Dodgeball Duel Solution

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Given the wording “winner-take-all, last-dodgeballer-standing championship match” I will be assuming that the duel happens once and will not be repeated.

Below is the payoff matrix for every action Austin, Mehmet and Julia can take. From looking at the payoffs it is clear that Austin has no choice over his probability of winning, and his probability of winning is entirely decided by Julia and Mehmets’ actions.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | Julia (fast) | | | |  |  |
| Payoffs (Austin,Mehmet,Julia) | | | Throws Left | | | | Throws Right | | | |
|  |  |  |  |  |  |  |  |
|  |  |  | Mehmet (fast) | | | | Mehmet (fast) | | | |
|  |  |  | Throws Left | | Throws Right | | Throws Left | | Throws Right | |
| Austin (slow) | Throws Left | | (0,1,0) | | (0,.5,.5) | | (.5,0,.5) | | (0,0,1) | |
| Throws Right | | (0,1,0) | | (0,.5,.5) | | (.5,.5,0) | | (0,0,1) | |

Strategy 1.) Julia and Mehmet both understand that their best chance of winning is to eliminate Austin in the first round and then take aim at each other during the second round. This will maximize their chance of winning and they will both win with 50% probability. However, Mehmet will realize he can cheat Julia out of her 50% and will adopt strategy 2.

Strategy 2.) Mehmet will eliminate Julia while Julia is busy eliminating Austin. Now Mehmet will win 100% of the time. However, Julia knows Mehmet will try this strategy and will also adopt it creating strategy 3.

Strategy 3.) Julia and Mehmet realize they can’t take the risk of not trying to eliminate one another first, and will therefore aim at each other. Austin will try to predict the winner of the duel between Julia and Mehmet to aim at and will be correct 50% of the time making him the winner. In the chance his ball strikes the looser between Julia and Mehmet the winner will then aim at him in the second round and eliminate him with 100% probability. Therefore, Austin will win 50% of the time while Julia and Mehmet will each win 25% of the time.

**The Final Probabilities:**

**( p(Austin wins), p(Mehmet wins), p(Julia wins) ) 🡪 ( .5, .25, .25 )**