

POKÉMON

A BTMA 431 Project



Lan

Levi

Chris

Lauren

Pokémon

Welcome, BTMA 431!

Today we are performing a data
analysis in the world of
Pokémon...





Today we will discuss...

- ▶ **OVERVIEW OF THE GAME**

- ▶ METHODOLOGY

- ▶ RESULTS

- ▶ QUESTION 1

- ▶ QUESTION 2

- ▶ QUESTION 3

- ▶ QUESTION 4



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- ▶ **RESULTS**
 - ▶ **QUESTION 1**
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 - ▶ **QUESTION 3**
 - ▶ **QUESTION 4**



PLAYER: "How do I play?
Which Pokémon should I
bring???"





Pokémon



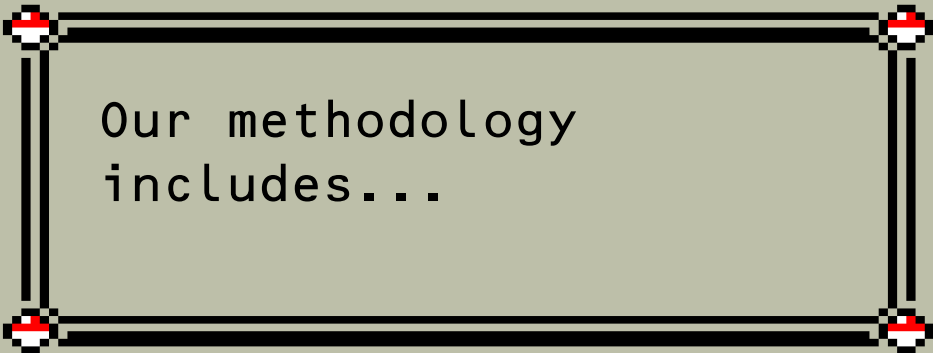
Pokédex



Pokémon Types



Pokémon Generation	Original Game	Location	Number of New Pokémon
Generation One (I)	Red & Yellow	Kanto	151
Generation Two (II)	Gold & Silver	Johto	100
Generation Three (III)	Ruby & Sapphire	Hoenn	135
Generation Four (IV)	Diamond & Pearl	Sinnoh	107
Generation Five (V)	Black & White	Unova	156
Generation Six (VI)	X & Y	Kalos	72
Generation Seven (VII)	Sun & Moon	Alola	88
Generation Eight (VIII)	Sword & Shield	Galar	92



Our methodology
includes...

▶ **CSS METHOD OF WEB**

SCRAPING

▶ RVEST, DYPLR, & TIDYR

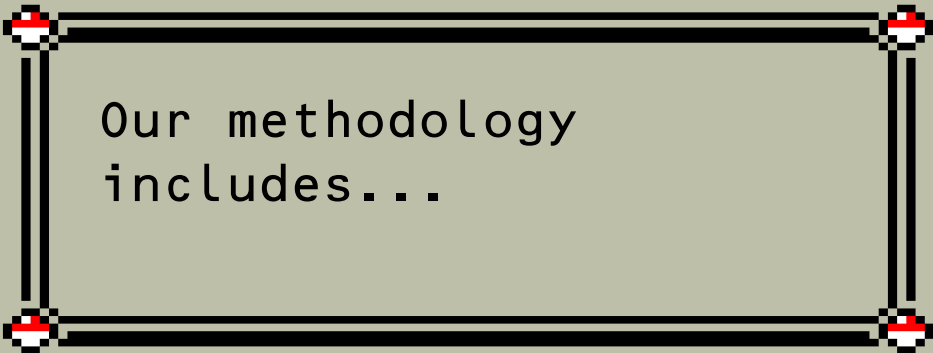
▶ DATA CLEANING VIA

▶ SEPARATING WORDS

▶ FORMATTING NUMERIC
DATA

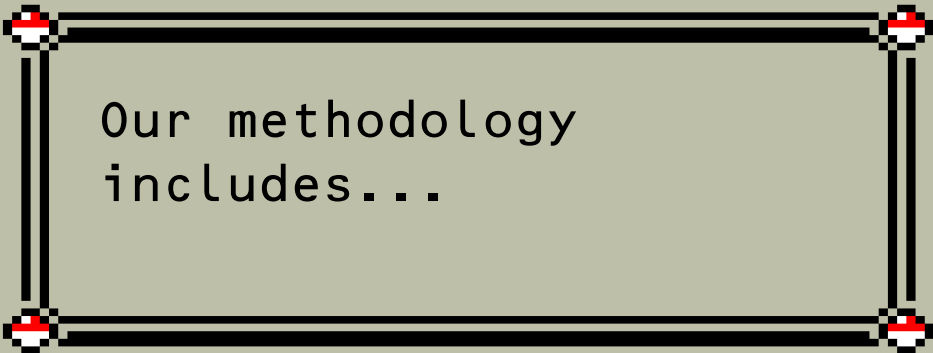
▶ CREATING DATA

FRAMES FROM STRINGS
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ANALYSIS

:Lv1A



TRAINER LAUREN: How have
special class Pokémon
changed over time?

