Fight outcomes

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Probabilities

Each fight consists of $f \in \{blue, red\}$ fighters and is observed by $J = 3$ judges.

Table 1 shows the possible decision outcomes of fight as a result of the judges' verdicts.

Table 1: Overview of all possible decisions

Judge 1	**Judge 2**	**Judge 3**	**Winner**	**Decision**
blue	blue	blue	blue	unanimous win
blue	blue	red	blue	split win
blue	blue	draw	blue	majority win
blue	red	draw	draw	split draw
blue	draw	draw	draw	majority draw
draw	draw	draw	draw	unanimous draw

Due to their rare nature, draws are excluded from the possible judges' verdicts. If a fight goes to the distance, judge j assigns per round r a score $y_{j,r}^{a,b} \in \{7-10, 8-10, 9-10, 10-9, 10-8, 10-7\}$. A fight goes to the distance if one of the fighters is not prematurely defeated by either a knockout or a submission. The probability of a knockout and a submission during a round is defined as, respectively, $p_{knockout,r,f}$ and $p_{submission,r,f}$. It is assumed that these probabilities are constant and do not change as the fight progresses. Therefore, the probability of "surviving" any round is equal to

$$p_{round} = 1 - (p_{knockout,blue} + p_{knockout,red} + p_{submission,blue} + p_{submission,red})$$

The main event and co-main event are scheduled for $R = 5$ rounds. All the other events are scheduled for $R = 3$ rounds.

Logically, the probability of a fight "going the distance" is

$$p_{decision} = \begin{cases} p_{round}^5 & \text{if (co-)main fight} \\ p_{round}^3 & \text{other} \end{cases}$$

In this case a fighter can win by either an unanimous or a split decision. There are $U = 3^J$ possible scorecard combinations that result in an unanimous decision.

The probability of fighter f winning by unanimous decision is equal to

$$p_{unanimous,f} = p_{decision} \cdot \sum[]$$

and by split decision

$$p_{split,f} = p_{decision} \cdot \sum_{j=1}^{J} \mathbb{I}(a > b) = J - 1$$

Together these probabilities form the probability that fighter f wins by the judges' decisions.

$$p_{judges,f} = p_{unanimous,f} + p_{split,f}$$

The probabilities of the other methods to win the fight are

$$p_{submission,f} = p_{submission,r,f} + \sum_{r=1}^{R-1} rp_{round} \cdot p_{submission,r,f}$$

and

$$p_{knockout,f} = p_{knockout,r,f} + \sum_{r=1}^{R-1} rp_{round} \cdot p_{knockout,r,f}$$

Together, the probability of fighter f winning the fight is equal to

$$p_{win,f} = p_{knockout,f} + p_{submission,f} + p_{judges,f}$$