

Statistics

Lecture 1



Feb 19-8:47 AM

Basic Math Review:

1) Reduce $\frac{36}{120} = \frac{\cancel{6} \cdot 6}{\cancel{6} \cdot 20} = \frac{\cancel{2} \cdot 3}{\cancel{2} \cdot 10} = \boxed{\frac{3}{10}}$

1) $\frac{3}{10}$

2) Convert .5% to

a) Decimal $.5\% = .5(.01) = \boxed{.005}$

a) .005

b) Reduced Fraction

$.5\% = .5 \left(\frac{1}{100} \right) = \frac{1}{2} \cdot \frac{1}{100} = \boxed{\frac{1}{200}}$

b) $\frac{1}{200}$

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3) 4% of 125 students were STEM majors.

How many of them were not STEM majors?

$$4\% \text{ of } 125 = .04(125) = \boxed{5}$$

$$125 - 5 = \boxed{120}$$

3) 120

4) In a deck of playing cards, 52 cards, and 4 aces. what percent of cards are aces?

4 is what percent of 52?

$$\frac{P}{100} = \frac{\text{part}}{\text{whole}} \quad \text{whole comes after of}$$

$$\frac{P}{100} = \frac{4}{52}$$

Cross-Multiply

$$52P = 100(4)$$

$$52P = 400$$

$$P = \frac{400}{52}$$

$$P = 7.692$$

$$P \approx 8$$

about

4) 8%

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Scientific Notation

$$N \times 10^n$$

$$1 \leq N < 10$$

any integer

$$2.6 \times 10^8 = \underline{\underline{260,000,000}}$$

$$4.25 \times 10^{-6}$$

$$\underline{\underline{0.00000425}}$$

$$2.6 \times 10^8 = 260,000,000$$

$$0.00000425$$

optional

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! Factorial

$$0! = 1$$

$$1! = 1$$

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

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

$$5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 120$$

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

Simplify

$$\frac{8!}{5! \cdot 3!} = \frac{8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 \cdot 3 \cdot 2 \cdot 1} = \boxed{56}$$

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TI-83 or TI-84

use your calc to simplify

$$\frac{5 \cdot 45 - 15^2}{5(5-1)} = \frac{225 - 225}{5 \cdot 4} = \frac{0}{20} = \boxed{0}$$

Do not use \emptyset for Zero.

$$\frac{28 - 20}{\frac{16}{\sqrt{25}}} = \frac{8}{\frac{16}{5}} = \frac{8}{3.2} = \boxed{2.5}$$

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$$2x - 5y = 20$$

Find x when $y = -4$

$$2x - 5(-4) = 20$$

$$2x + 20 = 20$$

$$2x = 0 \quad x = \frac{0}{2}$$

$$\boxed{x = 0}$$

Find y when $x = -10$

$$2(-10) - 5y = 20$$

$$-20 - 5y = 20$$

$$-5y = 20 + 20$$

$$-5y = 40$$

$$y = \frac{40}{-5}$$

$$\boxed{y = -8}$$

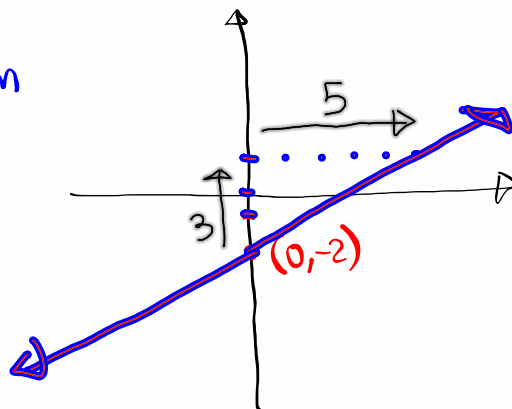
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Graph $y = \frac{3}{5}x - 2$

$y = mx + b$ Slope-Int. Form

$$m = \frac{3}{5} \begin{array}{l} \text{Rise} \\ \text{Run} \end{array}$$

Y-Int $(0, -2)$



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Plot (0,4) and (6,0), then find the eqn of the line that contains them.