ANALYSIS

:Lv1A



Special
Class
Pokémon

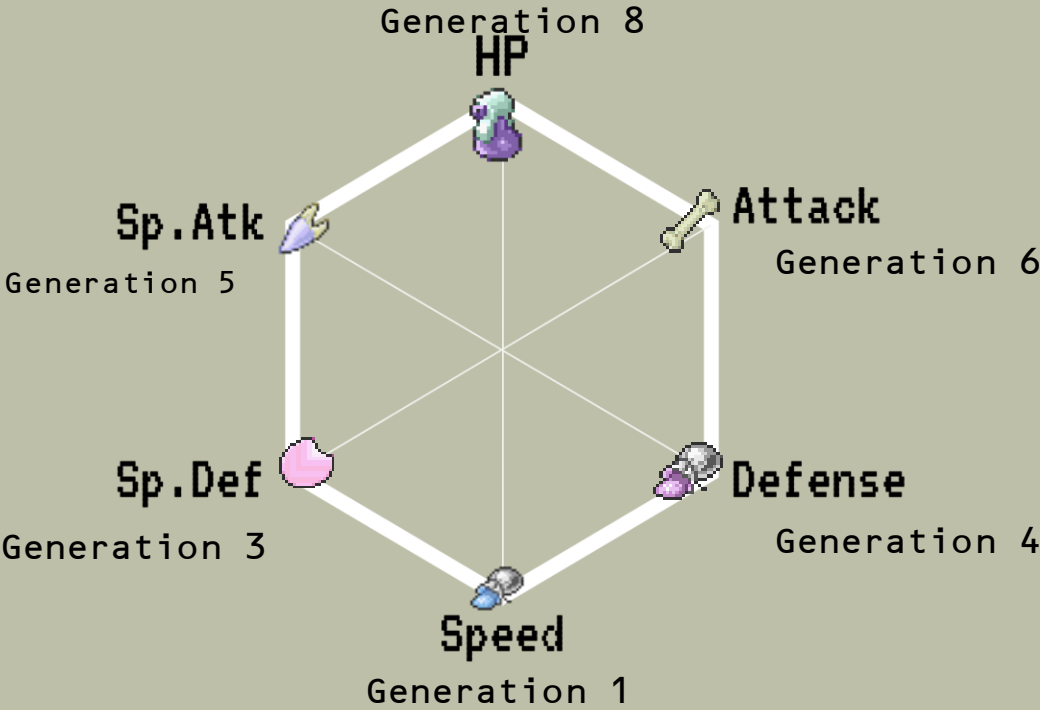
Legendary

Sub-legendary

Mythical

ANALYSIS

:Lv1B



STAT	LARGEST % CHANGE (using Generation 1 as baseline for comparison)
HP	0.150 Gen 8
Attack	0.179 Gen 6
Defense	0.130 Gen 4
Sp.Atk	-0.010 Gen 2
Sp.Def	0.202 Gen 3
Speed	0.018 Gen 5

ANALYSIS

:Lv2A



Bulbasaur
First Evolution



Ivysaur
Second Evolution



Venusaur
Third Evolution



TRAINER LAN: Can you
predict a Pokémon's total
stats when it evolves?

ANALYSIS

:Lv2A

*H_0 : Pokémon evolve in a
predictable fashion
 $Mean_{actual} = Mean_{predicted}$*

*H_a : Pokémon do not evolve
in a predictable fashion
 $Mean_{actual} \neq Mean_{predicted}$*

SUBSET data frame for
each evolution of
starter Pokémon

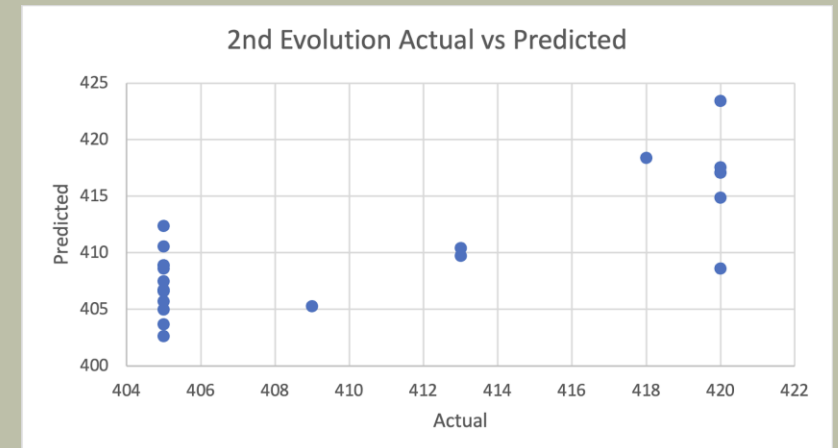
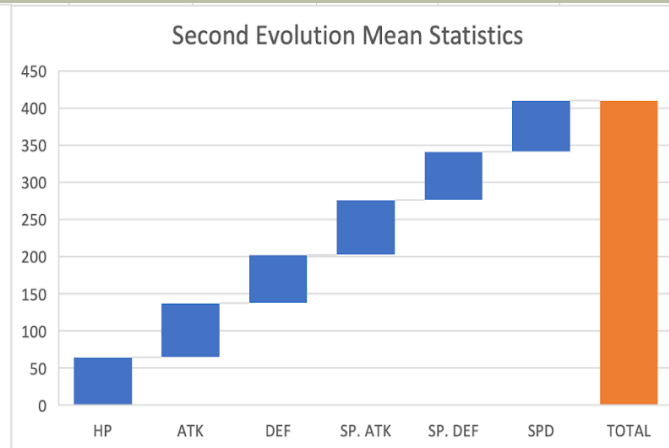
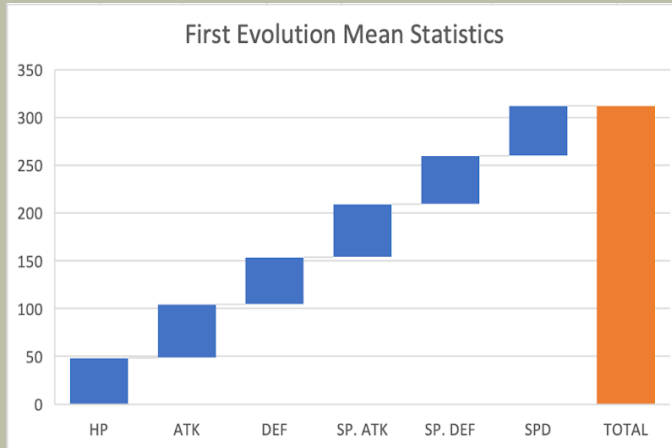
MAKE a linear regression
model

CREATE user-defined
function

STORE results in data-
frame for hypothesis
testing

ANALYSIS

:Lv2A



Equation predicting the 2nd Generation's TOTAL statistic

$$TOTAL_{second} = 1.1538(HP_{first}) + 0.3550(ATK_{first}) + 0.2963(DEF_{first}) + 0.3563(Sp. ATK_{first}) + 0.4013(Sp. DEF_{first}) + 0.7693(SPD_{first}) + 238.97$$

With 95% confidence
and 5% alpha level...

