

Statistics
Theoretical

development of
and proofs of statistical
theorems, formulas
rules & laws

Applied



uses those
Theorems,
laws, rules
to solve
real-world
problems.

Applied Statistics

① Descriptive Statistics

organizing

displaying - use tables
graphs
and summary
measures

② Inferential Statistics (our goal)

use inductive reasoning

Inferential

Terms

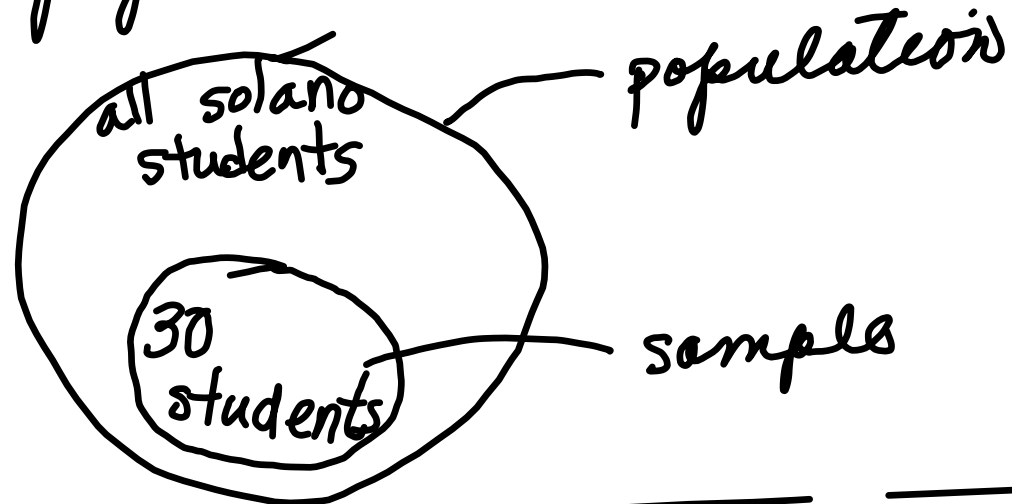
population - the collection of all elements of interest.

sample - a selection of a few elements from the population

△ sample survey.

↓
everyone
census

(ex) population - all Solano students



Probability - measures the likelihood that a certain outcome will occur

links descriptive & inferential statistics

Representative Sample - selected to represent the characteristics of the population as close as possible

Random Sample - (simple random sample)
each element has the same chance of being selected

(ex) put all your names in hat.
then draw 5.

MORE TERMS -

element - or member

the object being studied

variable - the characteristic
being studied - takes on
different values for different
elements

④ Height of each student in
this class.

element = student
variable = height

observation - the value of the variable
measurement for an element.

