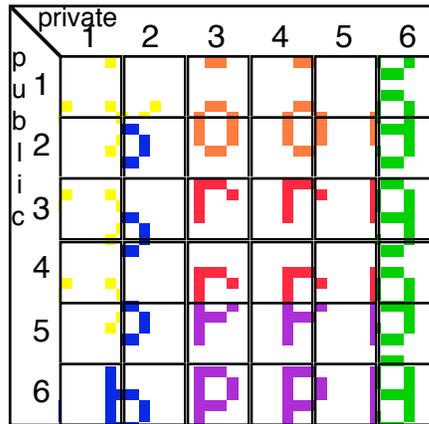


**EX:** In a spy game, players choose one of six possible colored tokens that represents their secret identity. When a player takes their turn, they roll one six-sided die in public and a second one in private. They then use the following chart to decide whether the result of the turn, (which they report to the other players), is a hit or miss—that is, whether the die roll lands in the region whose color matches their secret identity:



Assuming the color of the secret identity and the dice rolls are independent, find the number of possible outcomes in event  $A$  (for one turn):

$A \equiv$  the public die is 2, the secret identity color is blue, and the result is a miss

**SOL'N:** We make a diagram of possible outcomes. The diagram above captures all of the information about possible outcomes, but plotting the outcomes with an axis for each variable, including the result, allows us to count outcomes more easily.

In the diagram, below, the outcomes in  $A$  must be in the squares highlighted in light blue, as these squares correspond to public die is 2, the secret identity color is blue, and the result is a miss. Five of the squares in light blue are possible outcomes. Thus, our answer is 5.

**NOTE:** The problem of having four axes for the diagram when we can make only 3-dimensional pictures is dealt with by repeating the 3-dimensional picture side-by-side for each value of the fourth axis, (hit or miss). For even more dimensions we could repeat the entire diagram vertically or side-by-side.

Diagram of Spy Game Possible 1-Turn Outcomes  
(public die, private die, player color, result)