ANALYSIS

:Lv2A

Shapiro-Wilks Normality Test Results

Actual TOTAL test result: 7.154×10^{-6}

Predicted TOTAL test result: 0.04298

Non-normal
data

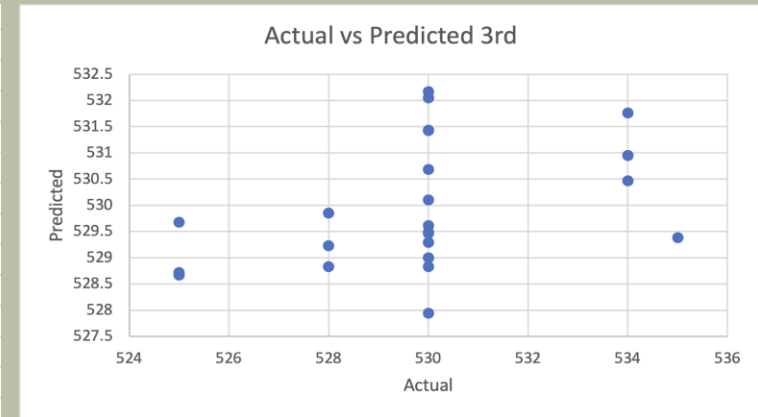
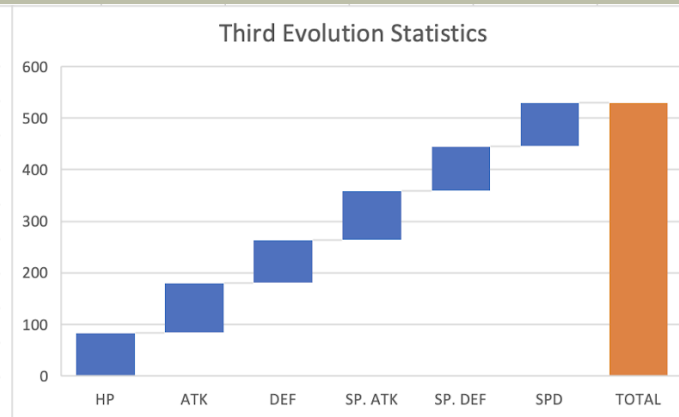
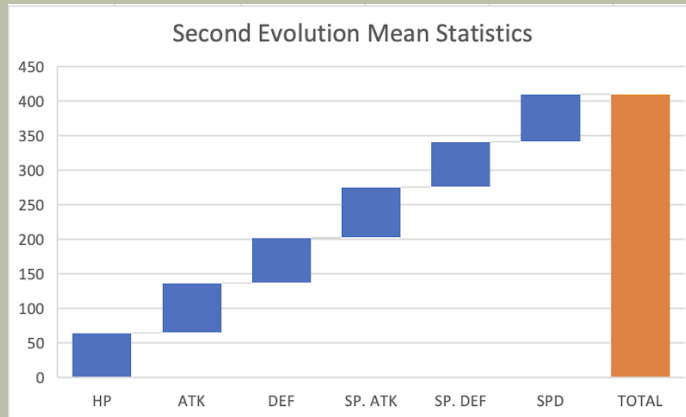
Two-tailed
Wilcoxon
Signed Rank
Test

Two-Tailed Wilcoxon Signed Rank Test:
P-value of test: **0.8081**

FAIL TO REJECT the
null hypothesis.

ANALYSIS

:Lv2B



► Equation predicting the 3rd Generation's TOTAL statistic

$$TOTAL_{third} = -0.11194(HP_{second}) - 0.02419(ATK_{second}) - 0.08472(DEF_{second}) - 0.02838(Sp. ATK_{second}) - 0.09992(Sp. DEF_{second}) - 0.04100(SPD_{second}) + 555.95233$$

Similarly, predict the 3rd generation...

ANALYSIS

:Lv2B

Shapiro-Wilks Normality Test Results

Actual TOTAL test result: 0.002588

Predicted TOTAL test result: 0.233

Normal/Non-
normal data

Two-tailed
Wilcoxon
Signed Rank
Test

Two-Tailed Wilcoxon Signed Rank Test:
P-value of test: **0.8977**



Alakazam used FUTURE SIGHT!

It saw that the null
hypothesis FAILED to be
rejected.