Data Set - the collection of observations
on one or more variables

Types of Variables
↓

Quantitative

measure
numerically

↘
discrete

i.e. # of
cars

countable

↘
continuous

- can assume
any value over
an interval

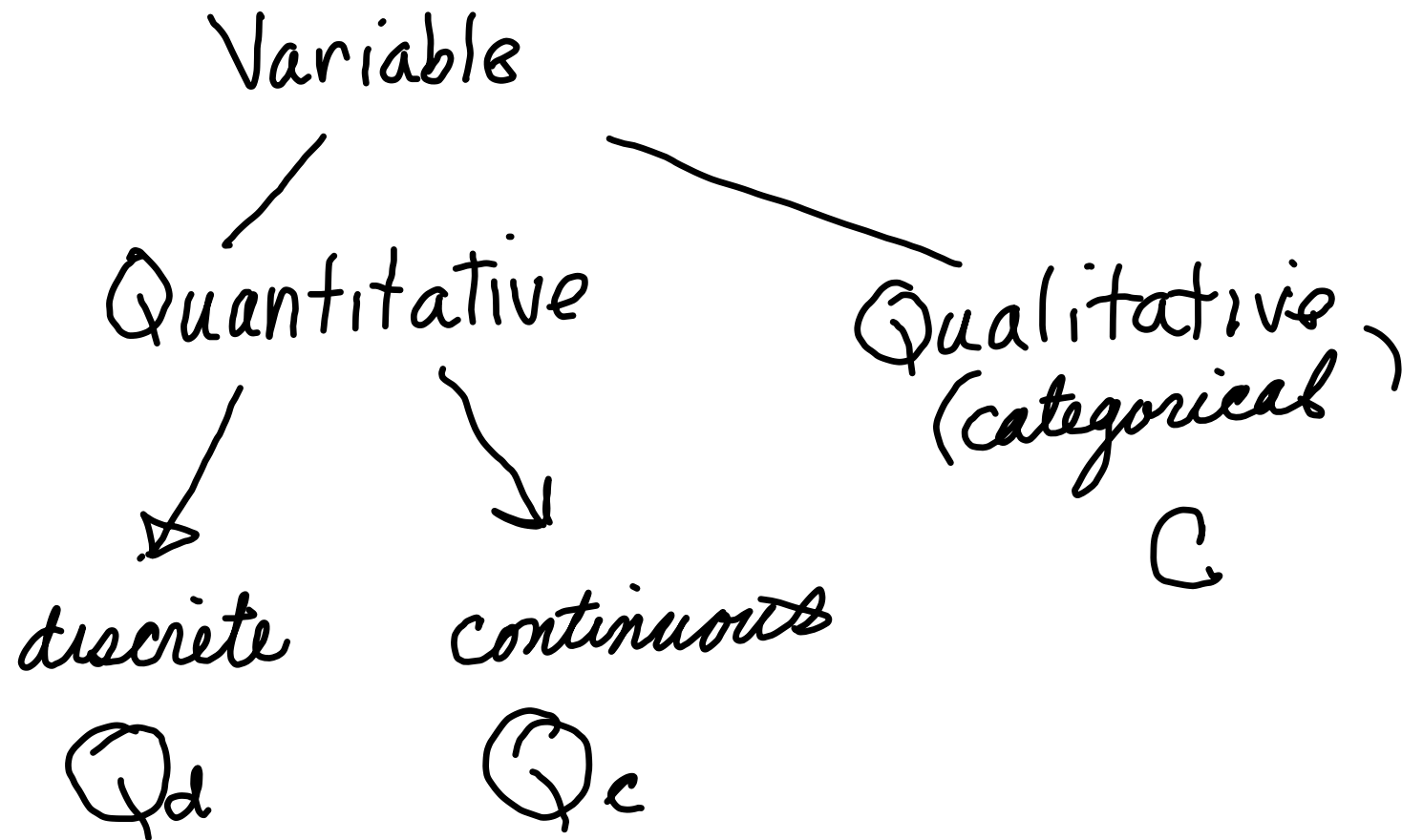
↘ Qualitative

(or categorical)

not numeric

can be
arrange into
2 or more
categories

(ex) car color
eye color
gender



Cross - Sectional Data

all data collected on different elements at the same period of time

time - Series -

Data collected on the same element at different points of time

Frequently we must add the value
of the variables together

ex Mark's scores on 5 exams
95% , 80% , 82% , 75% , 85%

What is his average ?

1st add the values together

$$\begin{array}{l} \text{1st obs} \\ \text{2nd obs} \end{array} \quad \begin{array}{l} x_1 = 95 \\ x_2 = 80 \\ x_3 = 82 \\ x_4 = 75 \\ x_5 = 85 \end{array}$$

$$x_1 + x_2 + x_3 + x_4 + x_5 = 95 + 80 + 82 + 75 + 85 \\ = 420$$

Σ

$$\Sigma x = 420$$

summation notation
capital sigma

ex

x	3	6	10	4
z	1	9	18	3

Find $\sum x = 3 + 6 + 10 + 4$
 $= 23$

$\sum x^2 = 9 + 36 + 100 + 16$
 $= 161$

notice different from $(\sum x)^2 = (23)^2$
 $= 529$

$$\begin{aligned}\sum xz &= x_1z_1 + x_2z_2 + x_3z_3 + x_4z_4 \\ &= 3 + 54 + 180 + 12 \\ &= 249\end{aligned}$$

