

Statistics

Spring 2023

Lecture 4



Feb 19-8:47 AM

Exam 1 Results

52	55	57	60	62	65	69	70	70	72
73	74	75	77	78	79	80	81	82	83
85	85	85	85	86	86	88	90	90	92
92	93	94	96	98	99	99	100	100	100

Find

- 1) $n = 40$
- 2) Range = $100 - 52 = 48$
- 3) Midrange = $\frac{100 + 52}{2} = 76$

4) Draw STEM Plot

```

5|257
6|0259
7|002345789
8|01235555668
9|0022346899
10|000
    
```

5) Mode: 85

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

"The range rule-of-thumb"

7) Find class width if we wish to have a freq. table with

- a) 3 classes

$$CW = \frac{\text{Range}}{3} = \frac{48}{3} = 16$$

CW = 17
- b) 5 classes

$$CW = \frac{\text{Range}}{5} = \frac{48}{5} = 9.6$$

CW = 10

Feb 21-11:18 AM

5 | 257
 6 | 0259
 7 | 002345789
 8 | 01235555668
 9 | 0022346899
 10 | 000

1) How many data elements are below 75?
 12

2) what % of data elements are below 75?

12 is what % of 40?

$$\frac{12}{40} \cdot 100 = 30 \quad \boxed{30\%}$$

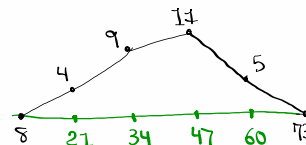


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Complete the chart below

class limits	class MP	class F
15 - 27	21	4
28 - 40	34	9
41 - 53	47	11
54 - 66	60	5

4) Draw Freq. Polygon



1) 4 classes

2) CW = 13

$$3) n = \sum f = 4 + 9 + 11 + 5 = 29$$

Find \bar{x} , S , and n for this grouped data

Clear all lists [2nd] [F4] [Enter]

Reset all lists [STAT] [Edit] [5: SetupEditor] [Enter]

class MP \rightarrow L1

class F \rightarrow L2 [STAT] [Edit] [1: Edit]

quit $\hat{=}$ Clear Screen

[End] [MODE] [clear]

L1	L2
21	4
34	9
47	11
60	5

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To find \bar{x} , S , and n :

STAT → **CALC**
1: 1-Var Stats

with Menu
 List: L1
 FreqList: L2
Calculate

No Menu
 L1, L2 **Enter**
7
End **2**

$\bar{x} = 41.621 \approx 42$
 $S = S_x = 12.292 \approx 12$
 $n = 29$

find S^2 in **Reduced fraction**
VARs **5: Statistics** **3: Sx**
 x^2 **Enter** $S^2 = 151.100952$

MATH **1: Frac** **Enter**

Round \bar{x} & S to a whole #, then find

$S^2 = \frac{61347}{406}$

68% Range
 $\bar{x} \pm S$
 $= 42 \pm 12 \Rightarrow$ **30 to 54**

USual Range "95% Range"
 $\bar{x} \pm 2S$
 $= 42 \pm 2(12) \Rightarrow$ **18 to 66**

2.5% 95% 2.5%
 18 66

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I randomly selected 32 students. Here are their ages:

25	28	18	32	35	30	Clear all lists Store this data in L1. Sort L1 STAT Edit 2: SortA L1 Enter
20	18	19	40	38	45	
28	21	18	19	44	34	
50	52	60	37	27	17	
58	43	36	20	28	20	
25	35					

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View L1, make STEM Plot

`2nd` `1` `Enter`

{ 17 18 18 18 19 ... }

1	7 8 8 8 9 9	find
2	0 00 15 5 7 8 8 8	$\bar{x} = 31.875$
3	0 24 55 6 7 8	$S = 12.260$
4	0 3 4 5	$n = 32$
5	0 2 8	\ominus Min = 17
6	0	\ominus $Q_1 = 20$

find S^2 in reduced fraction

`VARS` `5: Statistics` `3: Sx`

`χ^2` `MATH` `1: $\frac{\square}{\square}$` `Enter`

$S^2 = \frac{9319}{62}$

\ominus Med. = 29

\ominus $Q_3 = 39$

\ominus Max = 60

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Min = 17 5-Number Summary

$Q_1 = 20$ Box Plot

Med. = 29

$Q_3 = 39$

Max = 60

$IQR = Q_3 - Q_1 = 39 - 20 = 19$

Upper Fence = $Q_3 + 1.5(IQR) = 39 + 1.5(19) = 67.5$

Lower Fence = $Q_1 - 1.5(IQR) = 20 - 1.5(19) = -8.5$

outliers \Rightarrow above UF OR below LF

NO outliers

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1	7 8 8 8 9 9
2	0 0 0 15 5 7 8 8 8
3	0 2 4 5 5 6 7 8
4	0 3 4 5
5	0 2 8
6	0

$n=32$

what % of data elements are below 40?

24 out of 32 are below 40.

$$\frac{24}{32} \cdot 100 = 75\%$$

Percentile

Notation P_k

75% below 40 25% above

Data must be sorted.

