Statistics

Lecture 1

Feb 19-8:47 AM

Some Math Review:

1) Reduce $\dfrac{75}{120} = \dfrac{3 \cdot 25}{3 \cdot 40} = \dfrac{25}{40} = \dfrac{5 \cdot 5}{5 \cdot 8} = \dfrac{5}{8}$ ↘

1) $\underline{\quad \dfrac{5}{8} \quad}$

TI-83 or 84

75 ÷ 120 [Math] [1:▶Frac] [Enter]

2) write .025 in

a) Reduced fraction

.025 [Math] [1:▶Frac] [Enter]

2a) $\dfrac{1}{40}$

b) percent notation

.025 (100)% = $\boxed{2.5\%}$

2b) $\underline{2.5\%}$

Jan 6-4:42 PM

I surveyed 120 students, and 8.5% of them were nursing majors. How many were nursing majors? if decimal, round-up.

what is 8.5% of 120?

$$x = .085(120)$$

$$= 10.2 \approx \boxed{11}$$

$$\underline{11}$$

Jan 6-4:48 PM

! factorial

find 6!

$$0! = 1$$

$$1! = 1$$

$$2! = 2 \cdot 1 = 2$$

$$3! = 3 \cdot 2 \cdot 1 = 6$$

$$6! = 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$$

$$= \boxed{720}$$

$$n! = n(n-1)(n-2)(n-3) \cdots 3 \cdot 2 \cdot 1$$

Simplify $\dfrac{8!}{5! \cdot 3!} = \dfrac{8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 \cdot 3 \cdot 2 \cdot 1}$

$$= \boxed{56}$$

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use your calc to find

$$\frac{72 - 65}{\frac{16}{\sqrt{25}}} = \frac{7}{\frac{16}{5}} = \frac{7}{3.2} = 2.1875$$

Round to
whole $\longrightarrow 2$
1-dec. $\longrightarrow 2.2$
2-dec. $\longrightarrow 2.19$

$$1.645 \cdot \sqrt{\frac{(.8)(.2)}{100}}$$

$$= 1.645 \cdot \sqrt{\frac{.16}{100}} = 1.645 \cdot \frac{.4}{10}$$

$$= 1.645 (.04) = .0658$$

1-Dec   .1
2-Dec   .07

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In a regular standard deck of playing cards, what % of them are face cards?

52 Cards, 12 face cards

12   is [what % of] 52?

$$12 = \frac{P}{100} \cdot 52 \qquad \longrightarrow P = \frac{12}{.52} = 23.076\ldots$$

$$12 = .52\,P \qquad \approx \boxed{23\%}$$

Jan 6-5:01 PM

Given $y = 2.5x - 10$

find y when $x = 4$.

$y = 2.5(4) - 10 = \boxed{0}$

Do not use Ø for Zero.

find x when $y = 30$.

$30 = 2.5x - 10$

$40 = 2.5x$

$x = \dfrac{40}{2.5}$

$\boxed{x = 16}$

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Graph $3x + 5y = -15$

x	y
0	-3
-5	0

Isolate Y

$5y = -3x - 15$

$y = \dfrac{-3}{5}x - \dfrac{15}{5}$

Slope - Int

$\boxed{y = \dfrac{-3}{5}x - 3}$

$(0, -3)$

-3
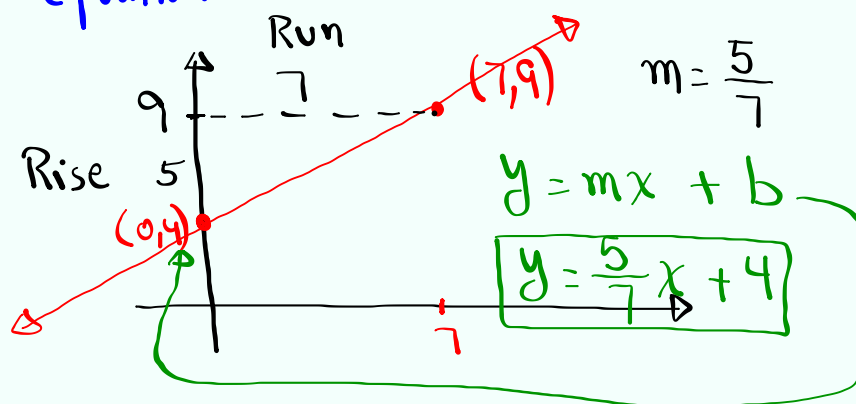
5

Y-Int
$(0, -3)$
Slope
$\dfrac{-3}{5}$

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4

Plot $(0,4)$ & $(7,9)$,

find equation of the line that contains them.

