

Statistics

Lecture 1



Feb 19-8:47 AM

Basic Math Review

$$1) \text{ Reduce } \frac{80}{120} = \frac{8 \cdot \cancel{10}}{12 \cdot \cancel{10}} = \frac{4 \cdot 2}{4 \cdot 3} = \frac{2}{3}$$

$$1) \frac{2}{3}$$

2) Convert .5% to

a) Reduced fraction

$$.5\% = \frac{.5}{100} = \frac{\cancel{5}^1}{\cancel{100}^{200}} = \frac{1}{200}$$

$$2a) \frac{1}{200}$$

b) Decimal notation

$$.5\% = .5(.01) = .005$$

$$2b) .005$$

Jun 24-4:31 PM

3) I surveyed 200 students and 12.5% of them were STEM majors.

How many of them were STEM majors?

What is 12.5% of 200?

$$\begin{aligned}
 x &= 12.5\% (200) && 3) \underline{25} \\
 &= \frac{12.5}{100} (200) \\
 &= 12.5(2) = \boxed{25}
 \end{aligned}$$

Jun 24-4:36 PM

Scientific Notation

Large or Small numbers

$$1 \leq N < 10 \quad N \times 10^n \quad \text{any integer}$$

$$\begin{array}{ll}
 2.5 \times 10^8 & 1.75 \times 10^{-4} \\
 \text{(Large \#)} & \text{(Small \#)}
 \end{array}$$

$$\begin{aligned}
 2.5 \times 10^8 &= 2.5 \underbrace{00000000} \\
 &= 250,000,000
 \end{aligned}$$

$$1.75 \times 10^{-4} = \underbrace{0000}1.75$$

optional $= 0.000175$

Jun 24-4:40 PM

Use your calc to find

$$\frac{8(250) - 100^2}{8(8-1)} = \frac{2000 - 10000}{8(7)}$$

$$= \frac{-8000}{8(7)} = \frac{-1000}{7}$$

$$\frac{36 - 28}{\frac{10}{\sqrt{4}}} = \frac{8}{\frac{10}{2}} = \frac{8}{5} = \boxed{1.6}$$

Simplify, Round to 2-decimal places

$$1.645 \cdot \sqrt{\frac{(.8)(.2)}{25}} = 1.645 \cdot \sqrt{\frac{.16}{25}}$$

$$= 1.645 \cdot \frac{.4}{5}$$

$$= .1316 \approx \boxed{.13}$$

Jun 24-4:44 PM

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

$$0! = 1$$

$$1! = 1$$

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

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

Simplify

$$6! - 4! =$$

$$6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 - 4 \cdot 3 \cdot 2 \cdot 1$$

$$= 720 - 24 = \boxed{696}$$

Simplify

$$\frac{7!}{4! \cdot 3!} = \frac{7 \cdot \cancel{6} \cdot \cancel{5} \cdot \cancel{4} \cdot \cancel{3} \cdot \cancel{2} \cdot 1}{4 \cdot \cancel{3} \cdot \cancel{2} \cdot 1 \cdot \cancel{3} \cdot \cancel{2} \cdot 1} = \frac{35}{1} = \boxed{35}$$

$$\text{Simplify : } \frac{5(180) - 30^2}{5(5-1)} = \frac{900 - 900}{5 \cdot 4} = \frac{0}{20} = \boxed{0}$$

Do not use 0 for zero.