$$x + y^2$$

$$(x + y)^2$$

$$\sum x^2$$

$$(\sum x)^2$$

Organizing Qualitative Data

2.4 Results recorded from a sample survey.

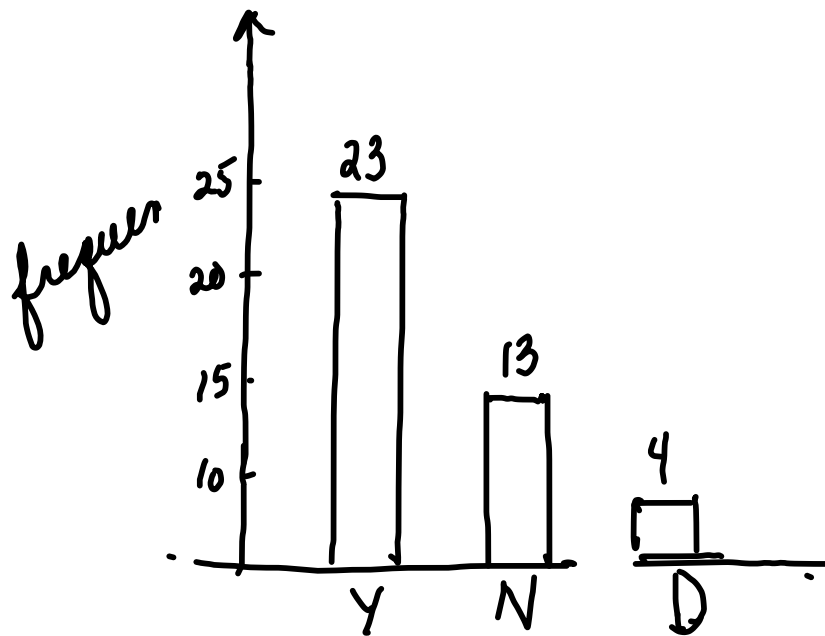
Sample size Yes, No, Don't know

n = 40 D N N Y Y Y N Y D Y
Y Y Y Y N Y Y N N Y
N Y Y N D N Y Y Y Y
Y Y N N Y Y N N D Y

	Count
Y	23
N	13
D	4
	40

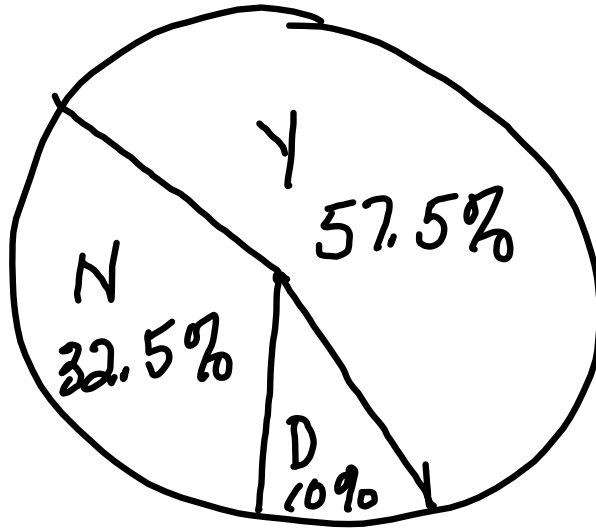
frequency table
frequency
(how often it occurs)

	Relative frequency rel freq	% frequency
Y	$\frac{23}{40} = .575$	57.5 %
N	$\frac{13}{40} = .325$	32.5 %
D	$\frac{4}{40} = .100$	10.0 %
	1.000	100%



A bar graph

Pie Chart

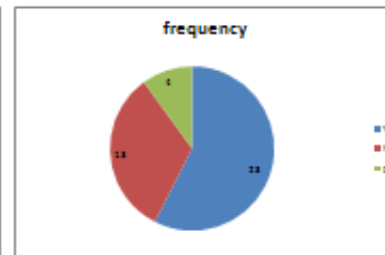
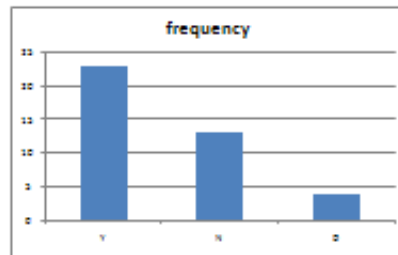


To calculate

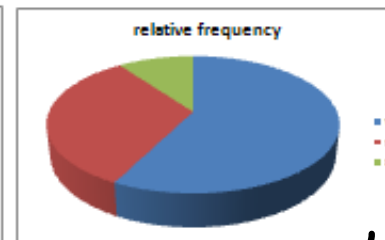
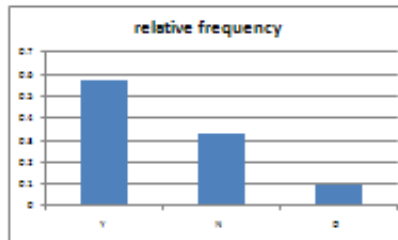
	Rel freq	
Y	.575	$360(.575) = 207^\circ$
N	.325	$360(.325) = 117^\circ$
D	.100	$360(.100) = 36^\circ$

Qualitative
Categorical C

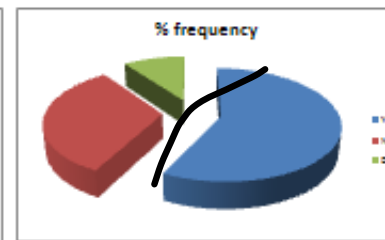
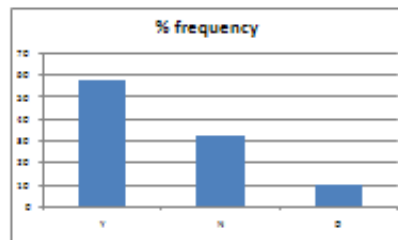
Data	
Category	frequency
Y	23
N	13
D	4



Category	relative frequency
Y	0.575
N	0.325
D	0.1



Category	% frequency
Y	57.5
N	32.5
D	10



Done
with
excel