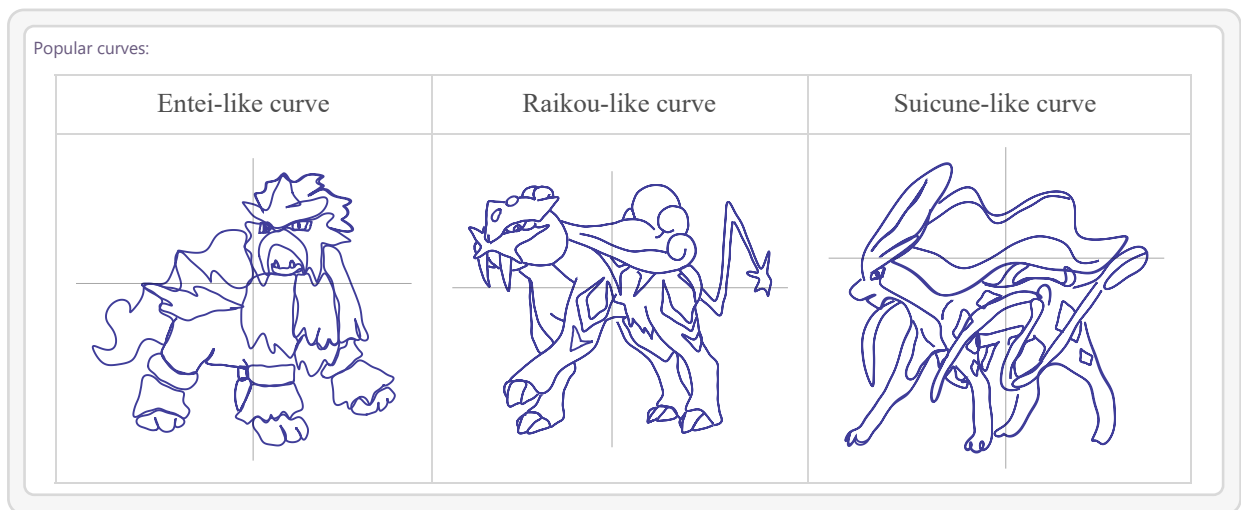


MATH:1260 Pokémath

The Mathematics of Pokémon Go[®]

Week 7 Monday, Spring 24



Plan for Today

- Module 2: Gotta Catch 'Em All!®
 - More on Basic Probability Principle
 - Probability Defined
 - Addition Rule

Class Reminders

- GW6 in discussion Thursday
- HW4 due Wednesday at midnight

Definitions

A **random experiment** has outcomes that we can not predict.

A single repetition of a random experiment is called a **trial**.

The possible results of a trial are called **outcomes**.

The SET of all possible outcomes is called the **sample space**.

An **event** is a **subset** of the sample space that contains all **outcomes** from inside the sample space that meet some **requirement**.

Basic Probability Principle

Let S be a sample space of **equally likely outcomes**. Let event E be a subset of S .

The probability of event E is $\frac{n(E)}{n(S)}$

Examples

Suppose I randomly pick one of the Johto pokemon from my bag. I have 286 Johto Pokémon® in my bag. 41 of those are legendary. If i pick one, what is the probability it is a Legendary? **Does the Basic Probability Principle apply here?**

Remember from last week, there were seven ways to get at least one shiny in three checks. Does that mean there is a $7/8$ chance any time you shiny check 3 Pokemon that you will find a shiny?

Example

I have 353 Shiny Pokémon[®] in my bag. Suppose I draw one shiny at random.

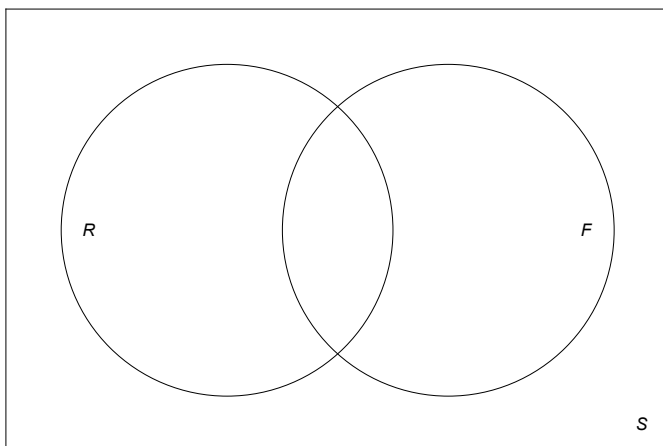
Of that set, 43 are Normal type, 40 are Flying type, 18 are Normal and Flying Type.

Notation:

S is the Sample Space

R is Normal

F is Flying



Probability of R

Probability of F?

Probability of $R \cap F$?

