Elementary Statistics Lecture 1

Some Basic Math review:

1) Reduce $\frac{15}{120} = \frac{5 \cdot 15}{5 \cdot 24} = \frac{5 \cdot 3}{3 \cdot 8} = \boxed{\frac{5}{8}}$

1. $\frac{5}{8}$

2) Write .125 in reduced fraction

$.125 = \frac{125}{1000} = \frac{5 \cdot 25}{5 \cdot 200} = \frac{5 \cdot 5}{5 \cdot 40} = \frac{\cancel{5}^{1}}{\cancel{40}_{8}} = \frac{1}{8}$

3) Convert .5% to

2. $\frac{1}{8}$

a) Decimal

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

b) Reduce fraction

$.5\% = \frac{.5}{100} = \frac{.5(10)}{100(10)} = \frac{5}{1000} = \boxed{\frac{1}{200}}$

4) Write $2,500,000,000$ in Scientific notation.

2.5×10^9

5) Write 8.75×10^{-10} in decimal notation.

10 times

0.000000000875

optional

8.5% of 120 randomly selected were left-handed. How many were left-handed?

What is 8.5% of 120?

$x = .085(120)$

If decimal $\Rightarrow$ Round-up

$x = 10.2$ $\quad x \approx 11$

Use calc. to find

$$\frac{125-100}{\frac{8}{\sqrt{25}}} = \frac{25}{\frac{8}{5}} = \frac{25}{1.6} = 15.625$$

whole # → 16

1-decimal → 15.6

2-decimals → 15.63

! Factorial

$0! = 1$

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

$5! = 5\cdot 4\cdot 3\cdot 2\cdot 1 = \boxed{120}$

$8! - 6! = 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1 - 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1$

$= 40\,320 - 720$

$= \boxed{39600}$

$_nC_r$ Combination $\quad {}_nC_r = \frac{n!}{r!\cdot(n-r)!}$

$${}_5C_2 = \frac{5!}{2!\cdot(5-2)!} = \frac{5!}{2!\cdot 3!}$$

$$= \frac{5\cdot 4\cdot \cancel{3}^{2}\cdot 2\cdot 1}{\cancel{2\cdot 1\cdot 3\cdot 2\cdot 1}} = \frac{10}{1} = \boxed{10}$$

$${}_7C_4 = \frac{7!}{4!\cdot(7-4)!} = \frac{7!}{4!\cdot 3!} = \frac{7\cdot 6\cdot 5\cdot \cancel{4!}}{\cancel{4!}\cdot \cancel{3\cdot 2\cdot 1}}$$

$$= \frac{35}{1} = \boxed{35}$$

Given $y = 4x - 12$

Find y when $x = 4.5$.

$y = 4(4.5) - 12$

$= 18 - 12 = \boxed{6}$

Find x when $y = 24$.

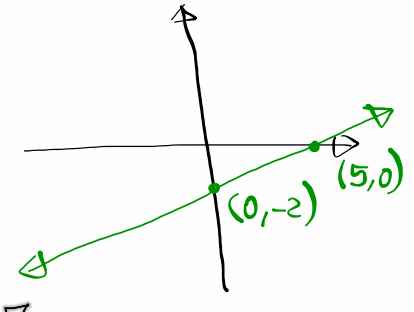
$24 = 4x - 12$

$24 + 12 = 4x$ $\quad 36 = 4x$

$\boxed{x = 9}$

Graph $2x - 5y = 10$

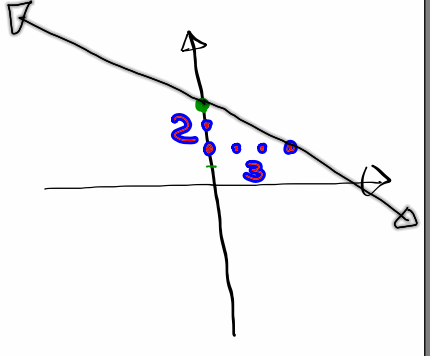
x	y
0	-2
5	0



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

Slope

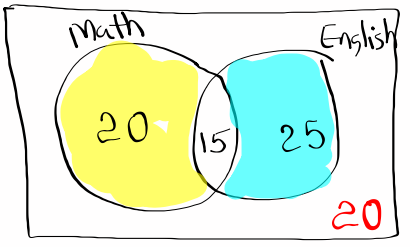
(0,4)
Y-Int



Slope = $\frac{\text{Rise}}{\text{Run}}$

I randomly selected 80 students.
15 were taking Math & English
20 " " Math only.
25 " " English only.

