

Probability Trees

- The setting out of solutions to problems requiring the manipulation of the probabilities of mutually exclusive and independent events can sometimes be helped by the use of probability tree diagrams. These have useful applications in decision theory.
- The best choice of probability tree structure often depends upon the question and the natural order in which events like A and B above occur.

Probability Trees

Probability Trees: Example

- Two gamblers, A and B, are playing each other in a tournament to win a jackpot worth \$6,000.
- The first gambler to win 5 rounds, wins the tournament, and the jackpot outright.
- Each player has an equal chance of winning each round. Also, a tie is not possible.

Probability Trees

Probability Trees: Example

- The tournament is suspended after the seventh round. At this point A has won 3 rounds, while B has won 4.
- They agree to finish then and divide up the jackpot, according to how likely an outright victory would have been for both.

How much money did A end up with?

Probability Trees: Example

- Consider that A needed to win two more rounds, while B only need to win one more.
- One could suppose that B was twice as likely as A to win the jackpot.
- That would mean that the shares of the jackpot would be \$2,000 for A and \$4,000 for B.

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- **WRONG!**

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Probability Trees: Example

- At the end of the seventh round, A had a 25% chance of winning the jackpot.
- A's share of the jackpot is the \$1,500.
- B had a 75% chance of winning, so gets \$4,500.