

# Statistics

## Fall 2022

### Lecture 7



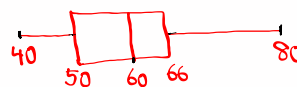
Class QZ 6:

Consider the 5-number Summary

Given below

Min  $Q_1$  Med  $Q_3$  Max  
40, 50, 66, 80

1) Draw Box Plot ✓



$$2) \text{ Find } IQR = Q_3 - Q_1 = 66 - 50 = 16 \checkmark$$

3) Upper Fence

$$= Q_3 + 1.5(IQR) = 90 \checkmark \\ = 66 + 1.5(16) = 90$$

4) Lower Fence

$$= Q_1 - 1.5(IQR) = 26 \checkmark \\ = 50 - 1.5(16) = 26$$

$$\text{Range} = 80 - 40 = 40$$

$$\text{Estimate } S \approx \frac{\text{Range}}{4} = \frac{40}{4} = 10$$

$$\text{Midrange} = \frac{80 + 40}{2} = 60$$

class width for

a) 3 classes

b) 5 classes

$$CW = \frac{\text{Range}}{3} \\ = \frac{40}{3} = 13.\bar{3}$$

$$CW = \frac{\text{Range}}{5} \\ = \frac{40}{5} = 8$$

$$CW = 14$$

$$CW = 9$$

Complete the chart below

class limits	Class MP	class F	% F
13 - 17	15	4	16%
18 - 22	20	6	24%
23 - 27	25	8	32%
28 - 32	30	7	28%

1) 4 classes  
 2) CW = 5  
 3)  $n = \sum F = 4 + 6 + 8 + 7 = 25$   
 4) Class MP =  $\frac{\sum \text{class limits}}{2}$   
 5)  $\% F = \frac{F}{n} \cdot 100$

6) Draw Pie chart with class MP & % F.

use class MP & class F to find

find  $\bar{x}$  in reduced fraction.

$\bar{x} = 23.6$   
 $S = 5.307$   
 $n = 25$

clear all lists  
 Reset all lists.  
 class MP  $\rightarrow$  L1  
 class F  $\rightarrow$  L2

STAT  $\rightarrow$  CALC  
 1: 1-Var Stats  
 with Menu: } No Menu  
 List: L1 } 1-Var Stats  
 FreqList: L2 } L1, L2  
 Calculate } Enter

VARS 5: Statistics  
 3:  $S_x$   $\chi^2$  Math  
 1:  $\frac{\square}{\square}$  Enter  
 $S^2 = \frac{169}{6}$

Clear all lists.

Store the following in L1.

38	25	20	40	42
18	48	32	30	28
19	49	52	16	24
24	27	30	31	45
34	30	49	50	40

Sort L1  
 STAT Edit 2: SortA( L1 Enter

View L1 2nd | 1  
 L1 Enter  $\rightarrow$   $\rightarrow$   $\rightarrow$

Make STEM Plot

1	689
2	044578
3	0001248
4	0025899
5	02

How many data elements are below 40? 16

what % of data elements are below 40?

below 40  $\rightarrow$  16  
 Sample Size  $\rightarrow$  25  
 $\frac{16}{25} \cdot 100 = 64\%$

$\begin{array}{r} 1 \mid 689 \\ 2 \mid 044578 \\ 3 \mid 0001248 \\ 4 \mid 0025899 \\ 5 \mid 02 \end{array}$	<p>Min = 16      Max = 52</p> <p>Range = 52 - 16 = 36</p> <p>Estimate S      <math>S \approx \frac{\text{Range}}{4} = \frac{36}{4} = \boxed{9}</math></p> <p>Mode = 30</p>
<p>Use 1-var stats with LI to find</p> <p><math>\bar{x} = 33.64</math></p> <p><math>S = 11.037</math></p> <p><math>n = 25</math></p> <p><math>\phi</math>    Min = 16</p> <p><math>\phi</math>    <math>Q_1 = 24.5</math></p> <p><math>\phi</math>    Med. = 31</p> <p>      <math>Q_3 = 43.5</math></p> <p>      Max = 52</p>	<p>Find <math>S^2</math> in reduced fraction.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <math display="block">S^2 = \frac{36547}{300}</math> </div> <p><math>\bar{x} \approx 34</math>      ,      <math>S \approx 11</math></p> <p>68% Range = <math>\bar{x} \pm S \Rightarrow \boxed{23 \text{ to } 45}</math></p> <p>Usual Range = <math>\bar{x} \pm 2S \Rightarrow \boxed{12 \text{ to } 56}</math></p> <p>"95% Range"</p>

<p>Min = 16</p> <p><math>Q_1 = 24.5</math></p> <p>Med. = 31</p> <p><math>Q_3 = 43.5</math></p> <p>Max = 52</p>	}	<p>5-Number Summary</p>	<p>Draw Box Plot</p> <p>IQR = <math>Q_3 - Q_1 = \boxed{19}</math></p>
<p>Upper Fence</p> <p><math>= Q_3 + 1.5(IQR)</math></p> <p><math>= 43.5 + 1.5(19) = \boxed{72}</math></p>	<p>Lower Fence</p> <p><math>= Q_1 - 1.5(IQR)</math></p> <p><math>= 24.5 - 1.5(19) = \boxed{-4}</math></p>	<p>Discuss outliers below -4 OR above 72</p> <p style="font-size: 2em; color: blue;">None</p>	

