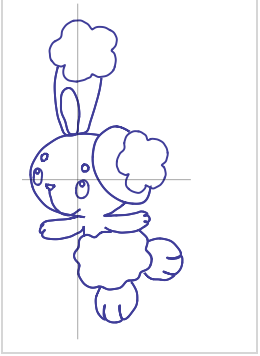
MATH:1260 Pokémath
The Mathematics of Pokémon Go®

Week 11 Monday, Spring 24

Popular curve:

Buneary-like curve



Plan for Today

- Module 3: To Be The Very Best
  - Battle Basics
  - Computing Damage

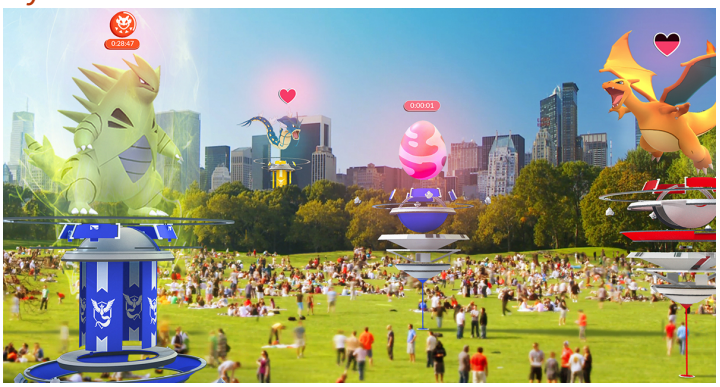
Class Reminders

- Project 2 Stage 3: Report is due Wednesday night.
- GW 9 in discussion Thursday.

Battle Basics--Types of Battles

PvE (Player vs Environment)

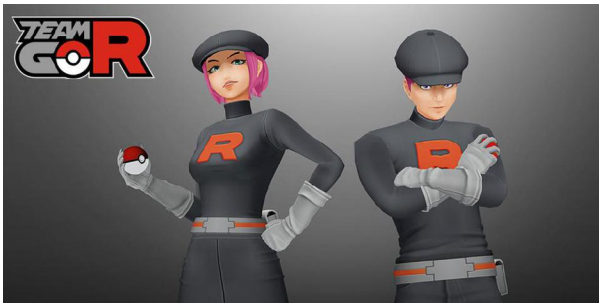
Gyms



Raids

Team Go Rocket

Grunts



Leaders (Cliff, Sierra, Arlo)

Boss (Giovanni)

Training

PvP (Player vs Player)

Friends

Nearby Trainers

League

→ Big Rewards

Gyms & Raids vs Trainer Battles

PvE (Player vs Environment)

Gyms

Raids

Team Go Rocket

- Grunts
- Bosses (Cliff, Sierra, Arlo)
- Leader (Giovanni)

Training

PvP (Player vs Player)

Friends

Nearby Trainers

League

Choose Your League

TopHat: How often do you battle and what is your favorite type of battle?

Pokemon Professor Kit: I live for battle.

Fast Moves and Charge Moves

Fast Moves

Does some damage

Charges up the Charge Move with Energy

Charge Moves

Typically do more damage

Uses up Energy

Charge Move Mini Games

Can be shielded

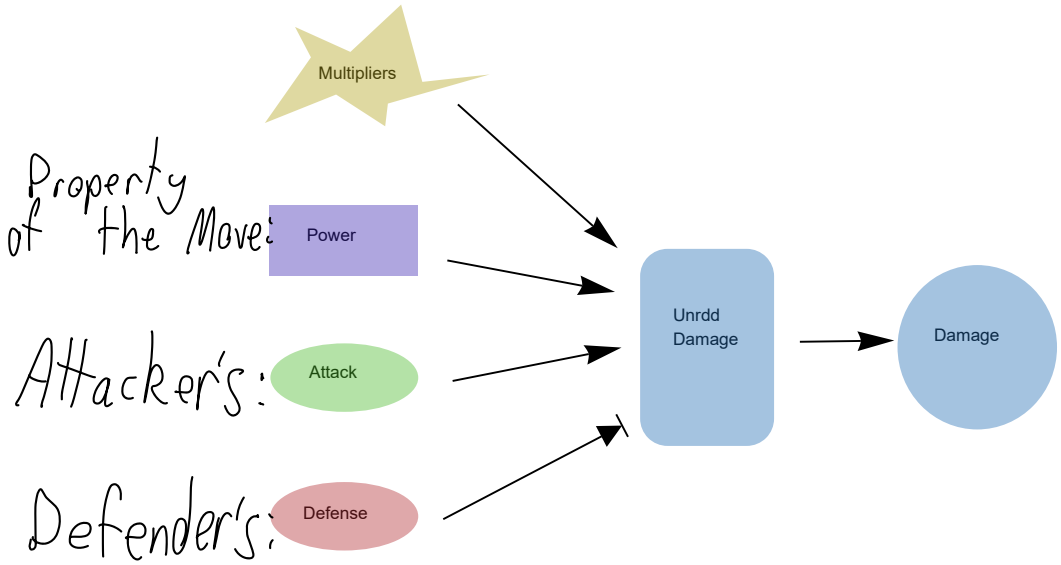
Damage Formula?

Minun hits Buneary with “quick attack”

What might appear in this formula?

Buneary's Def
Minun's Atk
Type of Move
Base Power of Move
Buneary's Type

Damage (Change in HP) Formula



Power

Power is a property of a move that influences the damage dealt by that move no matter what Pokemon uses it.

