bar{x} \pm 2s_x = (21.64, 118.36) = \frac{26}{27} \approx 96.3\%$$

$$70 + 2(24.18) = 118.36$$

$$70 - 2(24.18) = 21.64$$

$$\bar{x} \pm 3s_x = (-2.54, 142.54) = \frac{27}{27} = 100\%$$

$$70 + 3(24.18) = 142.54$$

$$70 - 3(24.18) = -2.54$$

Data falls very  
close to 68-95-99.7% Rule  
 $\therefore$  Normal

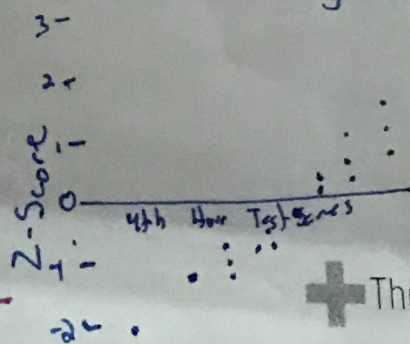
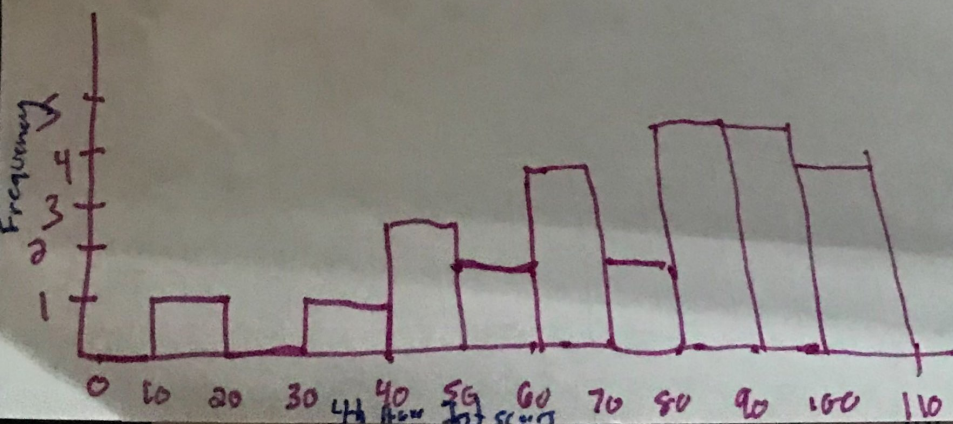
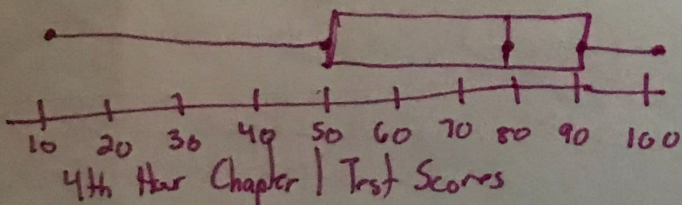
Normal Probability Plot (NPP)

Approximately  
Linear

$\therefore$  Dist  
of Test

scores is

approx. Normal



Sth Hour too small  $\angle Q_1 - IQR(1.5)$  too small  $\angle 55 - 35(1.5)$

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too small  $\angle 2.5$

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90	90	90	100	100	100	100	100

Is the distribution of Chapter 1 Test scores approximately normal? Justify your answer using several different approaches. The group with the most convincing argument will win a prize.

Sth Hour  
 $n = 32$   
 $\bar{x} = 72.5$   
 $s_x = 21.4$   
 min = 20  
 $Q_1 = 55$   
 med = 80  
 $Q_3 = 90$   
 max = 100

Compare Mean & Median  
 $\bar{x} = 72.5$  Med = 80  
 $\bar{x} < \text{median}$   
 mean is slightly less than median (7.5% less)

68-95-99.7 % Rule

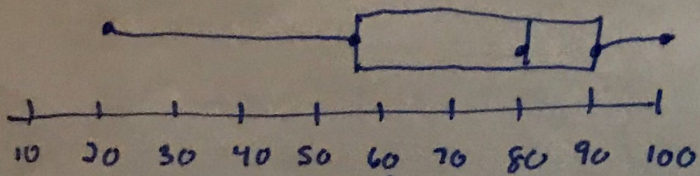
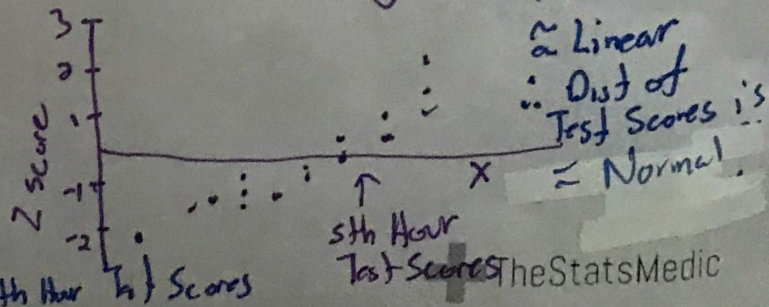
$\bar{x} \pm 1s_x = (51.1, 93.9) = 19/32 \approx 59.4\%$   
 $72.5 - 21.4 = 51.1$   
 $72.5 + 21.4 = 93.9$

