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Tri-Ominos

The game Tri-Ominos has tiles that are triangular in shape with each corner having a number 0-5. The rules of the game are similar to that of Dominos.

If each tile contains different combinations of the numbers 0-5,

1. How many tiles contain exactly two 1’s?
2. How many tiles contain exactly one 5?
3. How many tiles contain at least one 2?
4. How many tiles are there altogether in the game?

Solution:

If each tile contains different combinations of the numbers 0-5,

1. How many tiles contain exactly two 1’s?

If there are exactly two ones then there cannot be a one in the third corner. If this is so, the number in the third corner must be a 0, 2, 3, 4, or 5. This means there are 5 choices for what is in the last corner, therefore five tiles that have exactly two ones.

(5 nCr 1) =5

1. How many tiles contain exactly one 5?

If there is exactly one 5 then there are 5 other numbers that can be in one corner and 5 numbers that can be in the other corner. Since it does not matter if the numbers in the remaining two corners are the same or different, we can multiply the number of options together because for each value placed in one corner you can have those same five options in the other corner.

(5 nCr 1)(5 nCr 1)= 5\*5 = 25

1. How many tiles contain at least one 2?

If there is at least one 2, there can be one 2, two 2’s or three 2’s. In the case of one 2, as seen in the second problem, we can multiply the five options for one corner and the five options for the other corner together to arrive at 25 tiles. In the case of two 2’s, there are only five options for the last corner as seen in the first problem. In the case of three 2’s, this can only occur once with one tile all having 2’s. Add these options together and you get 31.

(5 nCr 1) (5 nCr 1) + (5 nCr 1) + (1 nCr 1)

= (5)(5) + 5 + 1

=25 + 5 + 1

=31

1. How many tiles are there altogether in the game?

The number of tiles that would contain 1 of any of the numbers would be 31. This multiplied by 6 would give you 186. However, there are not 186 tiles because those that contain one number also contain other numbers in which you need to subtract the common tiles to arrive at the number of tiles used in the game.

Number of 0’s: 31

Number of 1’s: 31 – (5 + 5) = 31-10 = 21

Number of 2’s: 31 – (10) – (4+4) =31-18 = 13

Number of 3’s: 31 – (10) – (8) – (3+3) = 31-24 = 7

Number of 4’s: 31 – (10) – (8) – (6) – (2+2) = 31-28 = 3

Number of 5’s: 31 – (10) – (8) – (6) – (4) – (1+1) =31-30= 1

When you add all of these values together you get that there are 76 tiles in the game.

Hints:

1. Draw what a tile would look like for question one that has two ones. What are the other options for the third corner? How can you write this in terms of the vocabulary that you would use in probability?
2. Think about the choices that you could have for exactly one. Would you multiply or add your options together? What makes more sense? Think back to easier problems in probability with different food options or music options. When do we add and when do we multiply?
3. “At least” could have different options, what are they? If it’s “this” or “this” or “this”, what do we do with these values to get your final answer?
4. We know that each number would in theory have 31 tiles. But, remember that tiles contain more than one number so we cannot count these tiles twice. How can we go about counting them only once?