Statistics

Summer 2022

Lecture 1

Basic Math Review:

1) Reduce $\dfrac{75}{120} = \dfrac{5 \cdot 15}{5 \cdot 24} = \dfrac{5 \cdot 3}{3 \cdot 8} = \dfrac{5}{8}$

$75 \boxed{\div} 120$ $\boxed{\text{MATH}}$ $\boxed{1: \blacktriangleright \text{frac}}$ $\boxed{\text{Enter}}$

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

2) Write .125 in reduced fraction

$.125 = \dfrac{125}{10^3} = \dfrac{125}{1000} = \dfrac{25}{200} = \dfrac{5}{40} = \boxed{\dfrac{1}{8}}$

2) $\dfrac{1}{8}$

$.125$ $\boxed{\text{MATH}}$ $\boxed{1: \blacktriangleright \text{frac}}$ $\boxed{\text{Enter}}$

3) write $.5\%$ in

a) Decimal

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

$= \boxed{.005}$

b) reduced fraction

$.5\% = \dfrac{.5}{100} = \dfrac{5}{1000} = \boxed{\dfrac{1}{200}}$

a) $.005$

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

Scientific Notation: $N \times 10^{n} \leftarrow$ any integer

$1 \leq N < 10$

2.8×10^{8} , 1.25×10^{-7}
Big #   Small #

1) write $4,850,000,000$ in S.N.

4.85×10^{9}

2) write 7.5×10^{-6} in decimal notation.

$7.5 \times 10^{-6} = 0.0000075$

4) 72% of 550 randomly selected students had iPhone. How many of them had iPhone?

what is 72% of 550?   if decimal ⇒ Round-up

$x = .72(550) = \boxed{396}$ 4) 396

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5)

I Surveyed 480 students, and 36 of them were left-handed.

What percent of them were left-handed?

36 is what % of 480?

$36 = \dfrac{P}{100} \cdot 480$

$36 = 4.8 \, P$ $P = \dfrac{36}{4.8} = 7.5$ 5) 7.5%

Use Your Calc to find

1) $\dfrac{125 - 100}{\frac{8}{\sqrt{25}}} = 15.625$

$\boxed{(}\ 125\ \boxed{-}\ 100\ \boxed{)}\ \boxed{\div}\ \boxed{(}\ 8\ \boxed{\div}\ 5\ \boxed{)}\ \boxed{Enter}$

Whole → 16

1-Decimal → 15.6

2-Decimals → 15.63

2) $1.96 * \sqrt{\dfrac{(.5)(.5)}{64}} = .1225 \approx \boxed{.123}$

$1.96\ \boxed{\times}\ \boxed{2nd}\ \boxed{x^2}\ .5\ \boxed{\times}\ .5\ \boxed{\div}\ 64\ \boxed{Enter}$

! Factorial

$0! = 1$

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

$1! = 1$

$2! = 2 \cdot 1$

Simplify

$5! + 4!$

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

$= 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 + 4 \cdot 3 \cdot 2 \cdot 1$

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

$= \quad 120 \quad + 24 = \boxed{144}$

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

$= \dfrac{56}{1} = \boxed{56}$

Simplify $\dfrac{7!}{4!} = \dfrac{7 \cdot 6 \cdot 5 \cdot 4!}{4!} = 7 \cdot 6 \cdot 5 = \boxed{210}$

Given $y = 4x - 12$

find y when $x = 4.5$.

$$y = 4(4.5) - 12 = 18 - 12 = \boxed{6}$$

find x when $y = 12$.

$$12 = 4x - 12$$
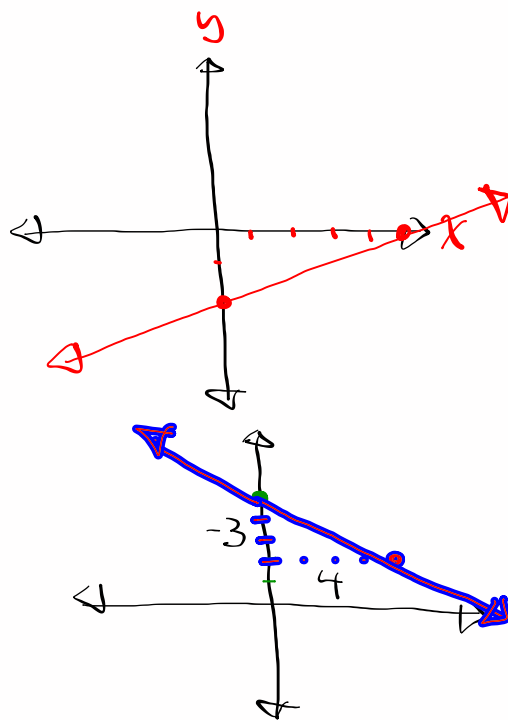
$$12 + 12 = 4x$$

$$24 = 4x$$

$$\boxed{6 = x}$$

Graph $2x - 5y = 10$

x	y
0	-2
5	0

Graph $y = mx + b$

$$y = \frac{-3}{4}x + 5$$

Slope $m = \frac{-3}{4}$ $m = \frac{Rise}{Run}$
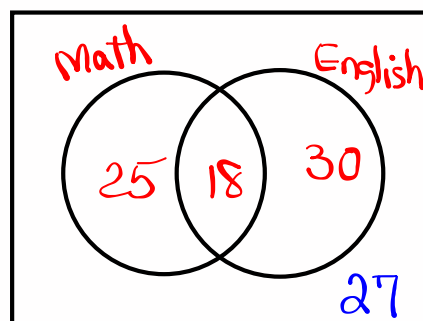
Y-Int $(0, 5)$

I randomly Selected 100 Students.

