

Statistics

Lecture 5



Feb 19-8:47 AM

I randomly selected 10 Quizzes, and here are the Scores.

8 5 6 8 10
4 5 7 2 10

1) $n = 10$

2) Range = $10 - 2 = 8$

3) Midrange = $\frac{10 + 2}{2} = 6$

4) Mode: 5, 8, 10
Trimodal

5) $\sum x = 65$

6) $\sum x^2 = 483$

7) $\bar{x} = \frac{\sum x}{n}$
 $= \frac{65}{10} = \boxed{6.5}$

8) $s^2 = \frac{n \sum x^2 - (\sum x)^2}{n(n-1)}$
 $= \frac{10 \cdot 483 - 65^2}{10(10-1)}$
 $= \frac{605}{90} \approx \boxed{6.722}$

9) $s = \sqrt{s^2}$
 $= \sqrt{6.722} \approx \boxed{2.593}$

10) Estimate s
 $s \approx \frac{\text{Range}}{4} \approx \frac{8}{4} = \boxed{2}$

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I randomly selected 20 exams, and here the scores

52	55	60	63	68	1) $n = 20$
70	70	73	75	79	2) Range = $100 - 52 = 48$
79	80	82	86	86	3) Midrange = $\frac{100 + 52}{2} = 76$
86	88	90	93	100	4) Mode = 86

5) Estimate $S \approx \frac{\text{Range}}{4} = \frac{48}{4} = 12$

6) $\sum x = 1535$

7) $\sum x^2 = 120963$

8) $\bar{x} = \frac{\sum x}{n} = \frac{1535}{20} = 76.75 \approx 77$

9) $S^2 = \frac{n \sum x^2 - (\sum x)^2}{n(n-1)} = \frac{20 \cdot 120963 - 1535^2}{20(20-1)} = \frac{63035}{380} \approx 165.882$

10) $S = \sqrt{S^2} = \sqrt{165.882} \approx 12.880 \approx 13$

11) 68% Range $\Rightarrow \bar{x} \pm S = 77 \pm 13 \Rightarrow 64 \text{ to } 90$

12) Usual Range $\Rightarrow \bar{x} \pm 2S = 77 \pm 2(13) \Rightarrow 51 \text{ to } 103$
 95% Range 77 ± 26

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52 55 60 63 68 Make STEM plot

52	55	60	63	68	5 2 5
70	70	73	75	79	6 0 3 8
79	80	82	86	86	7 0 0 3 5 9 9
86	88	90	93	100	8 0 2 6 6 6 8
					9 0 3
					10 0

How many numbers are below 70?
5

What % of numbers are below 70?
 $\frac{5}{20} \cdot 100 = 25\%$

Suppose the 5-Number Summary are
52 68 79 86 100

1) IQR = $Q_3 - Q_1 = 86 - 68 = 18$

2) Upper Fence = $Q_3 + 1.5(IQR) = 86 + 1.5(18) = 113$

3) Lower Fence = $Q_1 - 1.5(IQR) = 68 - 1.5(18) = 41$

4) Discuss outliers. $\frac{LF \quad \text{min} \quad \text{Max} \quad \text{UF}}{41 \quad 52 \quad 100 \quad 113}$
 No outliers

5) Draw Box Plot

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A data Set has a mean of 125 and standard deviation of 15.

1) 68%. Range = $\bar{x} \pm S = 125 \pm 15 \Rightarrow$ 110 to 140

2) 95%. Range = $\bar{x} \pm 2S = 125 \pm 2(15) \Rightarrow$ 95 to 155

3) 99.7%. Range = $\bar{x} \pm 3S = 125 \pm 3(15) \Rightarrow$ 80 to 170

4) Find the Z-Score for data element 150.

$$Z = \frac{x - \bar{x}}{S} = \frac{150 - 125}{15} = \frac{25}{15} = 1.667$$

5) Find the data element with Z-Score of -1.6.

$$Z = \frac{x - \bar{x}}{S}$$

$$-1.6 = \frac{x - 125}{15}$$

Cross-Multiply

$$x - 125 = -1.6(15)$$

$$x = 125 - 1.6(15)$$
x = 101

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Percentile

Data must be Sorted

Notation P_k

P_{15}

P_{80}

$P_{30} \text{ \& } P_{70}$

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How to find P_k :