$y = mx + b$

$y = -\frac{2}{3}x + 4$

Y-Int $b=4$

Slope $m = \frac{\text{Rise}}{\text{Run}} = \frac{-4}{6} = -\frac{2}{3}$

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I surveyed 80 people Total $80 - 45 = 35$

20 were Smokers only.

15 " Drinkers only.

10 " Smokers and Drinkers.

Smokers 20

Drinkers 15

35

Organize this information in a Venn Diagram.

SG 1

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Terminologies in Statistics:

what is statistics?

It is about collecting information (data)

organize them, draw graphs, do some calculations, and draw conclusion.

Two Branches:

1) Descriptive statistics

2) Inferential Statistics

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Descriptive Branch:

Collect data, organize, graph, and do certain computations.

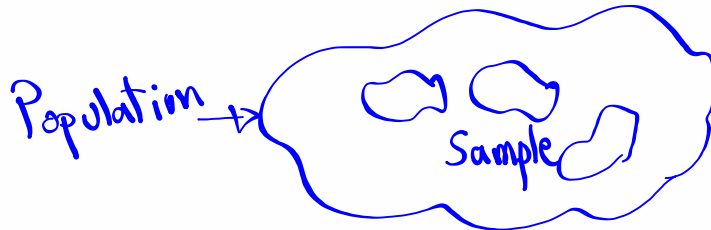
Inferential Branch:

Draw conclusion from descriptive statistics with some level of confidence and make predictions.

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Entire field of interest \Rightarrow Population \rightarrow All, every

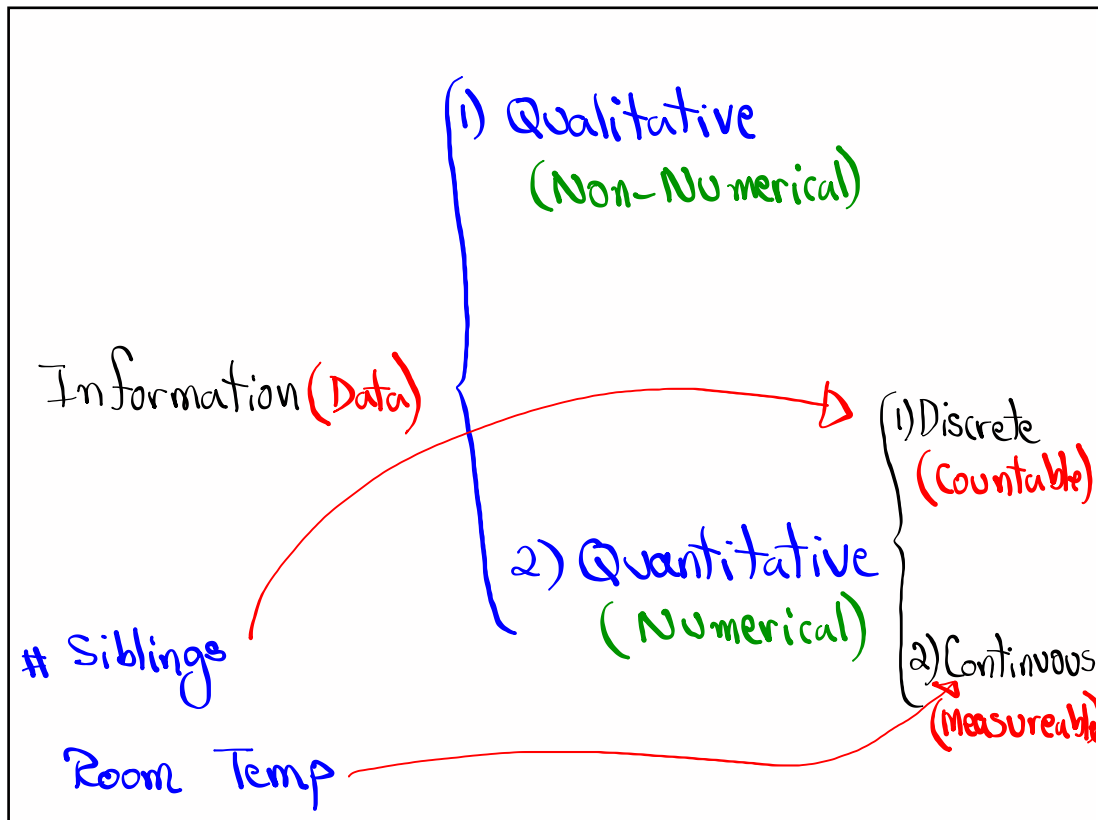
data randomly taken from population \Rightarrow Sample