ANALYSIS

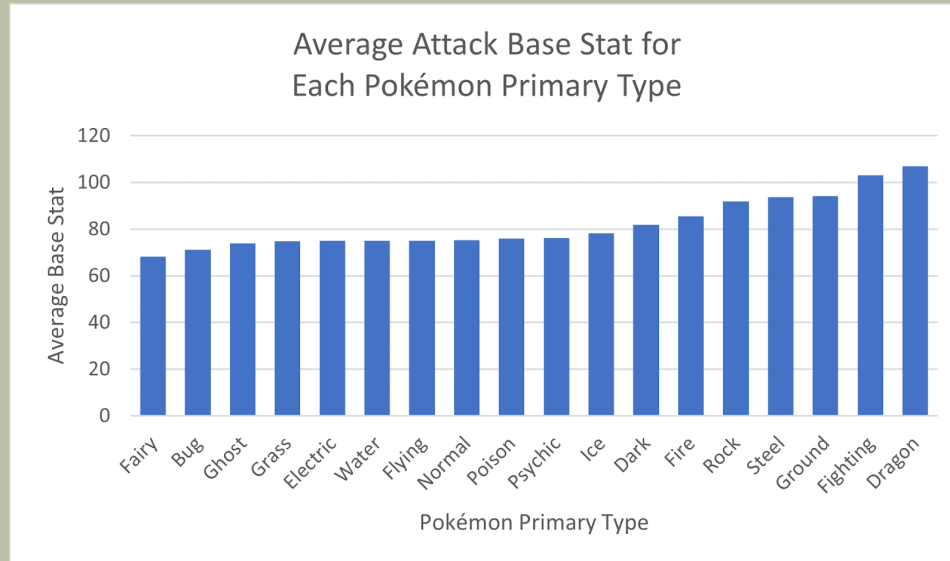
:Lv3A



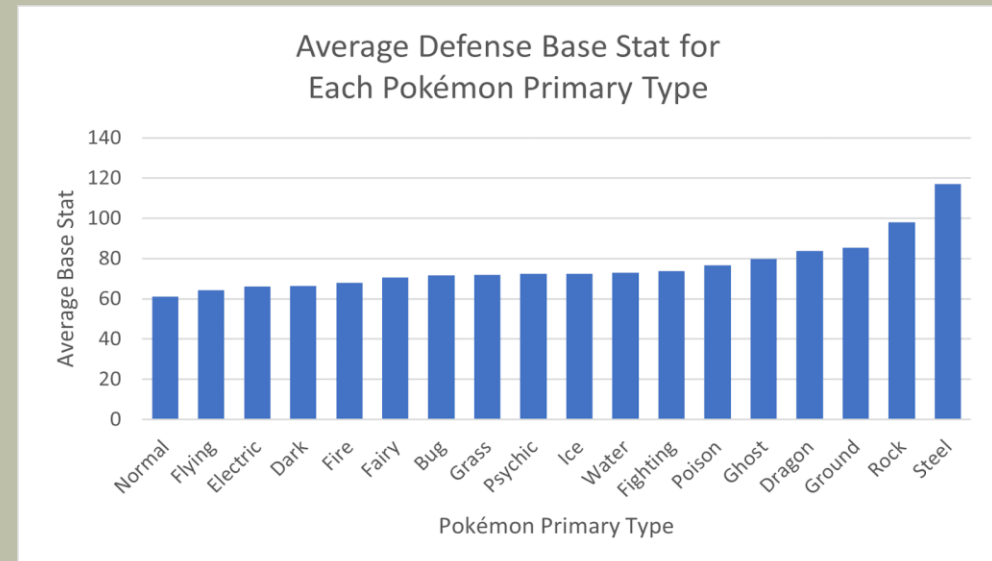
TRAINER CHRIS: Which
Pokémon type has the
highest average base
stats?

ANALYSIS

:Lv3A



► Primary Types with best base attack



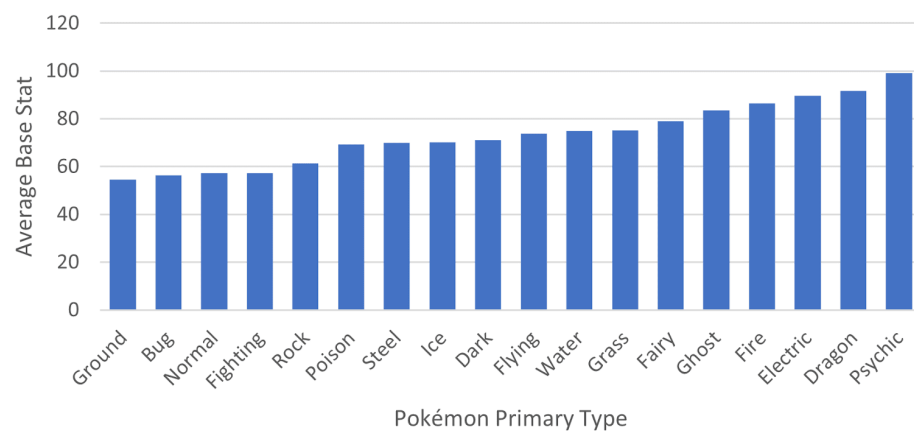
► Primary Types with best base defense



ANALYSIS

:Lv3A

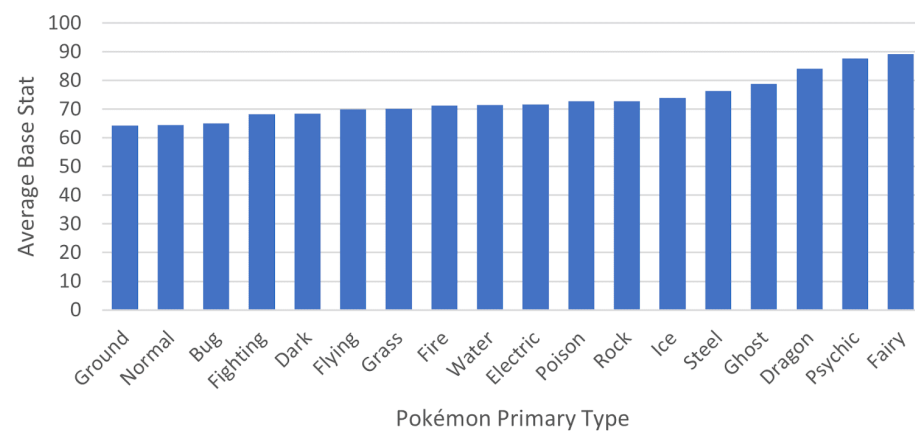
Average Sp. Atk Base Stat for
Each Pokémon Primary Type