Jun 24-4:51 PM

$$y = 4.5x - 27$$

find y if $x = 6$

$$y = 4.5(6) - 27 = 27 - 27 = \boxed{0}$$

find x if $y = -18$

$$-18 = 4.5x - 27$$

$$-18 + 27 = 4.5x$$

$$9 = 4.5x$$

$$x = \frac{9}{4.5}$$

$$\boxed{x = 2}$$

Jun 24-4:59 PM

$$3x - 2y = 8$$

$$-2y = -3x + 8$$

$$y = \frac{-3}{-2}x + \frac{8}{-2}$$

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

, Isolate y ,

write in

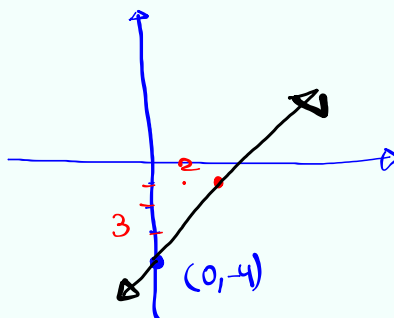
$$y = mx + b$$

form

Slope-Int. Form

y -Int $(0, -4)$

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



Jun 24-5:02 PM

Plot the following points
 $(0,6)$, $(3,5)$, $(5,3)$, $(8,0)$

Connect the first & last points to
 draw a line, give its eqn in $y = mx + b$.

$m = \frac{-6}{8} = \frac{-3}{4}$

$y = \frac{-3}{4}x + 6$

Y-Int.

Jun 24-5:06 PM

I surveyed 30 students

18 had iPhone
 10 had Macbook laptop
5 had both.

Draw its Venn Diagram.
 one way to
 organize information

SG 1 ✓

Jun 24-5:14 PM

What is statistics?

SG 2

It is about collecting information (Data)
we organize them, graph them,
do certain computations, and
draw conclusion from it.

Two Branches

- 1) Descriptive: Collect data, organize,
graph, do certain
computations.
- 2) Inferential: To draw reasonable
conclusion, to make predictions

Jun 24-5:45 PM

Entire field of interest \Rightarrow Population

Randomly select information
from it \Rightarrow Sample

Population \leftrightarrow Parameter

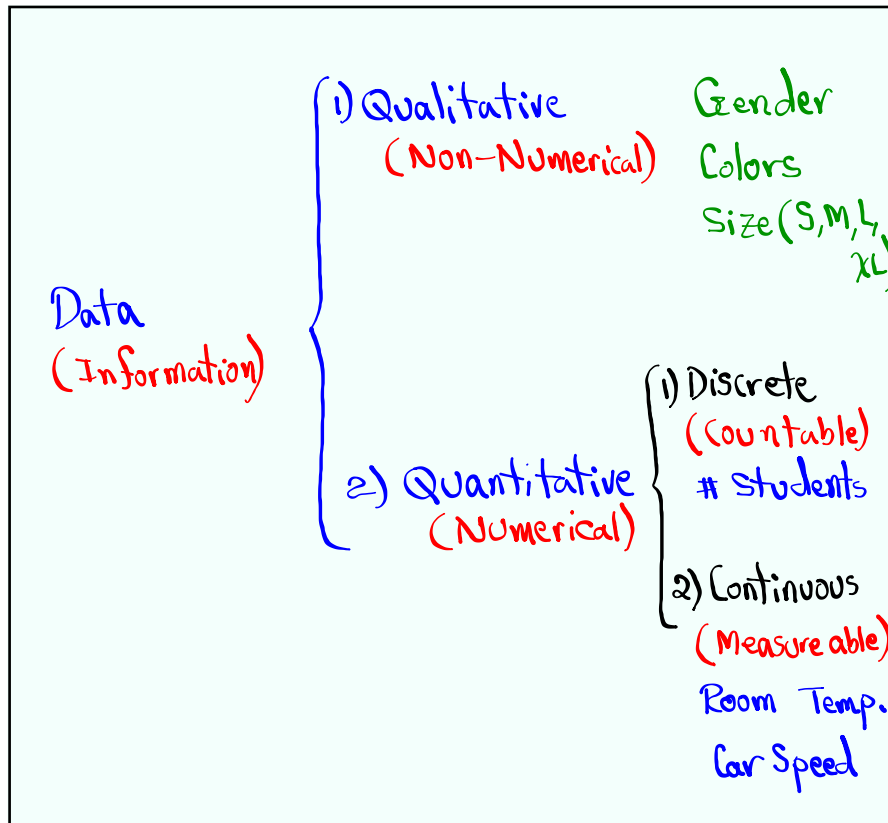
Sample \leftrightarrow Statistic

Average age of all students ----

Average salary of 10 randomly
selected nurses ----

we use statistic to learn about
Parameters.

