

Statistics

Lecture 4



Feb 19-8:47 AM

class QZ 5

Given $n=10$, $\sum x=60$, $\sum x^2=360$

Find

$$1) \bar{x} = \frac{\sum x}{n} = \frac{60}{10} = \boxed{6} \checkmark$$

$$2) S^2 = \frac{n \sum x^2 - (\sum x)^2}{n(n-1)} = \frac{10 \cdot 360 - 60^2}{10(10-1)} = \frac{3600 - 3600}{90} = \frac{0}{90} = \boxed{0} \checkmark$$

$$3) S = \sqrt{S^2} = \sqrt{0} = \boxed{0} \checkmark$$

Since $S=0$,
All data elements are
the same as $\bar{x}=6$.

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I randomly selected 25 students, their ages are given below:

34	28	18	20	20
19	35	40	42	25
20	30	30	30	40
35	31	24	29	25
23	50	42	38	26

1) Clear all lists
 [2nd] [†] [4:ClearAllLists] [Enter]

2) Reset all lists.
 [STAT] Edit
 [5:SetupEditor] [Enter]

3) Store this data in L1.
 [STAT] Edit
 [1:Edit]

L1	
34	[Enter]
28	[Enter]
⋮	
26	[Enter]

4) quit & clear screen
 [2nd] [MODE] [clear]

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Sort L1, then view it, and make Stem Plot

[STAT] Edit [2nd] [1] [Enter]
 [2:SortA]

[2nd] [1] [Enter]

{ 18 19 20 20 20
 → → →
 ← ← ←

1	89
2	0003455689
3	00014558
4	0022
5	0

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find \bar{x} & S . Round to whole #. $\bar{x} = 30$
 $S = 9$

STAT → **CALC**
1: 1-VAR Stats

With MENU
 List: L1
 FreqList: Blank
Calculate

No MENU
2nd **1**
 1-Var Stats
 L1 **Enter**

$\bar{x} = 30.16$
 $S = S_x = 8.513$

↓
 ↓
 ↓
 ↓

Min = 18
 $Q_1 = 23.5$
 Med. = 30
 $Q_3 = 36.5$
 Max = 50

Find S^e in reduced fraction.

VARS **5: Statistics** **3: Sx**
 χ^2 **MATH** **1: Frac** **Enter**

$S^e = \frac{10871}{150}$

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Min = 18
 $Q_1 = 23.5$
 Med. = 30
 $Q_3 = 36.5$
 Max = 50

5-Number Summary
 1) Box Plot

2) $IQR = Q_3 - Q_1 = 36.5 - 23.5 = 13$

3) Upper Fence = $Q_3 + 1.5(IQR) = 36.5 + 1.5(13) = 56$
 Lower Fence = $Q_1 - 1.5(IQR) = 23.5 - 1.5(13) = 4$

No outliers

Clear all lists **2nd** **+** **4: clearAllLists** **Enter**

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Complete the Sreq. table below

class limits	class MP	class F	Cum. F	Rel. F	%F
16 - 26	21	7	7	.14	14%
27 - 37	32	13	20	.26	26%
38 - 48	43	20	40	.40	40%
49 - 59	54	10	50	.20	20%

4 classes, $cw = 11$, $n = 50$

Find \bar{x} & S

class MP \rightarrow L1
class F \rightarrow L2

L1	L2
21	7
32	13
43	20
54	10

STAT \rightarrow CALC
1: 1-Var Stats
Menu List: L1
Freq List: L2
Calculate

Find S^2 in reduced fraction

Vars: 5: Statistics 3: Sx
 x^2 MATH 1: Frac Enter
 $S^2 = \frac{39083}{350}$

$\bar{x} = 39.26$
 $S = 10.567$

$n = 50$

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Suppose $n = 120$, $\bar{x} = 58$, and $S = 6$.

1) Find the usual Range $\rightarrow \bar{x} \pm 2S$
95% Range $= 58 \pm 2(6)$
 $= 58 \pm 12$
 $= 46$ to 70

Assuming data is symmetric

2) How many data elements are above 70?
2.5% of 120
 $= 3$

3) What % of data elements are below 46?
2.5%

4) Find Z-Score for data element 80.
 $Z = \frac{x - \bar{x}}{S} = \frac{80 - 58}{6} = \frac{22}{6} = 3.667$
unusual

4) Find data element with Z-Score of -1.5.
 $Z = \frac{x - \bar{x}}{S} \Rightarrow -1.5 = \frac{x - 58}{6}$
Cross-multiply $-2 \leq Z \leq 2$ usual
 $x - 58 = 6(-1.5)$
 $x - 58 = -9$
 $x = 49$

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1 | 89

2 | 0003455689

3 | 00014558

4 | 0022

5 | 0

 $n=25$ How many data elements
are below 30? 12

What percent of data elements are below 30?