Run

$(7,9)$

$m = \dfrac{5}{7}$

Rise 5

$(0,4)$

$y = mx + b$

$y = \dfrac{5}{7}x + 4$

7

Jan 6-5:13 PM

I surveyed 100 students. 25 were math and CS majors. 15 were math only majors. 20 were CS only majors.

Organize this in a Venn Diagram.

100 Students

Math   CS
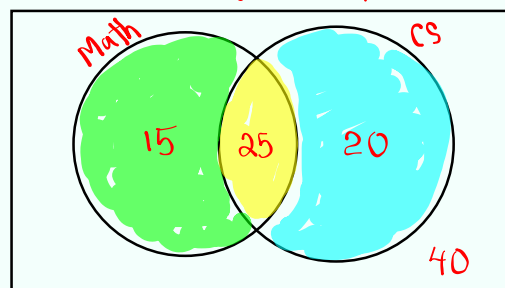
15   25   20

$100 - (15+25+20)$

$= 40$

40

SG 1 ✓

Jan 6-5:17 PM

Language of Statistics:

Statistics is about collecting information, organize them, graph them, process them, and draw conclusion from them.

Two Branches:
1) Descriptive:
   Collect information and do various things with them.
2) Inferential
   Draw conclusion from descriptive Statistics.

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Population   Entire field of interest
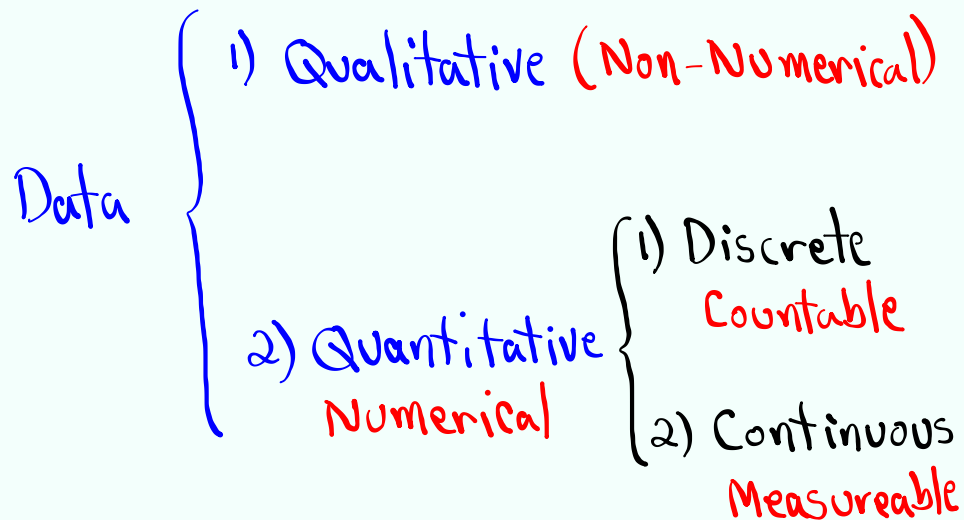   Every, all

Sample   Information collected randomly
              from Population.
              Randomly taken from Pop.

Population ⟷ Parameter

Sample ⟷ Statistic

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Data $\longrightarrow$ Information Collected

Data $\begin{cases} \text{1) Qualitative (Non-Numerical)} \\ \\ \text{2) Quantitative} \\ \quad\text{Numerical} \end{cases}$ $\begin{cases} \text{1) Discrete} \\ \quad\text{Countable} \\ \\ \text{2) Continuous} \\ \quad\text{Measureable} \end{cases}$

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Level of measurement:

1) Nominal (Names, No meaning ful order)

2) Ordinal (order is meaningful)

3) Ratio (You can make a meaningful ratio)

      Small drink 10oz

      Large   //   20 oz

4) Interval (Range of Values)

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How to collect data:

1) Systematic   every kth item selected

2) Stratified   Divide into groups
                 and few selected from
                 each group
                 Males & Females
                 2 M   3 F

3) Cluster   Divide into groups
                 Some groups are selected

Least reliable   Collect data from all
4) Random or   members of selected
   Convenience   groups.

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I surveyed
    100 Freshmen, 150 Sophmore, 75 Jrs.,
    and 25 Srs. from Cal poly Pomona.
              Stratified

College offeres 500 sections of classes in
  Winter 2026.
    I randomly selected 50 sections,
    and ask all students to complete a
    survey.
              Cluster

Your cousin told you to take my class.
        Random or Convenience

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Experiment   vs.   Observation

Take action   No action taken
and See the   but you
  result   notice changes.

Simple   Random   Sample

All   observation, All data elements
    have Same chance to be
        taken.

SG 2 ✓

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A data Set has a minimum of 20
and max. of 80.

