



PROBABILITY

Adam Klepáč

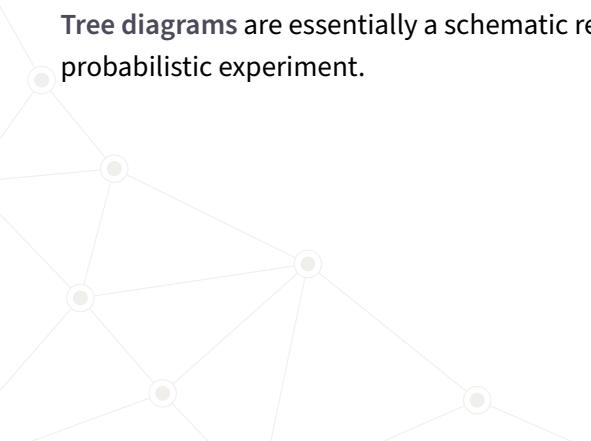
January 17, 2024

TREE DIAGRAMS

The bottom of the slide features a decorative design consisting of two large, solid red triangles that point towards each other, meeting at a central point. This creates a large, inverted 'V' shape. Below this, there is a smaller, dark red triangle pointing upwards, which is partially obscured by the bottom edge of the slide.

TREE DIAGRAMS

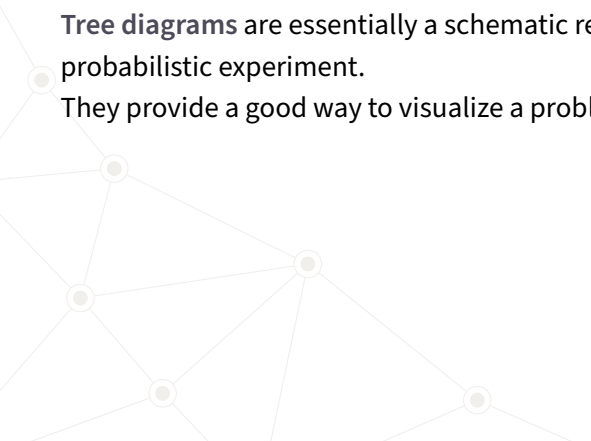
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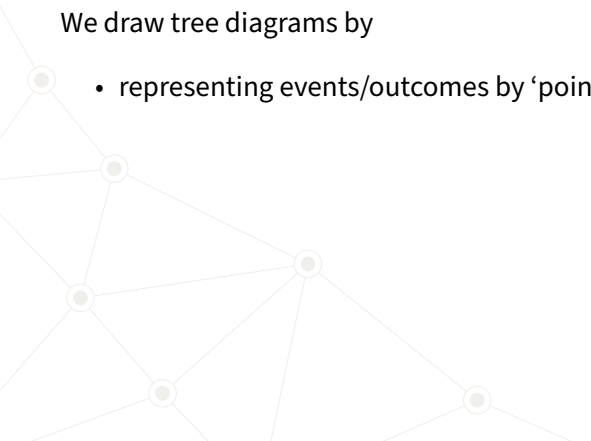
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In some sense, they allow **dependent events** to **become independent** and compute the probability of the successive occurrence of such events by simple multiplication.

DRAWING TREE DIAGRAMS

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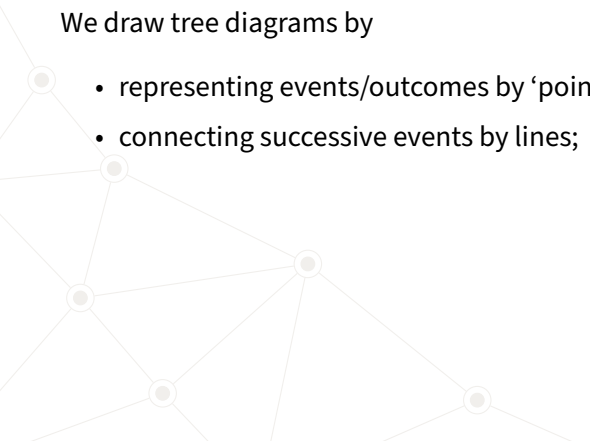
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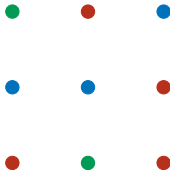
DRAWING TREE DIAGRAMS

We draw tree diagrams by

- representing events/outcomes by 'points' or 'dots';
- connecting successive events by lines;
- drawing the events from top to bottom in chronological order.

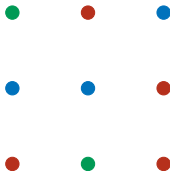
TREE DIAGRAM – EXAMPLE

Imagine again a set of 9 balls of three different colors.



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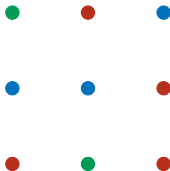
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We'll perform the same computation using a **tree diagram**.

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We start by drawing the ‘root’ of the tree. Just a simple dot which will then branch into different events.