$k\%$ below P_k above $(100-k)\%$

P_{15} 15% below P_{15} 85% above

P_{80} 80% below P_{80} 20% above

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1	7 8 8 8 9 9
2	0 0 0 15 5 7 8 8 8
3	0 2 4 5 5 6 7 8
4	0 3 4 5
5	0 2 8
6	0

Find P_{10}

$$L = \frac{10}{100} \cdot 32 = 3.2$$

If decimal \rightarrow Round up $L=4$

$P_{10} = 4\text{th element}$

$P_{10} = 18$

Find P_{50}

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

when whole # $\Rightarrow P_{50} = \frac{16\text{th} + 17\text{th}}{2} = \frac{28 + 30}{2} = 29$

How to find P_k :

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

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

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

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1	7	8	8	8	9	9
2	0	0	0	15	5	7
3	0	2	4	5	5	6
4	0	3	4	5		
5	0	2	8			
6	0					

Find P_{30}

$$L = \frac{30}{100} \cdot 32 = 9.6 \rightarrow L = 10$$

$P_{30} = 10\text{th element} = 21$

30% 70%

 $P_{30} = 21$

find P_{55}

$$L = \frac{55}{100} \cdot 32 = 17.6 \rightarrow L = 18$$

$P_{55} = 18\text{th element} = 32$

55% 45%

 $P_{55} = 32$

No decimal

Suppose $L = 12$

$$P_k = \frac{12\text{th} + \text{Next}}{2} = \frac{25 + 27}{2} = 26$$

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1	7	8	8	8	9	9
2	0	0	0	15	5	7
3	0	2	4	5	5	6
4	0	3	4	5		
5	0	2	8			
6	0					

Find k such that

$$P_k = 45$$

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

below

$$= \frac{27}{32} \cdot 100$$

$$= 84.375 \approx 84$$

84% 16%

below $P_{84} = 45$ Above

$P_{84} = 45$

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40 exams randomly selected, here are the Scores in Stem Plot.

5 | 2 5 7
 6 | 0 2 5 9
 7 | 0 0 2 3 4 5 7 8 9
 8 | 0 1 2 3 5 5 5 6 6 8
 9 | 0 0 2 2 3 4 6 8 9 9
 10 | 0 0 0

1) Find P_{20} whole #
 $L = \frac{20}{100} \cdot 40 = 8$
 $P_{20} = \frac{\text{8th element} + \text{Next element}}{2} = \frac{70 + 70}{2} = 70$

2) Find P_{82} Decimal $P_{82} = 33\text{rd element}$
 $L = \frac{82}{100} \cdot 40 = 32.8$ $L = 33$ $P_{82} = 94$
 $P_{82} = \frac{\text{82\%} + \text{1\%}}{2} = \frac{94 + 94}{2} = 94$

3) Find K such that $P_K = 85$.
 $K = \frac{B}{n} \cdot 100 = \frac{20}{40} \cdot 100 = 50\%$ (Below)
 $P_{50} = 85$ Median $\rightarrow P_{50} = 85$

SG 5-8 ✓✓✓

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working with ordered-Pairs:
 (x, y)

Given the following ordered-Pairs
 $(1, 3), (2, 6), (3, 10), (4, 10)$

Plot these Points

Scatter Plot

x	y	x^2	y^2	xy
1	3	1	9	3
2	6	4	36	12
3	10	9	100	30
4	10	16	100	40

Find:
 $\sum x = 10$ $\sum y = 29$
 $\sum x^2 = 30$ $\sum y^2 = 245$
 $n = 4$ $\sum xy = 85$

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Clear all lists. 2nd + 4: clear all list Enter

Reset all lists STAT Edit Enter
5: Setup Editor

x	y
1	3
2	6
3	10
4	10

$x \rightarrow L1, y \rightarrow L2$

STAT → CALC
2: 2-Var Stats

$\sum x = 10$ $\sum y = 29$

$\sum x^2 = 30$ $\sum y^2 = 245$

$n = 4$ $\sum xy = 85$

with Menu: } No Menu

xlist: L1 } L1, L2

ylist: L2 } □

FreqList: Clear } Enter

Calculate

Feb 28-8:42 PM

Consider the chart below

x	y
2	7
3	10
3	12
4	15
5	18

1) $n = 5$

2) Scatter Plot

3) $x \rightarrow L1, y \rightarrow L2$ Use 2-Var Stats
with $L1 \hat{=} L2$ to find

$\sum x = 17$

$\sum x^2 = 63$

$n = 5$

$\sum y = 62$

$\sum y^2 = 842$

$\sum xy = 230$

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How to find the regression line using TI:

$$y = a + bx$$

STAT → CALC

8: Lin Reg (a+bx)

with Menu: } No Menu

xlist: L1 } L1, L2 [enter]

ylist: L2 } []

[clear]

[Calculate]

$y = a + bx$

$a = -.154$

$b = 3.692$

$r^2 = .968$

$r = .984$

If r^2 & r missing:

[end] [0] ↓ ↓ ↓ ... ↓

▶ Diagnostic On

[enter] [enter]

Feb 28-8:56 PM

Consider the chart below

x	y
2	5
3	8
4	10
5	14
8	20

$x \rightarrow L1, y \rightarrow L2$

use Lin Reg (a+bx) with L1 & L2 to find

$a = .358 \approx .4$

$b = 2.509 \approx 2.5$

$r^2 = .987 \Rightarrow r^2(100) \approx 99\%$

$r = .994$

$\Rightarrow y = .4 + 2.5x$

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