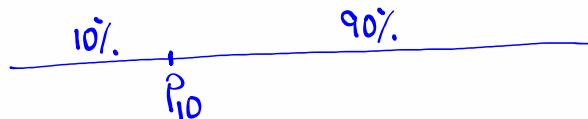
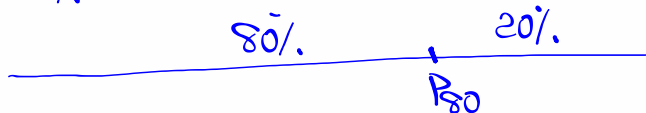
12 is what percent of 25?

$$\frac{P}{100} = \frac{12}{25} \rightarrow P = 48$$

48%

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Percentile

Notation is P_k , Data must be sorted $P_{10} \rightarrow 10\%$ below $\hat{=}$ 90% above $P_{80} \rightarrow 80\%$ below $\hat{=}$ 20% above $P_k \rightarrow k\%$ below $\hat{=}$ $(100-k)\%$ above

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How to find P_k :

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

If decimal \rightarrow Round-up, $P_k = L$ th element

If whole # $\rightarrow P_k = \frac{L\text{th element} + \text{Next one}}{2}$

1 | 89
 2 | 0003455689
 3 | 00014558
 4 | 0022
 5 | 0

Find P_{20}

$L = \frac{20}{100} \cdot 25 = 5$

$P_{20} = \frac{5\text{th element} + \text{Next one}}{2}$

$= \frac{20 + 23}{2} = \boxed{21.5}$

Find P_{65}

$L = \frac{65}{100} \cdot 25 = 16.25 \rightarrow L = 17$

$P_{65} = 17\text{th element} = \boxed{34}$

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1 | 89
 2 | 0003455689
 3 | 00014558
 4 | 0022
 5 | 0

Doing Reverse:

Find k such that $P_k = 40$

$k = \frac{B}{n} \cdot 100$, Round to whole %.

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

$P_{80} = 40$

Find k such that $P_k = 25$

$k = \frac{B}{n} \cdot 100 = \frac{7}{25} \cdot 100 = 28 \rightarrow \boxed{P_{28} = 25}$

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I randomly selected 24 exams, here are the Scores:

80	75	65	85	90	store in L1
100	92	88	58	94	Sort L1
86	72	66	69	70	View L1
82	78	63	100	98	Make Stem Plot
86	73	70	75		

find \bar{x} & s

$\bar{x} = 79.792 \approx 80$

$s = 12.176 \approx 12$

$n = 24$ $\text{Min} = 58$
 $Q_1 = 70$
 $\text{Med} = 79$
 $Q_3 = 89$
 $\text{Max} = 100$

```

5 | 8
6 | 3 5 6 9
7 | 0 0 2 3 5 5 8
8 | 0 2 5 6 6 8
9 | 0 2 4 8
10 | 0 0
    
```

$s^2 = \frac{81839}{552}$

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```

5 | 8
6 | 3 5 6 9
7 | 0 0 2 3 5 5 8
8 | 0 2 5 6 6 8
9 | 0 2 4 8
10 | 0 0
    
```

$n = 24$

Find P_{10}

$L = \frac{10}{100} \cdot 24 = 2.4 \rightarrow L = 3$

$P_{10} = \text{3rd element} = \boxed{65}$

Find P_{50} $L = \frac{50}{100} \cdot 24 = 12$ Median

$P_{50} = \frac{12\text{th} + 13\text{th}}{2} = \frac{78 + 80}{2} = \boxed{79}$

Find k such that $P_k = 85$

$k = \frac{B}{n} \cdot 100 = \frac{14}{24} \cdot 100 = 58.\bar{3} \approx 58$

Below \nearrow

$\frac{58\%}{85} \quad \frac{42\%}{85}$

$P_{58} = 85$

SG 7 & 8

✓

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Working with ordered-Pairs:

x	y	x ²	y ²	xy
✓ 1	4	1	16	4
✓ 2	7	4	49	14
✓ 2	6	4	36	12
✓ 3	10	9	100	30

$\sum x = 8$ ✓
 $\sum x^2 = 18$ ✓
 $n = 4$ ✓
 $\sum y = 27$ ✓
 $\sum y^2 = 201$ ✓
 $\sum xy = 60$ ✓

Clear all lists
 $x \rightarrow L1, y \rightarrow L2$

STAT \rightarrow CALC
2: 2-Var stats

Menu {

- xlist: L1
- Ylist: L2
- Freq List: Blank
- calculate

$L1, L2$
enter
 No Menu

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Consider the table below

x	y
2	5
3	8
3	10
4	10
5	12

Plot these Points

$x \rightarrow L1, y \rightarrow L2$, Find

- $\sum x = 17$
- $\sum x^2 = 63$
- $n = 5$
- $\sum y = 45$
- $\sum y^2 = 433$
- $\sum xy = 164$

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Perform the following steps

STAT → **CALC**

8:Lin Reg(a+bx)

Menu {
 X list: L1
 Y list: L2
 (Blank)
Calculate

No Menu
 L1, L2
Enter

$a = 1.808$
 $b = 2.115$
 $r^2 = .831$
 $r = .912$

If r & r^2 missing:
2nd **0** ↓ ↓ ... ↓
DiagnosticOn **Enter** **Enter**

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Study time	Quiz Scores
4	10
3	9
3	5
2	6
5	9

Study time → X → L1
 Quiz Score → Y → L2

STAT → **CALC**

8:Lin Reg(a+bx)

$a = 3.615$
 $b = 1.231$
 $r^2 = .419$
 $r = .647$

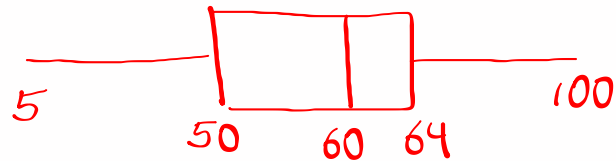
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Class QZ 6

Consider the 5-Number Summary give below

5 50 60 64 100

1) Draw Box Plot



2) $IQR = Q_3 - Q_1 = 64 - 50 = 14$

3) Upper Fence

$= Q_3 + 1.5(IQR) = 64 + 1.5(14) = 85$

4) Lower Fence

$= Q_1 - 1.5(IQR) = 50 - 1.5(14) = 29$

5) Discuss range for possible outliers. = 29

5 to 29 and 85 to 100

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