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The first event is ‘a randomly chosen ball is red’. There are three possible outcomes of a random choice – red, green or blue, each of different probability.

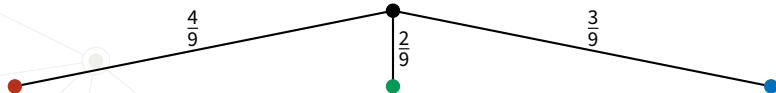
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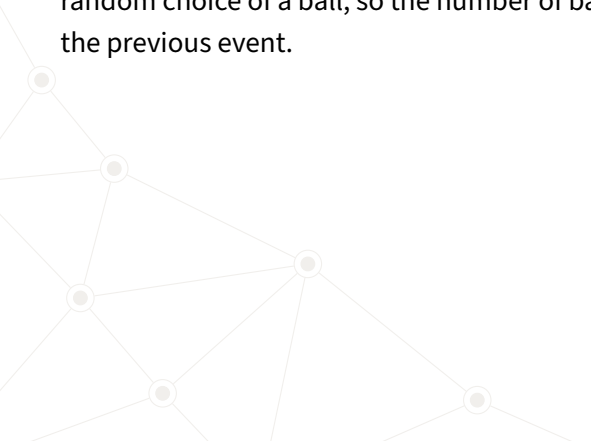
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We represent this in the tree diagram like this:



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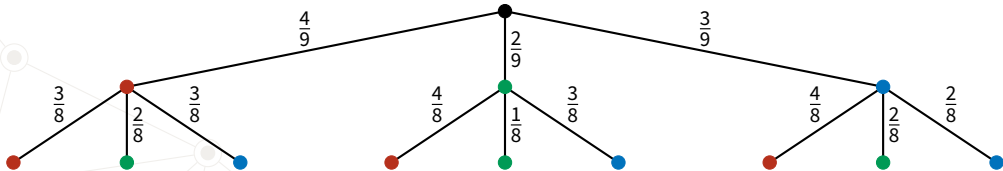
The next ball can be again red, green or blue. But, this event follows after a previous random choice of a ball, so the number of balls remaining is 8 and their colours depend on the previous event.



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The full tree diagram of this probabilistic experiment would look like this:



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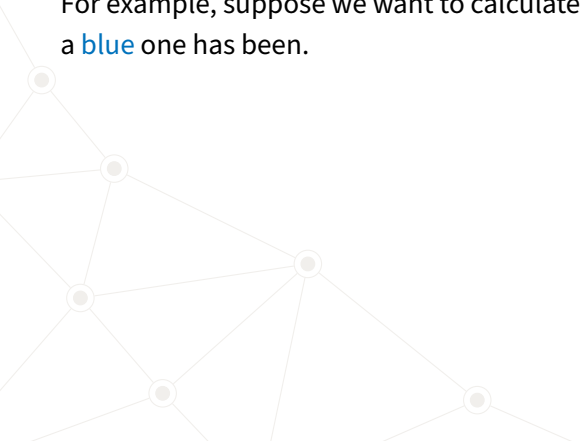
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For example, suppose we want to calculate the probability that a **green** ball is picked after a **blue** one has been.

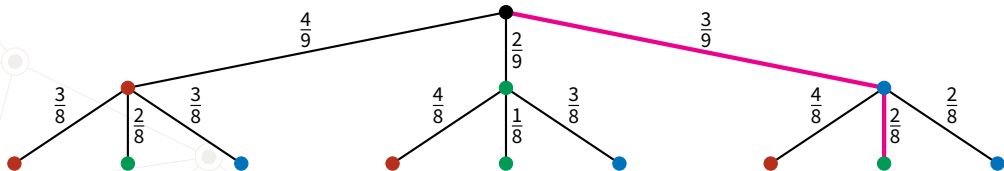


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This event corresponds to **this path** in the tree:

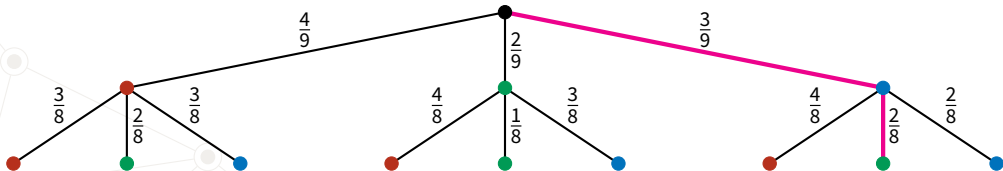


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Hence, we know its probability to be $\frac{3}{9} \cdot \frac{2}{8} = \frac{1}{12}$.

TREE DIAGRAM – PROBLEM #1

A football team wins its matches with a probability of 0.7.

Using a tree diagram, find the probability that they win at least 1 of their next three matches.

TREE DIAGRAM – PROBLEM # 2

Anna and Rob take their driving tests on the same day. The probability of Anna passing her driving test is 0.7. The probability of both Anna and Rob passing is 0.35.

1. Work out the probability of Rob passing his driving test.
2. Work out the probability of both Anna and Rob failing their driving tests.