Probability 1

Chapter 1

Section 1.6 The multiplication law for independent events

- If A is independent of B the probability of one doesn't depend on the other.
- If A is not independent of B it's probability is 'CONDITIONAL'

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Paul spins a coin  and rolls a dice. 

His results are shown on the right.

The coin and the dice do not affect each other, so their outcomes are **independent**.

There are 12 equally likely outcomes of the coin and dice, as shown in the diagram on the right.

From the sample space, we can see that the probability of a head and a 5 is $\frac{1}{12}$.

The probability of each outcome can also be found by multiplying the separate probabilities, as shown above.

Dice	Coin: H(ead)	Coin: T(ail)
6	H, 6	T, 6
5	H, 5	T, 5
4	H, 4	T, 4
3	H, 3	T, 3
2	H, 2	T, 2
1	H, 1	T, 1

This illustrates the **multiplication law** of probability which states that for independent events A and B,

$$P(\text{A and B}) = P(A) \times P(\text{B})$$

This law is sometimes called the AND Rule.

The multiplication law applies to any number of independent events.

Example 1

When two dice are thrown, what is the probability of getting
(i) two sixes (ii) 4 or more on each die?

Multiply

$P(6,6) = P(6) \times P(6)$
$= \frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$

$P(4 \text{ or more}) = 3/6 = \frac{1}{2}$

$P(4 \text{ or more}, 4 \text{ or more}) = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

SAMPLE SPACE