MATHEMATICS · GRADES 7-9

Simple Two-Stage Probability

Difficulty level: Intermediate

Mathematics: Grades 7-9

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Overview of the concept

This is how you work out the chance of two things happening in a row, like flipping a coin and then rolling a die, or drawing two names from a hat. A game player working out the odds of rolling two sixes in a row needs to combine the chance of each roll. A teacher drawing two names from a hat without putting the first one back has to allow for the smaller hat on the second draw. Knowing two-stage probability tells you how to work out the chance of a pair of events together, step by step.



Rule

Two-stage probability: P(first and second) = P(first) × P(second), where the second chance is worked out after the first has happened.

Multiply along the branches of the tree.

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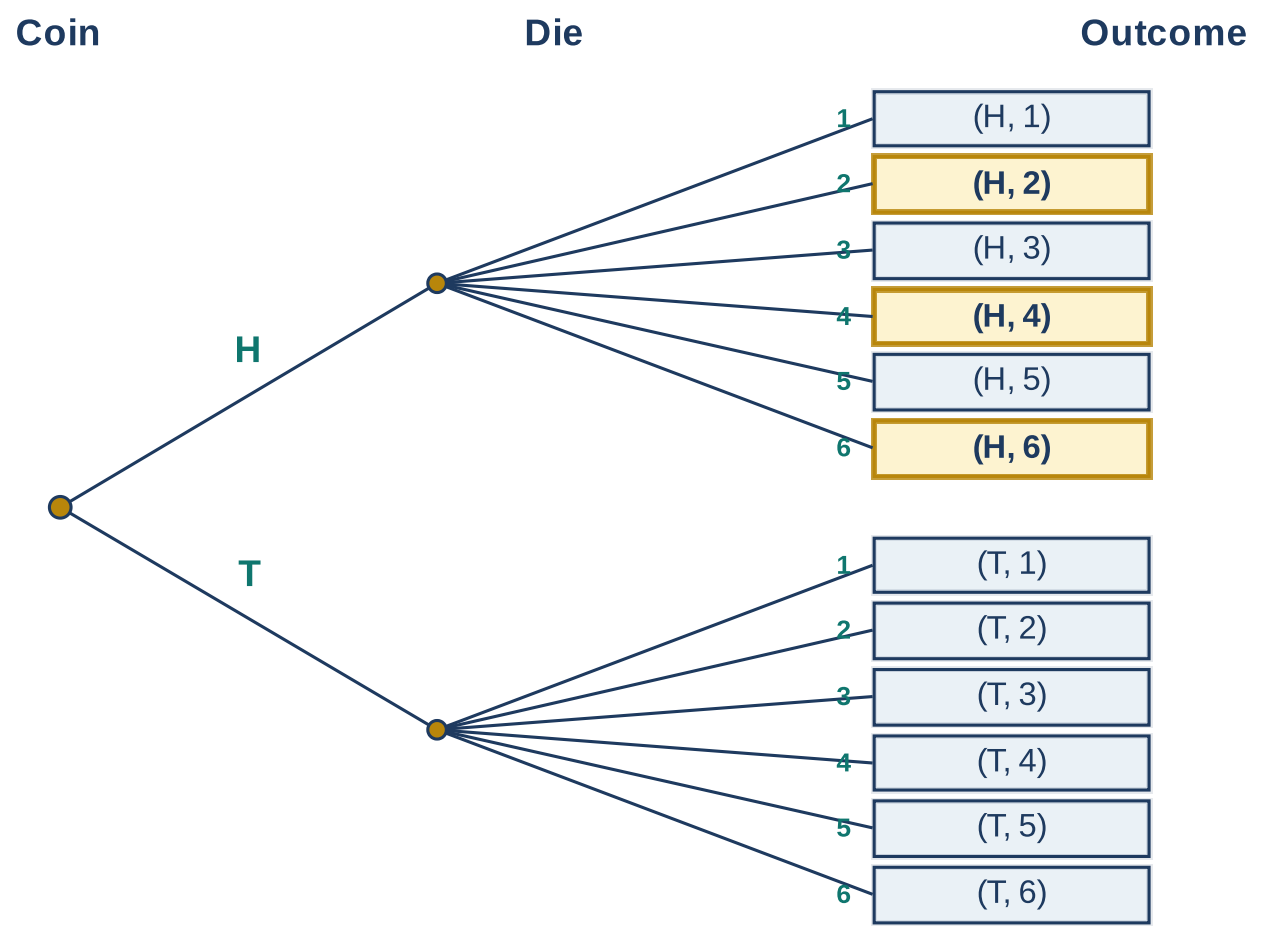
Worked examples

EXAMPLE 1

Q Find P(heads, then an even number) for a coin flip and a die roll



SOLUTION

P(heads) = $\frac{1}{2}$. P(even) = $\frac{3}{6}$, because three of the six faces (2, 4, and 6) are even.

$\frac{3}{6} = \frac{1}{2}$

The stages are independent, so multiply: $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$.

P is $\frac{1}{4}$.

