Tree diagrams

Construct and read a probability tree for two consecutive events; multiply along branches for a combined probability.

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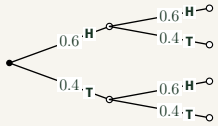
Show your method

Branches leaving the same point sum to 1. Multiply the probabilities along the branches leading to an outcome. With replacement, the second-stage probabilities are unchanged; without replacement, they change.

Worked example A biased coin has $P(\text{Heads}) = 0.6$. Tossed twice, independently. Find $P(\text{HH})$.



Multiply along the branches: $P(\text{HH}) = 0.6 \times 0.6$.
$= 0.36$

1. What is $P(\text{HT})$?

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2. What is $P(\text{TT})$?

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3. List all four outcomes of tossing a coin twice.

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4. Find $P(\text{Burger then Juice})$.

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5. Find $P(\text{Pizza then Cola})$.

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6. What must the probabilities of branches leaving the same point always sum to?

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7. A bag has 3 red, 2 blue. Drawn, replaced, drawn again. Find $P(\text{red})$ on the 2nd draw.

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8. Using the same tree, find $P(\text{blue then blue})$.

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9. A tree's first branch is $P(\text{Win}) = 0.3$. Find $P(\text{Lose})$.

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Tree diagrams (continued)

Compare with-replacement and without-replacement trees; combine leaf probabilities.

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10. Without replacement, given the 1st is red, find $P(\text{red})$ on the 2nd draw.

11. Using the same without-replacement tree, find $P(\text{red then red})$.

12. Explain why without-replacement probabilities change on the 2nd draw but with-replacement ones don't.

13. Find $P(\text{at least one Head})$ in two tosses.

14. Using the without-replacement tree, find $P(\text{one red, one blue, either order})$.

15. A without-replacement tree starts with 10 counters, 4 red. Find $P(\text{1st red})$.

16. Following Q15, if the 1st counter drawn was red, how many counters (and how many red) remain for the 2nd draw?

17. A two-branch tree has probabilities 0.45 and blank at the first stage. Find the missing probability.

18. A student tosses a coin twice, gets Heads first, and says Tails is now more likely. Explain why this is wrong.