

Pokémath: Homework 4



Pokémon[®] Problems

I will catch a whole bunch of Foongus! Foongus are equally likely to spawn with the symbol female (φ) or male (σ).

Notation:

I will use the symbols φ and σ for the assigned sex used in the game.

If I catch three Foongus and the first is female, and the second and third are both male, I would denote that outcome $\varphi\sigma\sigma$. So the order matters!

S_1 is the sample space for an experiment where I catch 1 Foongus, S_2 for an experiment where I catch 2 Foongus and so on. So **there are multiple experiments happening!** Pay close attention to which one we are talking about!

1)

a) If I catch one Foongus in my experiment. The sample space is $S_1 = \{\varphi, \sigma\}$. What is $n(S_1)$?

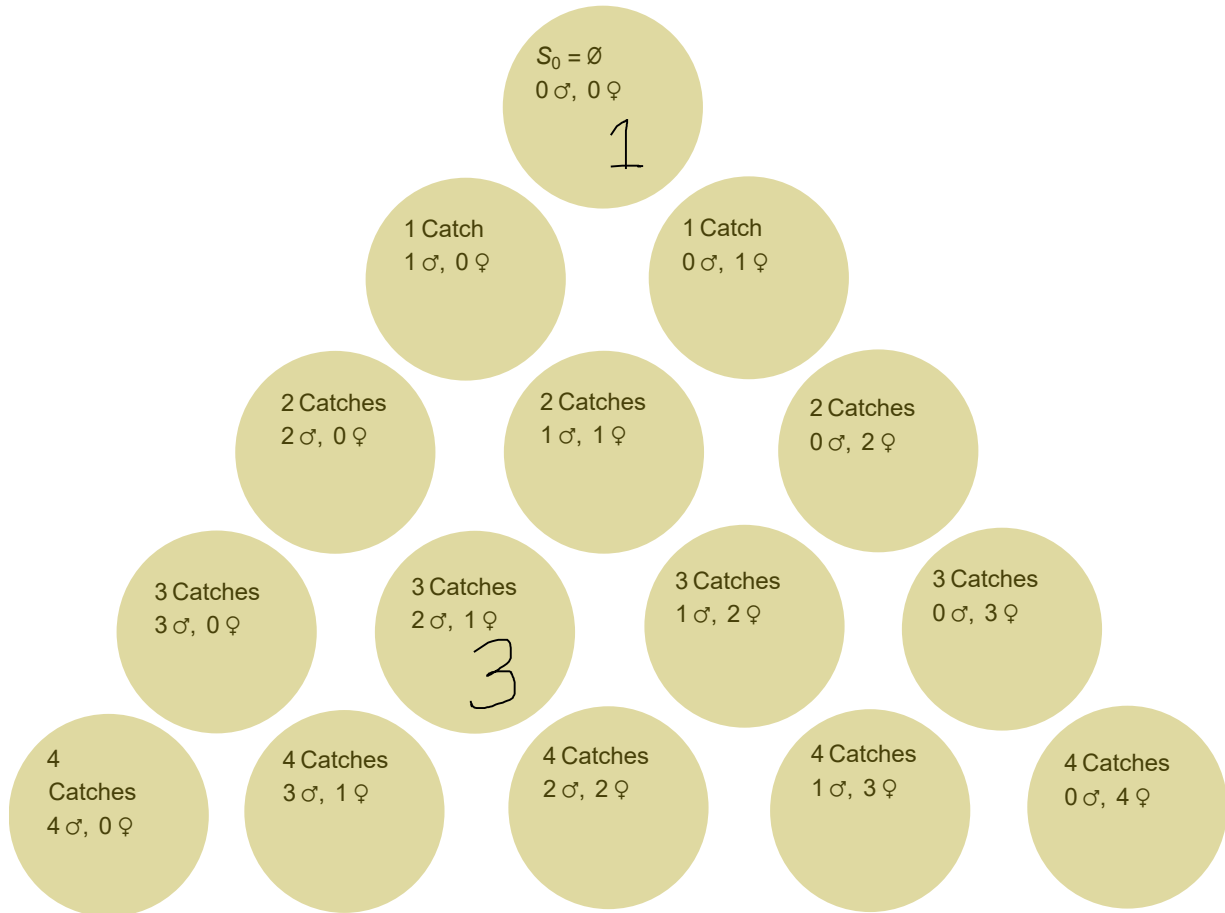
b) If I catch two Foongus in my experiment. The sample space is $S_2 = \{\varphi\varphi, \varphi\sigma, \sigma\varphi, \sigma\sigma\}$. What is $n(S_2)$?

c) If I catch three Foongus in my experiment, what is the sample space, S_3 ? What is $n(S_3)$?

d) If I catch four Foongus in my experiment, what is the sample space, S_4 ? What is $n(S_4)$?

2) Consider events defined as catching a specific number of Pokemon of each sex. For example, if I catch three Pokemon, the event that I have 2 ♂ and 1 ♀ is the subset $\{\sigma\sigma\varphi, \sigma\varphi\sigma, \varphi\sigma\sigma\}$. This set has three elements for the three ways I can have 2 ♂ and 1 ♀ so I fill in 3 in the bubble for 2 ♂, 1 ♀.

a) Fill in the rest of the bubbles below with the *number of elements in the event* described by the bubble.



Congratulations, you have just constructed Pascal's Triangle!

b) Confirm that the number in the bubble is the sum of the two numbers above it. If you did 5 catches, what is the number of ways to have 3 ♂, 2 ♀?

c) Explain in a few sentences why the number of ways to have 3 ♂, 2 ♀ in 5 catches is the number of ways to have 3 ♂, 1 ♀ plus the number of ways to have 2 ♂, 2 ♀ in 4 catches.

3) Probabilities. Suppose I make 4 catches. Use the Basic Probability Principle to find the probabilities of the events. Hint: your sample space from (1d) might be helpful.

- a) Exactly 2 ♂.
- b) At least 2 ♂.
- c) More ♀ than ♂.
- d) Either no ♂ or no ♀.