Organize this in a Venn Diagram.



How many students were taking one of these classes but not both?

Total 80

SG 1

20 + 25 = 45

What is Statistics?

Collecting information, organize, graph, do certain calculation. Learn from it to make predictions

Two Branches

1) Descriptive: Collect data (Information) organize, graph, do computations

2) Inferential: when we learn from collected data to make predictions.

Entire field of interest ⇒ Population

Data randomly selected from population ⇒ Sample

Population ⟺ Parameter

Sample ⟺ Statistic

Average age of all students ⇒ Parameter

Median income of {20 randomly selected nurses} (Sample) ⇒ Statistic

Data
- 1) Qualitative (Non-Numerical)
  - Eye Color
  - Class grades (Pass or No pass)
- 2) Quantitative (Numerical)
  - 1) Discrete (Countable)
  - 2) Continuous (Measured)

Continuous ⇒ Room Temp.

Discrete ⇒ # of students in the room

Consider a coin ⇒ Heads or Tails

if you toss it 100 times: 40 Heads, 60 Tails

Level of measurements

1) Nominal → Names — Red, White, Blue; Toyota, Honda, Chevy, Ford.

2) Ordinal → Small, Med., Large

3) Ratio → Meaningful Ratio

Shirt size 15 — Not Ratio

Shirt size 30

Small drink 10 oz

Large " 20 oz

4) Interval

Range of values

90% – 100% ⇒ A

How to collect data:

1) Systematic: Every Kth item selected.

2) Stratified: Divide into groups, and few are selected from each group.

3) Cluster: Divide into groups, Select some of the groups, Now collect data from all members of selected groups.

College offers 200 math sections.

40 sections randomly selected, all students are asked to do student survey.

4) Random / Convinience.

"Least Reliable Method"

Experiment

You observe changes based on action taken.

Simple Random Sample

when all outcomes have equal chance of being selected.

SG 2

I randomly selected 8 students, and here are QZ results

2, 3, 4, 4, 6, 6, 6, 10

Sample Size $\boxed{n=8}$

Range = Max − Min = 10 − 2 = $\boxed{8}$

Midrange = $\frac{\text{Max} + \text{Min}}{2} = \frac{10+2}{2} = \frac{12}{2} = \boxed{6}$

Mode: 6

$\sum x = 2+3+4+4+6+6+6+10 = \boxed{41}$

Summation — Data Element

$\sum x^2 = 2^2+3^2+4^2+4^2+6^2+6^2+6^2+10^2 = \boxed{253}$

$= 4+9+16+16+36+36+36+100$

Summation — Data element^2

Consider the Sample below:

0, 2, 2, 2, 4

1) $n = \boxed{5}$

2) Range = Max − Min = 4 − 0 = $\boxed{4}$

3) Midrange = $\frac{\text{Max}+\text{Min}}{2} = \frac{4+0}{2} = \boxed{2}$

4) Mode = $\boxed{2}$

5) $\sum x = 0+2+2+2+4 = \boxed{10}$

6) $\sum x^2 = 0^2+2^2+2^2+2^2+4^2 = \boxed{28}$

I randomly selected 20 students, here are their ages:

18 19 19 20 23 25
25 25 28 30 30 30
32 34 34 35 38 39
40 42

1) $n = 20$

2) Range = 42 − 18 = $\boxed{24}$

3) Midrange = $\frac{42+18}{2} = \boxed{30}$

4) Mode: 25 & 30 Bimodal

Perform the following operations

if result is whole # ⇒ Add 1

" " decimal ⇒ Round-up

$\frac{\text{Range}}{3} = \frac{24}{3} = 8 \Rightarrow \boxed{9}$

$\frac{\text{Range}}{4} = \frac{24}{4} = 6 \Rightarrow \boxed{7}$

$\frac{\text{Range}}{5} = \frac{24}{5} = 4.8 \Rightarrow \boxed{5}$

On the right of SG => You will find videos

On Wed. night

- Collect data
- Organize them in the form of a table
- Graph them
  - Bar chart
  - Histogram
  - Ogive
  - Freq. Polygon
  - Pie chart
  - STEM Plot