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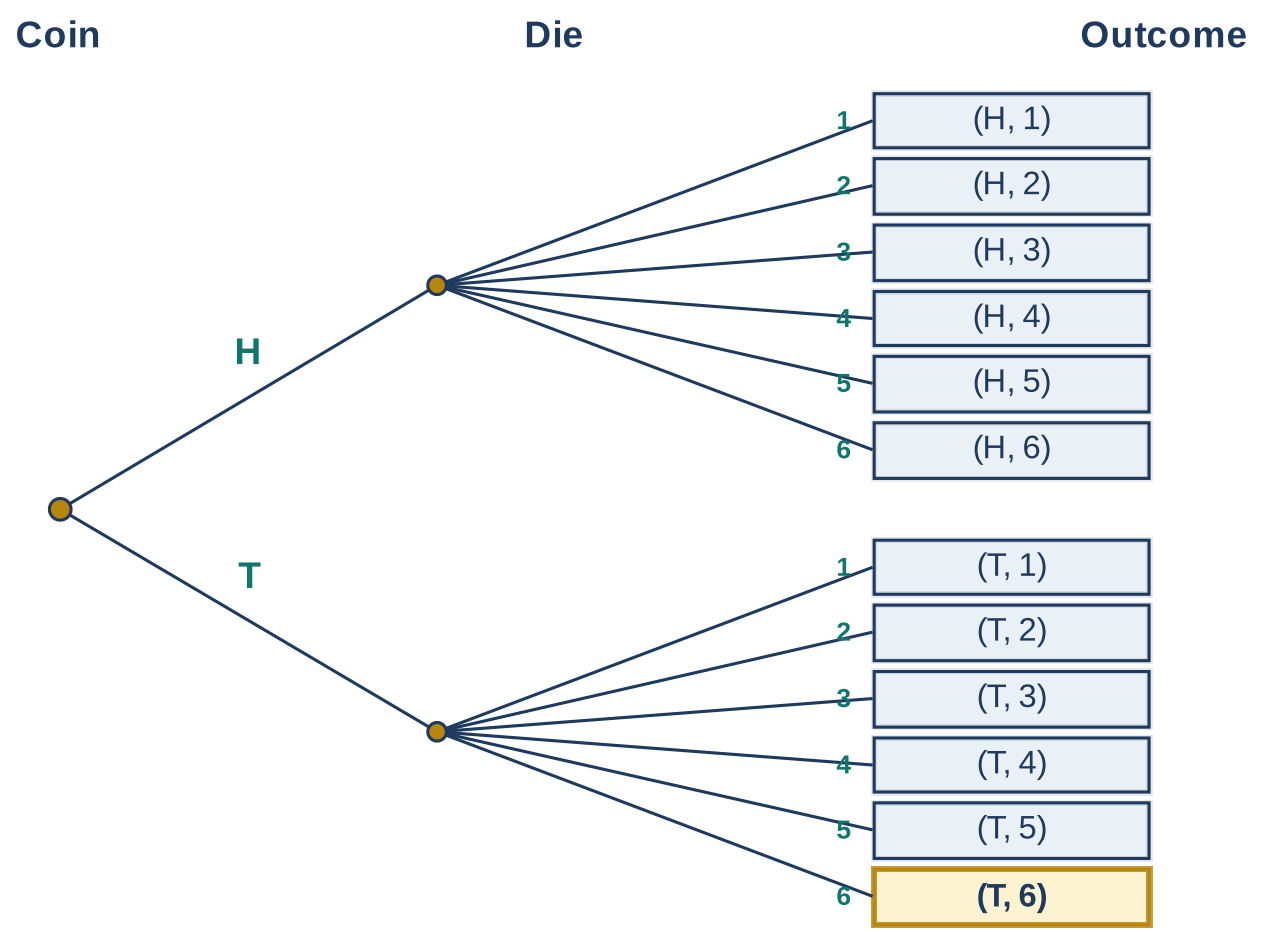
EXAMPLE 2

Q Find P(tails, then a 6) for a coin flip and a die roll



SOLUTION

P(tails) = $\frac{1}{2}$. P(6) = $\frac{1}{6}$

Multiply: $\frac{1}{2} \times \frac{1}{6} = \frac{1}{12}$.

P is $\frac{1}{12}$.

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Practice questions

1. Flip a coin and roll a die. Find P(heads, then a number greater than 4).

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2. A bag has 3 red counters and 2 blue counters. One counter is taken out, then a second counter is taken out without putting the first one back. Find P(red, then blue).

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3. Flip a coin and roll a die. Find P(heads, then 1).

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4 Flip a coin and roll a die. Find P(tails, then odd).

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5 Flip a coin twice. Find P(heads, then heads).

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6 Roll a die twice. Find P(6, then 6).

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7 A spinner lands on red with probability $\frac{1}{2}$, then a coin is flipped. Find P(red, then heads).

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8 The first stage has outcome A with probability $\frac{1}{3}$, and the second stage has outcome B with probability $\frac{1}{2}$. Find P(A, then B).

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9 The first stage has outcome A with probability $\frac{1}{4}$, and the second stage has outcome B with probability $\frac{1}{4}$. Find P(A, then B).

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10 **A coin is flipped and then a die is rolled. How many different combined outcomes are possible?**

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ANSWER KEY

1. $\frac{1}{6}$

2. $\frac{3}{10}$

3. $\frac{1}{12}$

4. $\frac{1}{4}$

5. $\frac{1}{4}$

6. $\frac{1}{36}$

7. $\frac{1}{4}$

8. $\frac{1}{6}$

9. $\frac{1}{16}$

10. 12

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