Probability of $R \cup F$?

TopHat. What is the probability of F^c ?

Formal Definition of Probability

P is a function from events to the numbers between 0 and 1 with the following properties:

- $P(S) = 1$.
- if A and B are disjoint events, $P(A \cup B) = P(A) + P(B)$
 - This is known as the “addition rule for disjoint sets”

Intuition

E is an event, a subset of possible outcomes.

$P(E)$ is the probability that one of the outcomes that is in this subset will occur (in a single trial).

Example: Addition Rule for Disjoint Events

The **experiment** is “check the species of the next **starter** Pokémon[®] to spawn”.

The sample space?

Some events:

$F = \{\text{Fire Type}\}$ What is $P(F)$?

$W = \{\text{Water Type}\}$ What is $P(W)$?

Are F and W disjoint?

$F \cup W$ is the event that the Pokémon[®] who spawns is a Fire Type or Water Type. What is $P(F \cup W)$?

What if the **experiment** is changed to be “check the species of the next Pokémon[®] to spawn”?

General Addition Rule

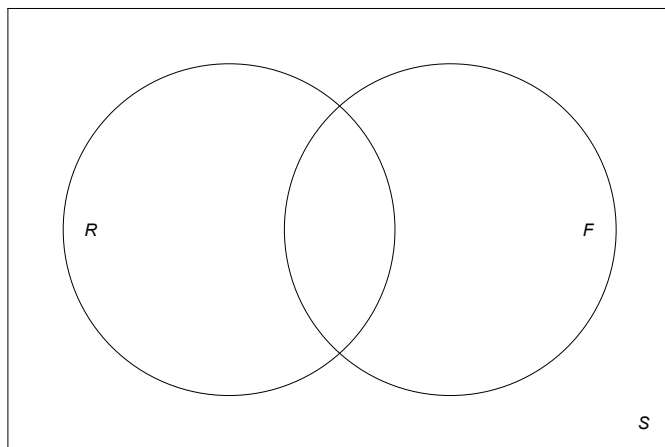
What if my sets are not disjoint? Recall, I have 353 Shiny Pokémon® in my bag. Suppose I draw one shiny at random.

Of that set, 43 are Normal type, 40 are Flying type, 18 are Normal and Flying Type.

We need the **general addition rule**:

$$P(R \cup F) = P(R) + P(F) - P(R \cap F)$$

Does this formula remind you of anything?



Complement Rule

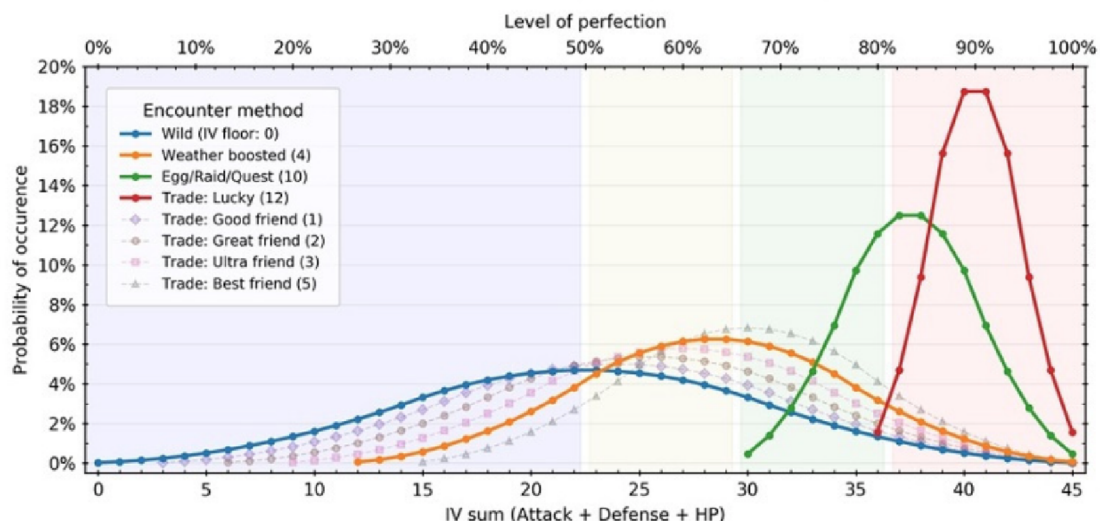
$$P(R^C)?$$

Can you guess what the complement rule might be?

IVs

Each IV can be a value from 0 to 15. So there are 4096 possible IVs.

The sum can be a value from 0 to 45 but not all sums are equally likely...



What is the probability of a 4* in a Lucky Trade?

What is the probability of a 2* in a Lucky Trade?

What is the probability of a 3* in a Lucky Trade?