18 were taking Math and English.

25 " " Math only

30 " " English only.

Make a Venn Diagram

SG 1 √

Math   English

25   18   30

27

Total = 100

What is Statistics?

Collecting information (Data), organize, graph, do certain Computations, and draw Some Conclusions to make predictions.

Two Branches of Statistics:

   — Descriptive: Collect data, graph, do Certain Computations

   — Inferential: Draw Conclusion from raw data obtain in descriptive Statistics with Some degree of Confidence

Entire field of interest: Population (All)

groups selected randomly
from Population : Sample (Randomly Selected)

Population ⟺ Parameter

Sample ⟺ Statistic

Average income of 25 randomly selected nurse
→ Statistic

Average age of all police officers in
LA County
Parameter

Data
1) Qualitative   Red, white, and Blue
   (Non-Numerical)

2) Quantitative
   Numerical
   Room temp.
   # People in
   the room

   1) Discrete   2 cups
      Countable   of coffee
                  100 Daily
                  flights from
   2) Continuous LA to SF
      Measureable
                  24 oz of
                  Coffee
                  flight Time
                  from LA to SF

Level of Measurements (they may overlap)

1) Nominal
Mike, Mary, Moe
Red, White, Blue
Small, Med., Large

2) Ordinal   Zip Codes, House #, S,M,L,XL

3) Ratio
Small   12 OZ
Large   24 OZ

4) Interval   Range of Values
90%-100% ⇒ A
Distances   18 miles to 25 miles

How to Collect data:

1) Systematic: Every Kth item Selected.

2) Stratified: Divide into groups, and
then Select from each group.

3) Cluster: Divide into groups, Select
few groups, now Collect
data from all members of
Selected groups.

4) Random / Convinience:
"Least Reliable Method"

I randomly Selected 80 freshmen, 100 Sophmore, 125 Jr. , 70 Sr., and 50 graduate Students from Cal poly to do Student Survey.   Stratified.

Mt. SAC offered 1000 Sections of classes in Spring Semester.

They random Selected 50 Sections and ask all Students to do Student Survey.

Cluster

Experiment   Vs   Observation

Experiment: You observe changes after
            Some actions taken.

Observation : You observe output
              without taking any action.

Simple Random Sample: Same chance to be
                                      Selected.
Slip a fair Coin 50/50 chance for tails.
Selecting a Student in class

SG 2 √√√

I randomly selected 8 students, and here are scores of a quiz:

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

1) Sample Size $\boxed{n=8}$

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

3) Midrange = $\dfrac{\text{Max + Min}}{2} = \dfrac{10 + 2}{2} = \dfrac{12}{2} = \boxed{6}$

Wrong $\quad 10 + 2 \div 2 = 11$

Right $\quad (10 + 2) \div 2 = \boxed{6}$

4) Mode $\quad$ 4 appears the most.

5) $\sum x = 2 + 3 + 4 + 4 + 4 + 6 + 6 + 10 = \boxed{39}$
Summation of x, $x \to$ Data element

6) $\sum x^2 = 2^2 + 3^2 + 4^2 + 4^2 + 4^2 + 6^2 + 6^2 + 10^2 = \boxed{233}$

7) Simplify $\dfrac{n \cdot \sum x^2 - (\sum x)^2}{n \cdot (n-1)} = \dfrac{8 \cdot 233 - 39^2}{8 \cdot (8-1)}$

$= \dfrac{343}{56}$

Let's reduce it

$343 \div 56$ $\boxed{\text{MATH}}$ $\boxed{1: \blacktriangleright \text{Frac}}$ $\boxed{\text{Enter}}$ $\boxed{\dfrac{49}{8}}$

I randomly selected 20 students and here are their ages:

18	19	19	20	23
25	25	25	28	29
30	30	30	34	34
35	38	39	40	42

1) $n = 20$ $\qquad$ Max $\quad$ Min

2) Range = 42 − 18 = 24

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

4) Mode = 25 & 30 $\quad$ Bimodal

Perform the following operation

if decimal ⟹ Round-up
if whole ⟹ Add 1

5) $\dfrac{\text{Range}}{3} = \dfrac{24}{3} = 8 \Rightarrow \boxed{9}$

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

7) $\dfrac{\text{Range}}{5} = \dfrac{24}{5} = 4.8 \Rightarrow \boxed{5}$

18   19   19   20   23
25   25   25   28   29
30   30   30   34   34
35   38   39   40   42

Make STEM Plot

1 | 8 9 9
2 | 0 3 5 5 5 8 9
3 | 0 0 0 4 4 5 8 9
4 | 0 2

How many students were younger than 25?

$\boxed{5}$

below 25

What % of students were younger than 25?

$$\frac{5}{20} \cdot 100 = 25\%$$

To organize data set ⇒ we need to make a frequency table.

class limits	class BNDRS	class MP	class F	Cum.F	Rel.F/%.F

Each row makes one class(group)

Class limits	class BNDRS	Class MP	Class F	Cum.F	Rel.F	%.F
20 – 28	19.5 – 28.5	24	4	4	.2	20%
29 – 37	28.5 – 37.5	33	10	14	.5	50%
38 – 46	37.5 – 46.5	42	6	20	.3	30%

Sample Size

3 classes , class width = 29-20 = 9 ,
                                = 38-29 = 9   28 ↑ 29

class MP = $\dfrac{+ \text{class limits}}{2}$, Rel. F = $\dfrac{f}{n} = \dfrac{f}{20}$

Draw
- Bar chart   - freq. Polygon
- Histogram   - Pie chart
- Ogive   - Box Plot