Sample \Leftrightarrow Statistic

Population \Leftrightarrow Parameter

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Level of Measurements:

1) Nominal → Names, Colors, Races, Name of States

2) Ordinal → Order is meaningful
Small, Med., Large

3) Ratio → Ratio has to be meaningful

4) Interval
Small → 100Z → 2 to 1
Large → 200Z

↳ Range of Values Drive time
40 to 50 mins.

90% - 100% → A

Distance between two Cities
300 to 320 miles

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Methods on Collecting Data:

1) Systematic every kth item selected
Record every 10th call.

Select every 20th item
for inspection.

2) Stratified Divide into groups,
Select few from each group

80 students { 50 Females (Select 10 females)
30 Males (Select 8 males)

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3) Cluster Divide into groups
Select few groups
Collect data from all
members of selected groups.

College is offering 2000 classes.
100 classes were randomly selected,
all students from selected classes
completed a survey form.

4) Random / Convenience
"Least Reliable Method"

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Experiment vs Observation

Experiment: You observe changes after
some action taken.

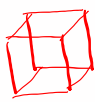
Observation: You observe changes
without taking any action.

Simple Random Sample:

Every member of sample
has the same chance of
being selected.

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I Slip a Fair Coin.
 Heads or Tails
 50/50 chance to get those on every
 flip.
 Can it land on legs? Impossible

Roll a Fair die  You can get
 1, 2, 3, 4, 5, 6
 Simple Random
 Sample.

Can You get an even number?
 2, 4, 6 → Very likely

Can You get a Zero? NO, Impossible

Can You get 1, 2, 3, 4, 5, or 6? Yes
SG 2 Surely

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Consider the Sample below
 2, 4, 4, 4, 6

- 1) Sample Size $n=5$
- 2) Min. = 2, Max. = 6
- 3) Range = Max - Min. = $6 - 2 = 4$
- 4) Midrange = $\frac{\text{Max} + \text{Min}}{2} = \frac{6 + 2}{2} = \frac{8}{2} = 4$

x → Data elements

$$\sum x = 2 + 4 + 4 + 4 + 6 = 20$$

↑
 Summation

$$\frac{\sum x}{n} = \frac{20}{5} = 4$$

$$\sum x^2 = 2^2 + 4^2 + 4^2 + 4^2 + 6^2 = 4 + 16 + 16 + 16 + 36 = 88$$

Simplify $\frac{n \sum x^2 - (\sum x)^2}{n(n-1)} = \frac{5 \cdot 88 - (20)^2}{5(5-1)} = \frac{40}{20} = 2$

Find $\sqrt{\text{last answer}}$, Round to 3-decimal places.
 $\sqrt{2} \approx 1.414$

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Consider the Sample below
0 5 8 10

1) $n = 4$ 2) $\text{Min.} = 0$ 3) $\text{Max} = 10$

4) $\text{Range} = \text{Max} - \text{Min} = 10$ 5) $\text{Midrange} = \frac{\text{Max} + \text{Min}}{2}$
 $= \frac{10 + 0}{2} = 5$

6) $\sum x = 0 + 5 + 8 + 10 = 23$ 7) $\sum x^2 = 0^2 + 5^2 + 8^2 + 10^2 = 189$

8) $\frac{\sum x}{n} = \frac{23}{4} = 5.75$

9) $\frac{n \sum x^2 - (\sum x)^2}{n(n-1)} = \frac{4 \cdot 189 - 23^2}{4(4-1)} = \frac{227}{12} = 18.91\bar{6}$
 ≈ 19

10) $\sqrt{\text{last answer}}$, Round to 1-decimal Place
 $\sqrt{19} \approx 4.4$

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Class QZ 1:

1) what kind of calculator do we need for this class? **TI-83 or TI-84**

2) Simplify $\frac{8 \cdot 200 - 40^2}{8(8-1)} = \frac{1600 - 1600}{8 \cdot 7} = \frac{0}{56} = 0$

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