► Primary Types with best
base special attack



Average Sp. Def Base Stat for
Each Pokémon Primary Type



► Primary Types with best
base special defense



ANALYSIS

:Lv3A



DRAGON



PSYCHIC

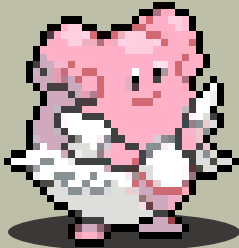
GROUND

HP	0/5
Attack	0/9
Defense	0/24
Sp. Atk	0/15
Sp. Def	0/31
Speed	0/14

Therefore, conclude
that...

ANALYSIS

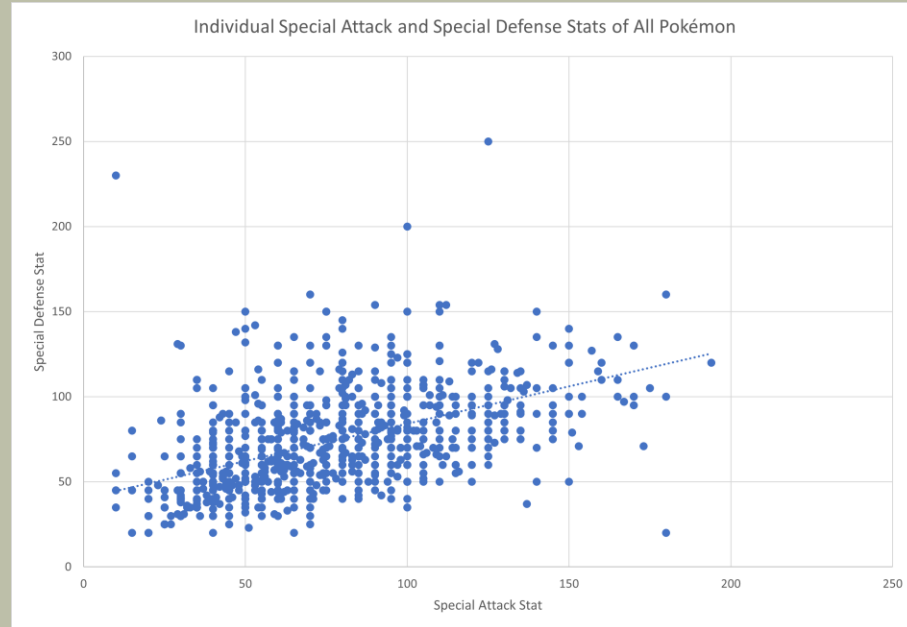
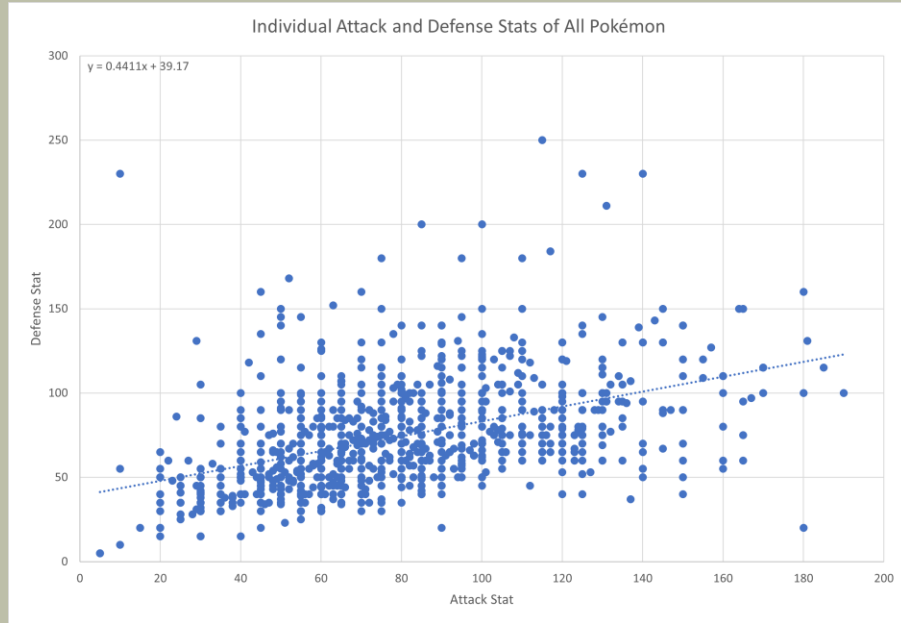
:Lv3B



TRAINER CHRIS: Is there a significant *negative* correlation between the attack (special attack) and defense (special defense) stats of Pokémon? ▼

