Estimate Probability using Relative Frequency & Use Tree Diagrams HD2

Express probabilities as fractions, decimals or percentages ONLY

The Words

Mutually exclusive means events that cannot occur together e.g. *Head* and *Tail* when a coin lands, or to describe the outcomes at the **end of a tree diagram**. When results are **mutually exclusive** we **add** probabilities. *See how the four outcome probabilities in example 3 below are added to make 1.*

Events are **independent** when one event does not effect the outcome of the other. Independent events may or may not occur together. These are easy to spot because the events are usually separated 'physically' or by 'time'. For example, the results from two dice are two independent events **separated physically**. Catching the bus in the morning and catching the bus in the evening are two independent events **separated in time**. When results are **independent** we **multiply**. **This may seems a bit complicated but just remember in examinations it means in tree diagrams we multiply along the branches**. *See example 3 below.*

Relative frequency refers to the ratio of successes to tries in an **experiment** and is used to **estimate** probability.

The Formulae - Memorise These

$$P(\text{Event}) = \frac{\text{The Number of Possible Successes}}{\text{The Total Number of Possible Ways}} \qquad \text{Relative Frequency} = \frac{\text{The Number of Successes}}{\text{The Number of Trials}}$$

P(not A) = 1 – P(A)   P(A **or** B) = P(A) **+** P(B) - where A and B cannot occur together - mutually exclusive.
P(A **and** B) = P(A) × P(B) - for independent events.

Example 1: Adding

Calculate the probability that an even number or a 3 lands on a fair die. An even number and a 3 cannot occur together, therefore P(Even OR 3) = P(Even) + P(3) = $\frac{1}{2}+\frac{1}{6}=\frac{3}{6}+\frac{1}{6}=\frac{4}{6}=\frac{2}{3}$.

Example 2a: Estimate Relative Frequency

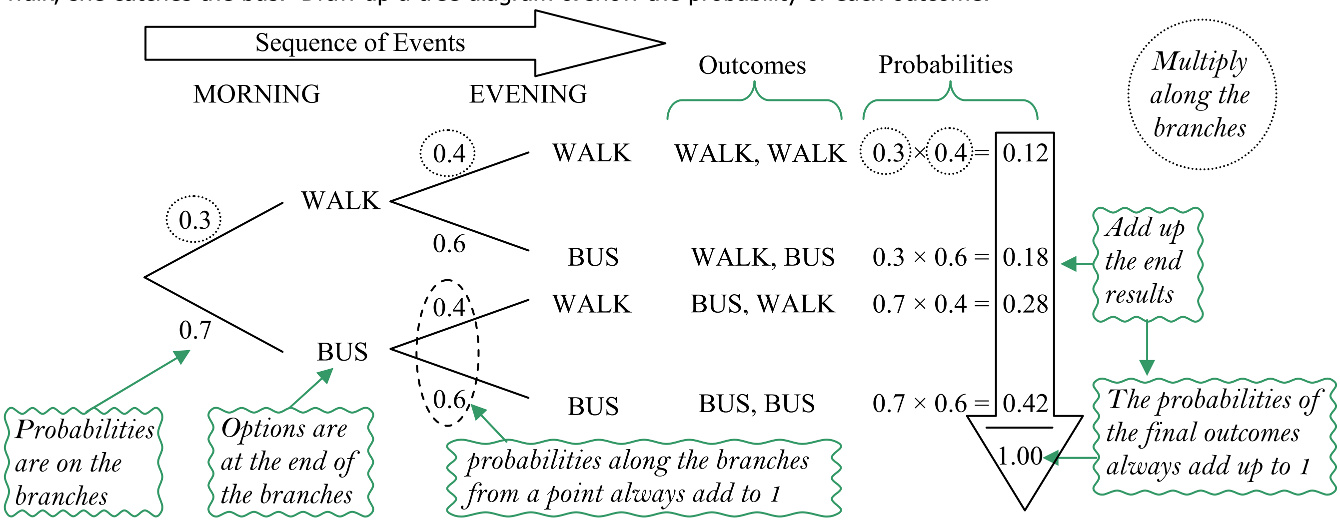
A biased die is thrown 100 times and lands on two 10 times; estimate the probability that the die will land on two on its next throw. Estimate for P(two) = $\frac{\text{The Number of Successes}}{\text{The Number of Trials}}=\frac{10}{100}=\frac{1}{10}$.

Example 2b: Estimate the number of results using Relative Frequency

The biased die is now thrown 450 times. Estimate the number of times it will land on two? $450\times\frac{1}{10}=45$.

Example 3: Tree Diagram

The chance Amy walks to school in the morning is 0.3; the chance she walks home in the evening is 0.4. If she does not walk, she catches the bus. Draw up a tree diagram & show the probability of each outcome.



Your Turn!!

a) John randomly selects 20 students in the school hall and finds that 3 are year 7 students. There are 500 students in the hall. Estimate how many students in the hall are year 7 students.
b) In example 3, what is the probability that Amy catches the bus both in the morning & in the evening?
c) If Amy changes her habits such that chance she walks in the morning is 0.1 and 0.2 in the evening. Copy the tree diagram above but with the correct probabilities on the branches. What are final four probabilities that add up to 1?

RAPID 'ACID' TEST – Blank out the page above before answering these!

1. After travelling through a town ten times, you notice that the first set of traffic lights were green three times and the second set were green six times. Given that the traffic lights work independently, draw a tree diagram with the options 'green' and 'not green' to show the possible outcomes and the estimated probabilities of these outcomes. Include the probabilities of the final outcomes e.g. green followed by green.