Range = Max − Min = 80 − 20 = $\boxed{60}$

$\text{Midrange} = \dfrac{\text{Max} + \text{Min}}{2} = \dfrac{80 + 20}{2} = \boxed{50}$

Possible error

$80 + 20 \div 2 \rightarrow 90$

$(80 + 20) \div 2 \rightarrow 50$

Jan 6-6:16 PM

I randomly selected 5 quizzes, here are the scores

$$3 \quad 5 \quad \boxed{8} \quad 8 \quad 9$$

Sample Size $\boxed{n = 5}$

Max $= 9$, Min $= 3$

Range $=$ Max $-$ Min $= 9 - 3 = \boxed{6}$

Midrange $= \dfrac{\text{Max} + \text{Min}}{2} = \dfrac{9 + 3}{2} = \boxed{6}$

Mode (Data element with highest frequency) 8

Median (Data element in the middle after data is sorted)
8

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$$\sum x = 3 + 5 + 8 + 8 + 9 = \boxed{33}$$
Sum of data elements

$$\sum x^2 = 3^2 + 5^2 + 8^2 + 8^2 + 9^2 = \boxed{243}$$
Sum of squares of data elements

Compute $\dfrac{\sum x}{n} = \dfrac{33}{5} = \boxed{6.6}$

Compute $\dfrac{n \sum x^2 - (\sum x)^2}{n(n-1)}$

$$= \dfrac{5 \cdot 243 - 33^2}{5(5-1)} = \dfrac{126}{20} = \boxed{6.3}$$

Find $\sqrt{\text{Last answer}} = \sqrt{6.3} \approx \boxed{2.51}$

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Consider the Sample below

$$2 \quad 4 \quad 6 \quad 8 \quad 10 \quad 12$$

1) $\boxed{n = 6}$

2) Max = 12, Min = 2

3) Range = Max - Min = 12 - 2 = 10

4) Midrange = $\dfrac{\text{Max} + \text{Min}}{2} = \dfrac{12 + 2}{2} = 7$

5) Mode None

6) Median = $\dfrac{6 + 8}{2} = \boxed{7}$

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7) $\sum x = 2 + 4 + 6 + 8 + 10 + 12 = \boxed{42}$

8) $\sum x^2 = 2^2 + 4^2 + 6^2 + 8^2 + 10^2 + 12^2 = \boxed{364}$

9) Compute $\dfrac{\sum x}{n} = \dfrac{42}{6} = \boxed{7}$

10) Compute $\dfrac{n \sum x^2 - (\sum x)^2}{n(n-1)} = \dfrac{6 \cdot 364 - 42^2}{6(6-1)}$

$= \dfrac{420}{30} = \boxed{14}$

11) Find $\sqrt{\text{Last Answer}}$

$= \sqrt{14} \approx \boxed{3.742}$

Jan 6-6:35 PM

We organize data in a freq. table.

class limits	Class BNDRS	class MP	class F	cum.F	Rel. F	% F

To make this table, we need to have # of classes.

$$\text{Class width} = \frac{\text{Range}}{\text{\# of classes}}$$

If decimal ⟶ Always round-up.

If whole ⟶ Always add 1.

Jan 6-6:41 PM

I randomly selected 25 exams, min. Score was 60, Max. Score was 100.

$n = 25$ $Max = 100$ $Min = 60$

$Range = Max - Min = \boxed{40}$

$Midrange = \frac{Max + Min}{2} = \frac{100 + 60}{2} = 80$

Find class width if we wish to have

a) 3 classes $CW = \frac{Range}{3} = \frac{40}{3} = 13.\overline{3}$ $\boxed{CW = 14}$

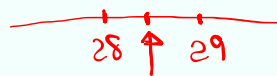b) 4 classes $CW = \frac{Range}{4} = \frac{40}{4} = 10$ $\boxed{CW = 11}$

c) 5 classes $CW = \frac{Range}{5} = \frac{40}{5} = 8$ $\boxed{CW = 9}$

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Consider the freq. table below

Class limits	Class BNDR	Class MP	Class F	Cum.F	Rel. F	%F
18 – 28	17.5 – 28.5	23	7	7	.35	35%
29 – 39	28.5 – 39.5	34	8	15	.40	40%
40 – 50	39.5 – 50.5	45	5	20	.25	25%

28 ↑ 29

$\boxed{CW=11}$ ✓

$n = 20$

Class MP = $\dfrac{\text{Add class limits}}{2}$

Rel. F = $\dfrac{f}{n} = \dfrac{f}{20}$

we can draw

1) Bar chart

2) Histogram

3) Ogive

4) Freq. Polygon

5) Pie chart

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