ANALYSIS

:Lv3B



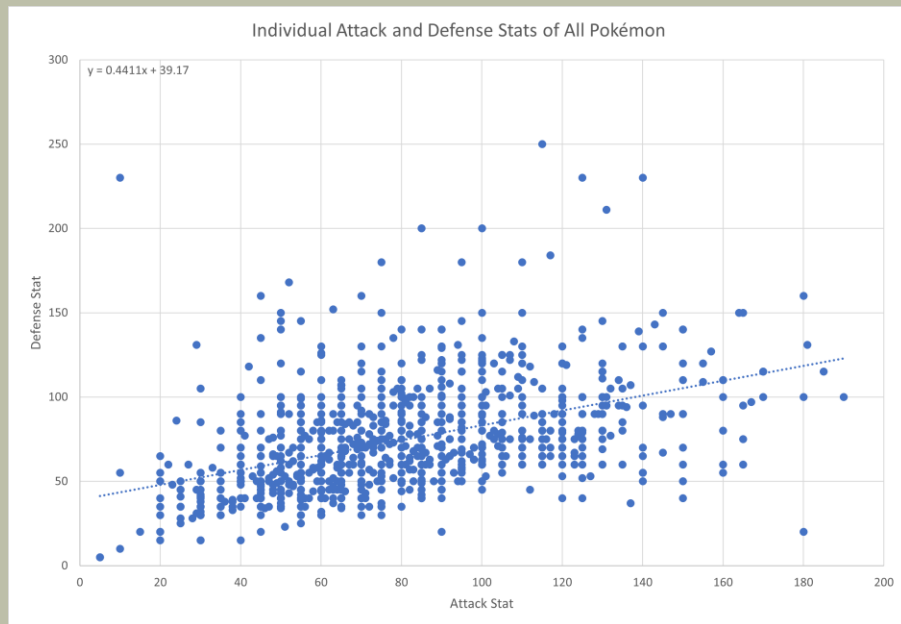
Both plots imply that

...

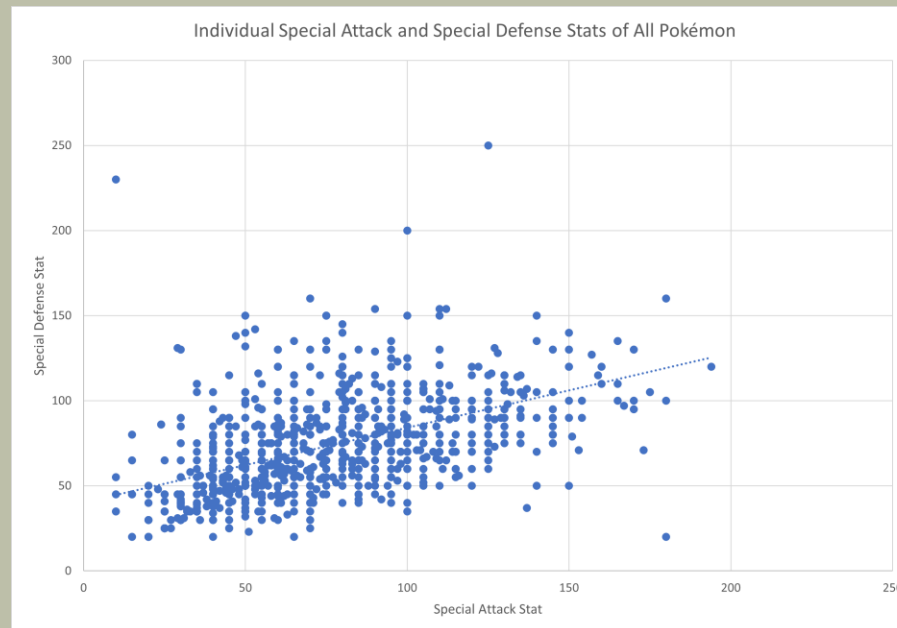


ANALYSIS

:Lv3B



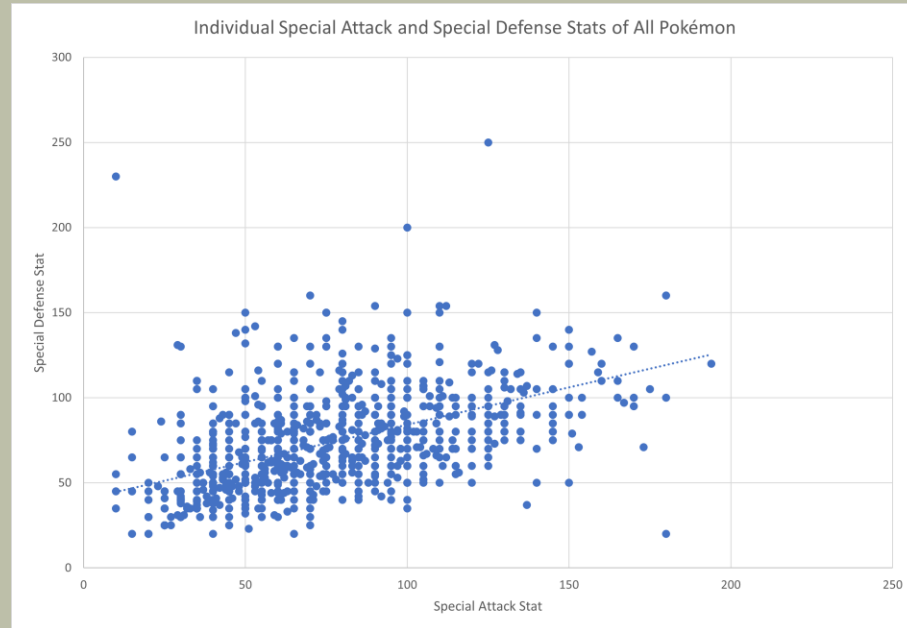
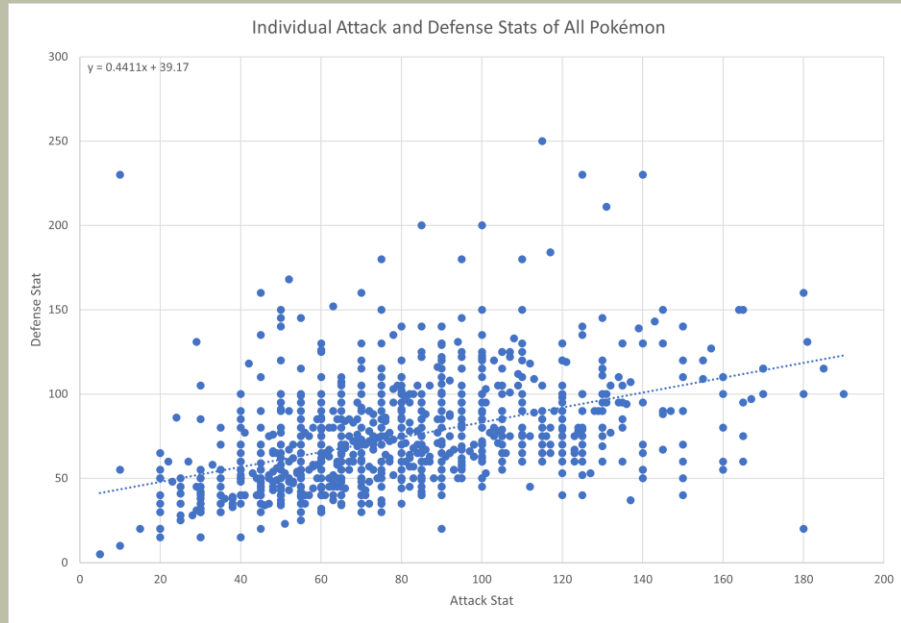
correlation coefficient =
0.45767