$\bar{x} \pm 2s_x = (29.7, 115.3) = 31/32 \approx 96.9\%$   
 $72.5 - 2(21.4) = 29.7$   
 $72.5 + 2(21.4) = 115.3$

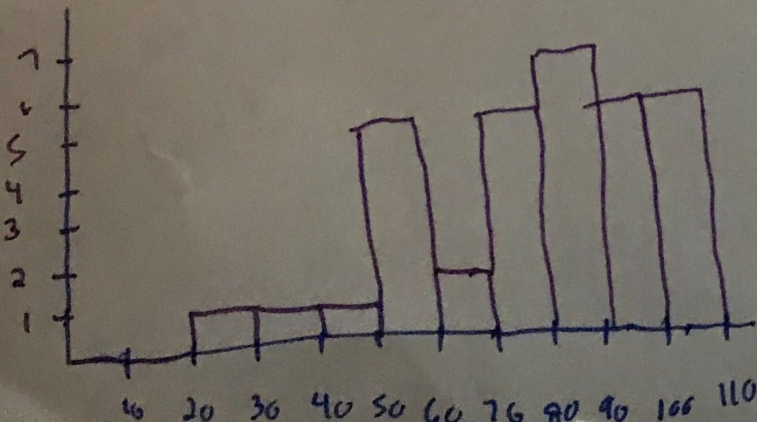
$\bar{x} \pm 3s_x = (8.3, 136.7) = 32/32 = 100\%$   
 $72.5 - 3(21.4) = 8.3$   
 $72.5 + 3(21.4) = 136.7$

Data falls close to 68-95-99.7 Rule

Normal Probability Plot (NPP)



Sth Hour Chapter 1 Test scores

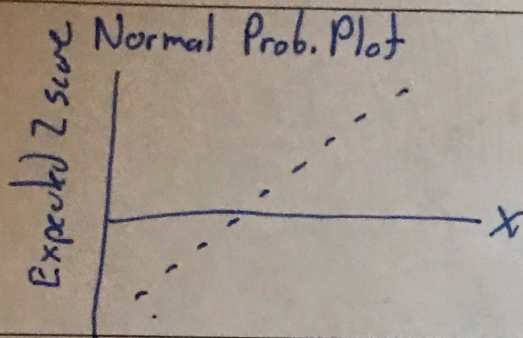


# Lesson 2.2 – Density Curves and Normal Distributions

Big Ideas:

- To Check Normality
- Graph
- Compare mean + median
- Check 68 - 95 - 99.7
- Normal Probability Plot

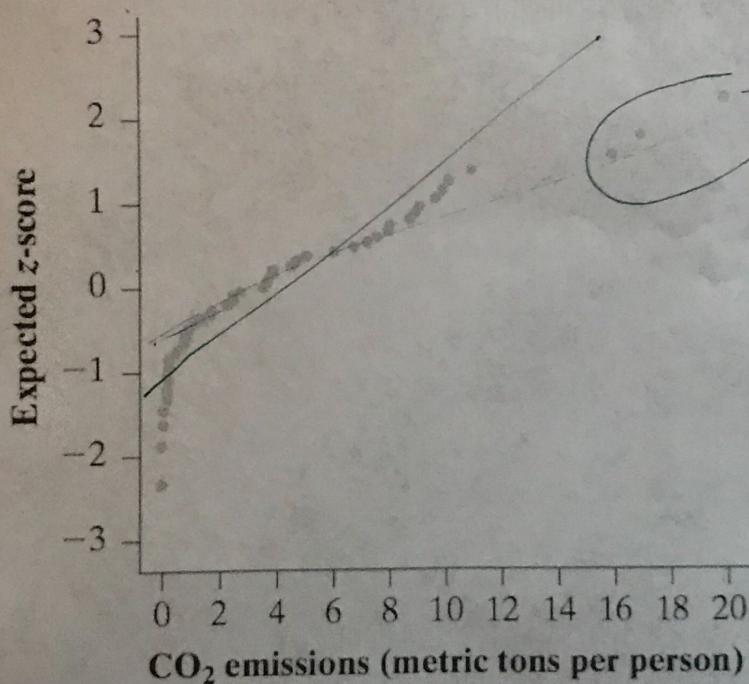
N.P.P.



If N.P.P. is  $\approx$  linear, the distribution of data is approximately normal

## Check Your Understanding:

The following figure is a Normal probability plot of the emissions of carbon dioxide (CO<sub>2</sub>) per person in 48 countries. Use the graph to determine if this distribution of CO<sub>2</sub> emissions is approximately Normal.



Outliers appear as points that are far away from overall pattern  
skewed right

The distribution of CO<sub>2</sub> emissions is not approximately normal b/c the Normal Prob. Plot is not linear.