The Power for Quick Attack is 5.

https://bulbapedia.bulbagarden.net/wiki/List_of_moves_(GO)

Quick Attack		**5**

Minun has base attack 147, base defense 150, and base HP 155.
This Minun has IVs 10/5/0
This Minun is level 4 so its CPM is .25572

So Minun's actual attack stat is (Base Attack + Attack IV) * CPM= (147+10)*.25572 = 40.148
Remember that base attack and the final attack stat are **not the same**.

Good thing we have our excel CP calculator to do these calculations!

Defense

Buneary has base defense 105
This Buneary has defense IV 1
This Buneary is level 2 so the CPM is .166398

(Base Defense + Defense IV) * CPM = 18.47

Good thing we have our excel CP calculator to do these calculations!

Level	CPM	Attack	Defense	unrndd HP	HP	unrdd CP	CP
1	0.094	12.69	10.434	13.818	13	15.23736	15
1.5	0.135137	18.24355	15.000255	19.8652	19	31.49236	31
2	0.166398	22.46371	18.470164	24.46049	24	47.74737	47

Multipliers

STAB (Same Type Attack Bonus) → When type of the Move matches the type of the Pokeman

1 or 1.2

Trainer Battle Bonus

1.3

Type Effectiveness Bonus

1.6 or .625 (or a combination)

If there are multiple multipliers, they are multiplied together.

In Raids and Gyms there can also be weather and friendship bonuses. We will not often deal with these bonuses in class.

Type Effectiveness Chart

TYPE OF DEFENDING POKEMON

Type of Attacking MOVE

ATTACK \ DEFENSE	NORMAL	FIRE	WATER	GRASS	ELECTRIC	ICE	FIGHTING	POISON	GROUND	FLYING	PSYCHIC	BUG	ROCK	GHOST	DRAGON	DARK	STEEL	FAIRY
NORMAL													−	✖			−	
FIRE		−	−	+		+						+	−		−		+	
WATER		+	−	−					+				+		−			
GRASS		−	+	−				−	+	−		−	+		−		−	
ELECTRIC			+	−	−				✖	+					−			
ICE		−	−	+		−			+	+					+		−	
FIGHTING	+					+		−		−	−	−	+	✖		+	+	−
POISON				+				−	−				−	−			✖	+
GROUND		+		−	+			+		✖		−	+				+	
FLYING				+	−		+					+	−				−	
PSYCHIC							+	+			−					✖	−	
BUG		−		+			−	−		−	+			−		+	−	−
ROCK		+				+	−		−	+		+					−	
GHOST	✖										+			+		−		
DRAGON															+		−	✖
DARK							−				+			+		−		−
STEEL		−	−		−	+							+				−	+
FAIRY		−					+	−							+	+	−	

Type Effectiveness Multiplier

Find the row corresponding to the type of the move used by the attacking Pokemon. Find the column corresponding to the type of the defending Pokemon.

+ Means “super effective” so the multiplier is 1.6

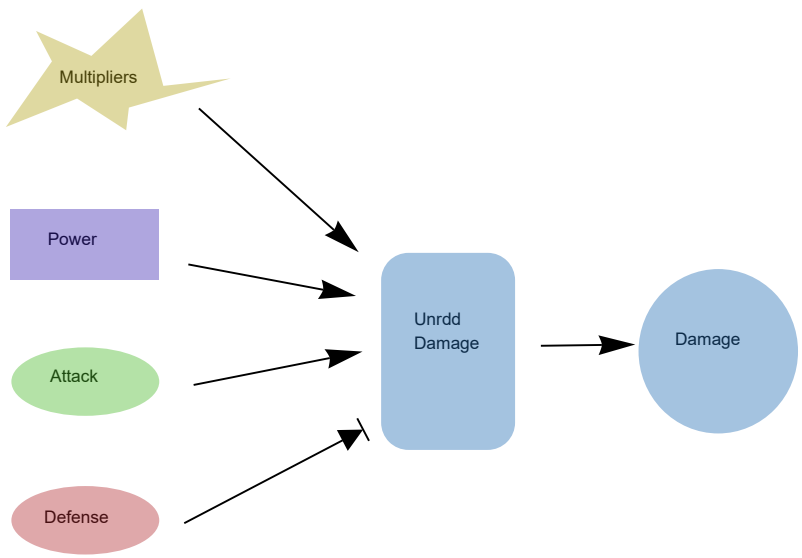
-- Means “not very effective” the multiplier is .625

X Means “almost immune” so the multiplier is (.625)*(.625) = .390625

Defenders with Two Types

If the defender has two types, do the process above for each type. Then multiply the two results together.

Damage Formula



Unrounded Damage =

Atk stat of the attacker

$$\frac{1}{2} * \text{Power} * \frac{\text{Attack}}{\text{Defense}} * \text{Multiplier}$$

Def stat of the defender

Damage =

$$\lfloor \text{Unrounded Damage} \rfloor + 1$$

$\lfloor\ \rfloor$ means round down.

unrounded damage

$$\frac{1}{2} \cdot 5 \cdot \frac{40}{18} \cdot 1 \cdot 1.3 \cdot 1 = 7.\overline{2}$$

Ouch Buneary!

$$\lfloor 7.\overline{2} \rfloor + 1 = 8$$

So each hit with Quick Attack reduces Buneary's HP by ___8___.

How many Quick Attacks would it take to knock out Buneary?

$$\frac{\text{Buneary's HP}}{\text{Damage}} \rightarrow \frac{24}{8} = 3 \text{ 'turns'}$$