correlation coefficient =
0.51198

ANALYSIS

:Lv3B

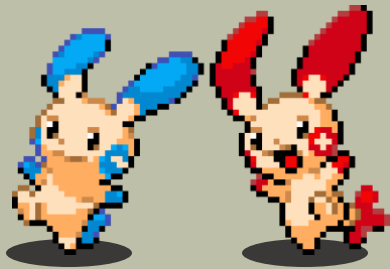


There IS a moderate
positive correlation...



ANALYSIS

:Lv3B



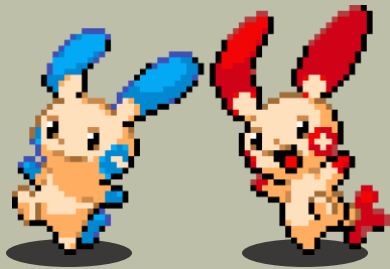
Therefore, moderate
positive correlation
means...

► **IF** attack or special
attack stat is
higher, expect
that defense or
special defense stat
will also be higher

CONFIRMS that comparing
the average base stats of
Pokémon types is valid

ANALYSIS

:Lv3B



Therefore, moderate
positive correlation
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IF attack or special
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► **CONFIRMS** that
comparing the average
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ANALYSIS

:Lv4A



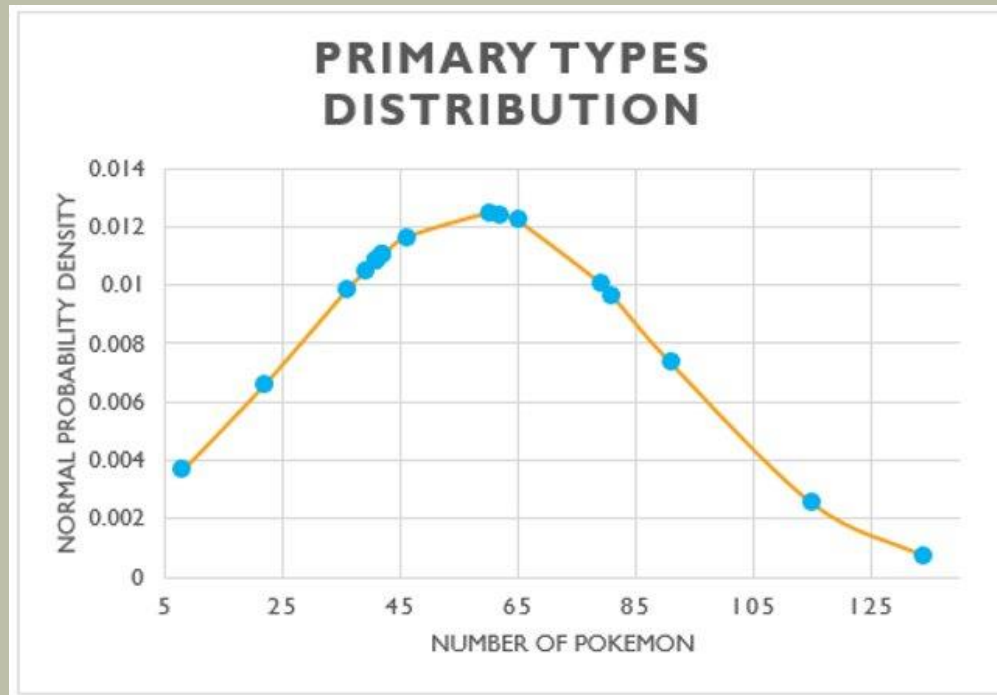
???



TRAINER LEVI: Which primary type is most common among Pokémon? What distribution does it follow?

ANALYSIS

:Lv4A



Average # of
Pokémon per type

58

Most common
Pokemon type

WATER

134

ANALYSIS

:Lv4B



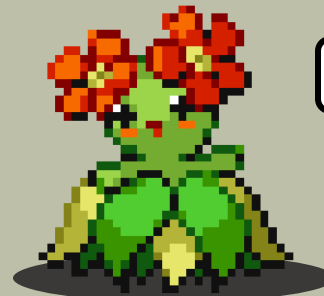
GYARADOS

WATER



ELECTRIKE

ELECTRIC



BELLOSSOM

GRASS

Wild Bellossom and wild
Electrike appeared!

Grass and electric type are
highly effective against
water...