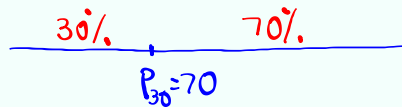
1) Location $L = \frac{k}{100} \cdot n$
 ↑
 Sample Size

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

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

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52	55	60	63	68
70	70	73	75	79
79	80	82	86	86
86	88	90	93	100



Find

P_{30}

$$L = \frac{30}{100} \cdot 20 = 6$$

↑
whole #

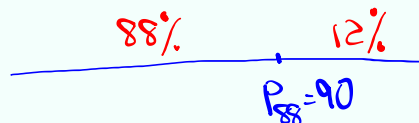
$$P_{30} = \frac{6^{\text{th}} + 7^{\text{th}}}{2} = \frac{70 + 70}{2} = \boxed{70}$$

Find P_{88}

$$L = \frac{88}{100} \cdot 20 = 17.6 \quad L = 18$$

↑
Decimal

$P_{88} = 18^{\text{th}}$ element
 $= \boxed{90}$



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Doing Reverse:

Find k such that

$P_k = 80$
Below

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

$k = \frac{11}{20} \cdot 100 = 55$

$P_{55} = 80$

55% 45%

$P_{55} = 80$

52 55 60 63 68
70 70 73 75 79
79 80 82 86 86
86 88 90 93 100

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Some TI Instructions:

- 1) To clear the Screen Clear
- 2) To quit 2nd Mode
- 3) To clear all lists
2nd + 4:Clear All lists Enter
- 4) To reset all lists
STAT Edit Enter
5:Setup Editor

Clear the Screen

Clear

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How to store data elements in a list:

Store the following Sample in a list.

32 45 40 28
18 20 30 55
35 25

STAT Edit

1:Edit

L1	
32	enter
45	"
40	"
⋮	
25	"

Let's quit

2nd **Mode**

Let's clear Screen

Clear

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How to view a list:

2nd **1** **Enter**

L1

{ 32 45 40 28 . . . 25 }

→ → →
← ← ←

How to Sort L1:

STAT Edit **2nd** **1** **Enter**

2:SortA()

Let's view L1 now

2nd **1** **Enter**

{ 18 20 25 . . . 55 }

→ → →
← ← ←

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Clear All lists

2nd **+** **4: Clear All Lists** **Enter**

Store the following in L1: **STAT** **Edit** **1: Edit**

65	88	70	100	75	65 Enter
					88 "
58	92	90	85	60	70 "
					...
					60 "

Let's quit

2nd **Mode**

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How to find \bar{x} & S_x :

STAT **→** **CALC** **1: 1-Var Stats**

with Menu
List: **L1**
FreqList: **clear**
Calculate

No Menu
L1 **Enter**

$\bar{x} = 78.3$

$S_x = 14.675$

$n = 10$

5-Number Summary

Min. = 58
Q1 = 65
Med = 80
Q3 = 90
Max = 100

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How to find S^2 :

[VARS]

[5: Statistics]

[3: S_x]

[x^2]

[Enter]

$$S^2 \approx 215.344$$

Convert to a reduced fraction

[MATH]

[1: $\frac{\square}{\square}$]

[Enter]

$$S^2 = \frac{19381}{90}$$

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Clear all lists

[2nd] [+ [4: clear All lists] [Enter]

Store the following in L1

75	82	90	88	70
100	55	65	95	85
78	80			

[STAT] Edit

[1: Edit]

L1
75
82
90
⋮
80

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Find \bar{x} & S .

STAT → **CALC**

1:1-Var Stats

$\bar{x} = 80.25$ List: L1 No Menu

$S = 12.779$ Freq List: **Clear** L1

Calculate **Enter**

↓ $n = 12$ **Find S^2**

↓ Min = 55

↓ $Q_1 = 72.5$ **VARS**

↓ Med = 81 **5: Statistics**

$Q_3 = 89$ **3: S_x**

Max = 100 **χ^2**

Convert to reduced fraction **Enter**

MATH $S^2 = \frac{7185}{44}$ $S^2 = 163.295$

1: $\frac{\square}{\square}$ **Enter**

Enter

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