A Sample has a mean of 88 and standard deviation of 10.  $\bar{x} = 88, S = 10$

1) Find the Z-Score for data element 95.

$$Z = \frac{x - \bar{x}}{S} = \frac{95 - 88}{10} = \frac{7}{10} = \boxed{0.7} \quad \text{Usual} \quad -2 \leq Z \leq 2$$

2) Find the Z-Score for data element 62

$$Z = \frac{x - \bar{x}}{S} = \frac{62 - 88}{10} = \frac{-26}{10} = \boxed{-2.6} \quad \text{Unusual} \quad Z < -2 \text{ or } Z > 2$$

3) Find the data element with Z-Score 2.5.

$$Z = \frac{x - \bar{x}}{S} \quad \text{2.5} = \frac{x - 88}{10} \quad \text{Cross-multiply}$$

$$x - 88 = 2.5(10)$$

$$x - 88 = 25 \rightarrow x = 88 + 25$$

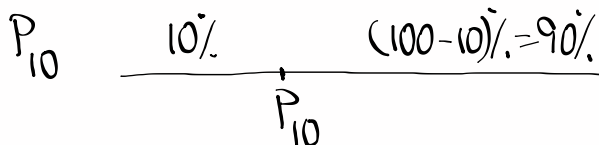
$$\boxed{x = 113}$$

Unusual  $Z < -2$  or  $Z > 2$

## Percentile

"Data must be Sorted"

$P_K$



How to find  $P_k$ :

Location  $L = \frac{k}{100} \cdot n$  ← Sample Size

If  $L$  is decimal → Round-up  $P_k = L^{\text{th}}$  element

If  $L$  is whole →  $P_k = \frac{L^{\text{th}} \text{ element} + \text{Next element}}{2}$

Consider the data below

5	025
6	03489
7	02555889
8	23668
9	028
10	0

$n=25$

Find  $P_{10}$

$L = \frac{k}{100} \cdot n$

$L = \frac{10}{100} \cdot 25 = 2.5$

$L=3$   $P_{10} = 3^{\text{rd}}$  element

$P_{10} = 55$

10% | 90%

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$P_{10}$

55

Find  $P_{80}$

$L = \frac{k}{100} \cdot n = \frac{80}{100} \cdot 25 = 20$

$P_{80} = \frac{20^{\text{th}} \text{ element} + \text{Next element}}{2} = \frac{86+88}{2} = 87$

80% | 20%

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$P_{80} = 87$

doing Reverse:

Find  $k$  such that  $P_k = 70$ .

$k = PR = \frac{B}{n} \cdot 100$

Sample Size →  $n$

Below →

Round to whole %.

5	025
6	03489
7	02555889
8	23668
9	028
10	0

$n=25$

$k = \frac{8}{25} \cdot 100 = 32$

$P_{32} = 70$

32% | 68%

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70

Find  $k$  such that  $P_k = 90$

$k = PR = \frac{B}{n} \cdot 100$

Below →

$k = \frac{21}{25} \cdot 100 = 84$

$P_{84} = 90$

84% | 16%

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$P_{84} = 90$

I randomly Selected 32 students, here are their ages

35	26	20	18
20	40	30	25
25	18	19	34
38	26	27	29
50	52	43	47
24	27	33	35
39	46	50	44
21	19	50	40

Store in LI

Double check for accuracy

Sort LI

View LI

Make

STEM Plot

1	8899
2	00145566779
3	0345589
4	003467
5	0002

1	8899
2	00145566779
3	0345589
4	003467
5	0002

$n=32$

Find  $P_{20}$

$$L = \frac{20}{100} \cdot 32 = 6.4 \rightarrow L=7$$

$P_{20} = 7\text{th element}$

$P_{20} = 21$

20%	80%
$P_{20} = 21$	

Find  $P_{50} = \text{Median}$

$$L = \frac{50}{100} \cdot 32 = 16$$

$P_{50} = \frac{16\text{th element} + 17\text{th element}}{2}$

$$= \frac{30 + 33}{2} = 31.5$$

31.5

end | 1 ( LI(16) enter LI(17) = 33

50%	50%
$P_{50} = 31.5$	

Find  $K$  such that  $P_K = 45$

$$K = PR = \frac{B}{n} \cdot 100 = \frac{26}{32} \cdot 100 = 81.25 \approx 81\%$$

Below  $\uparrow$

81%	19%
$P_8 = 45$	

Clear all lists

L1	L2
2	5
3	8
4	10
4	12
5	15

STAT → CALC

2:2-Var Stats

with Menu

{	Xlist: L1	}	No Menu
	Ylist: L2		2-Var Stats
	FreqList/clear		L1, L2
	Calculate		enter

$$\sum x = 18$$

$$\sum y = 50$$

$$\sum x^2 = 70$$

$$\sum y^2 = 558$$

$$n = 5$$

$$\sum xy = 197$$

class QZ 7:

Consider the Sample below

Find

15 10 16 18 18

1)  $\bar{x} = 15.7$

14 20 15 15 16

2)  $S = 2.7$

3)  $S^2 = \frac{661}{90}$

} Round to  
1-decimal} Reduced  
Fraction