ANALYSIS

:Lv4B



Average HP for

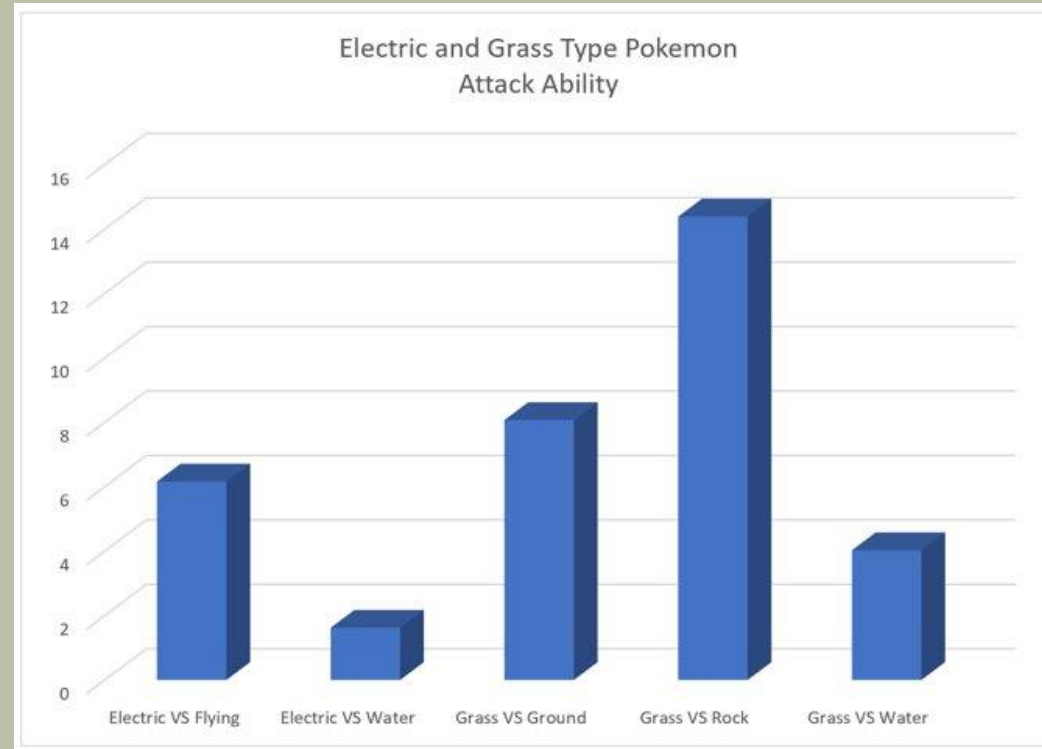
WATER

FLYING

VS.

Average **ELECTRIC** type
attack

-3.89



ANALYSIS

:Lv4B



Average HP for

WATER

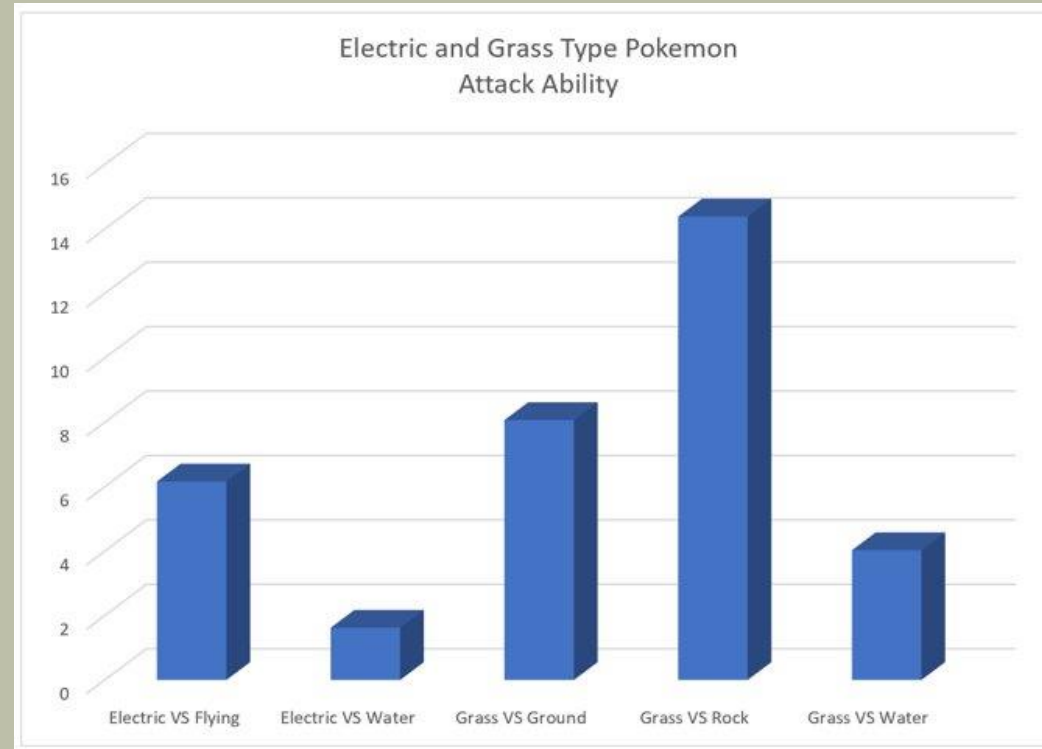
GROUND

ROCK

VS.

Average GRASS type
attack

- 8.83



ANALYSIS

: Lv4B



WATER



GRASS



PRESS START TO CONTINUE!!

Therefore, conclude
that...



SUMMARY



Pokémon are
equally strong



Base stats are predictable
between evolutions



Pokémon types offer
different advantages



How to handle the
game's most common
Pokémon type

Bring a variety of
Pokémon to battle!



There's only one
question left
unanswered... ▼

...Will **YOU**
catch 'em all?