Jun 24-5:49 PM



Jun 24-5:53 PM

Methods to Collect Samples:

1) Systematic

every k th item selected

every 10th item selected for inspection.

2) Stratified

Divide into groups, select few from each group.

30 students

18 Females (select 5)

12 Males (select 4)

Jun 24-5:57 PM

3) Cluster

Divide into groups, select few groups, collect data from all items of selected groups.

College offers 500 sections of classes.

Select 50 classes, and collect data from all students on those 50 classes.

4) Random/Convenience

Least Reliable Method

Jun 24-6:01 PM

Level of measurements

1) Nominal Small, Med., Large
Red, white, Blue
First Name

2) Ordinal meaningful order
Small, Med, Large

3) Ratio Meaningful Ratio
Small 10 oz
Large 20 oz

4) Interval Range of values
90% - 100% \Rightarrow A

Jun 24-6:07 PM

Experiment vs Observation

Observation → Notice of change
without taking action.

Experiment → Notice of change
due to some action
taken.

Simple Random Sample

All outcomes have same chance of
happening.

Flip a fair coin → 50-50 chance
for H or T.

SG 2 ✓

Jun 24-6:13 PM

Consider the Sample below

2, 3, 5, 5, 10

1) Sample Size $n = 5$

2) Min. = 2, Max. = 10

3) Range = Max - Min = $10 - 2 = 8$

4) Midrange = $\frac{\text{Max} + \text{Min}}{2} = \frac{10 + 2}{2} = 6$

5) Mode = 5

6) $\sum x = 2 + 3 + 5 + 5 + 10 = 25$

↑
Summation

7) $\sum x^2 = 2^2 + 3^2 + 5^2 + 5^2 + 10^2$
 $= 4 + 9 + 25 + 25 + 100 = 163$

8) $\frac{\sum x}{n} = \frac{25}{5} = 5$

9) $\frac{n \sum x^2 - (\sum x)^2}{n(n-1)} = \frac{5 \cdot 163 - 25^2}{5(5-1)} = \frac{190}{20} = \frac{19}{2}$
 $= 9.5$

10) $\sqrt{\text{Last Answer}}$, Round to 3-decimal places
 $\sqrt{9.5} \approx \boxed{3.082}$

Jun 24-6:24 PM

I randomly selected 8 students, here are their QZ Scores

2, 3, 5, 5, 8, 8, 9, 12

1) Sample Size $n = 8$

2) Min. = 2, Max. = 12

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

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

5) Mode = 5 & 8 Bimodal

6) $\sum x = 2 + 3 + 5 + 5 + 8 + 8 + 9 + 12 = 52$

7) $\sum x^2 = 2^2 + 3^2 + 5^2 + 5^2 + 8^2 + 8^2 + 9^2 + 12^2 = 416$

8) $\frac{\sum x}{n} = \frac{52}{8} = 6.5$

9) $\frac{n \sum x^2 - (\sum x)^2}{n(n-1)} = \frac{8 \cdot 416 - 52^2}{8(8-1)} = \frac{624}{56}$

624 ÷ 56 MATH 1: Frac Enter = $\frac{78}{7}$

10) Last answer, Round to 2-decimal places

$\sqrt{\frac{78}{7}} \approx 3.34$

Jun 24-6:34 PM

A Sample Set has a min. = 20, and max. = 100.

1) Find its range

Range = Max - Min = 100 - 20 = 80

2) Divide range by 4, if decimal → Round-up

$\frac{\text{Range}}{4} = \frac{80}{4} = 20 \rightarrow \boxed{21}$ if whole → Add 1

3) Divide range by 6, if decimal → Round-up
if whole → Add 1

$\frac{\text{Range}}{6} = \frac{80}{6} = 13.\bar{3} \rightarrow \boxed{14}$

Jun 24-6:46 PM

In - Person QZ 1

1) what days & Time do we meet?

MTW 4:30-7:20 PM

2) what calculator is used for this class?

TI-83 or TI-84

3) Simplify $\frac{45 - 32}{\frac{8}{\sqrt{4}}} = \frac{13}{\frac{8}{2}} = \frac{13}{4} = 3.25$

Jun 24-6:57 PM