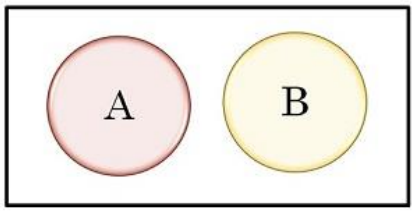
M - Probability

What is the Bayes' Theorem for conditional probability?	$$P(A \mid B) = \frac{P(A \cap B)}{P(B)}$$ *In other words, P (one event occurs | another occured) = P (both occurred) / P (given one occurred)* ***OR*** *the probability of one event occurring given another has already occured.*
How can you check if event A depends on event B?	**If dependent:** $$P(A \mid B) \neq P(A)$$ As given B has occurred, then the probability of A changes. **Otherwise, if independent:** $$P(A \mid B) = P(A)$$ As B occurring doesn't affect the probability of A occurring,
Give an example of a dependent event	Picking sweets out of a bag **without replacement**.
What product-based formula holds true if event A and event B are independent? Why?	$$P(A \cap B) = P(A) \cdot P(B)$$ This is because… $$P(A) = P(A \mid B) = \frac{P(A \cap B)}{P(B)}$$ As they're independent. Finally, you can rearrange.
What are mutually exclusive events? (with example and formula)	Events that cannot occur at the same time. E.g.,  Or flipping a coin **TWICE**, you cannot have HH and TT at the same time meaning these events are also mutually exclusive. This can be given by:

	$P(A \cap B) = 0$
What is the probability of event A OR event B?	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$ For mutually exclusive, P(A n B) = 0.
What are exhaustive events? (with example)	$P(A \cup B) = 1$ When rolling a six-sided die, the events 1, 2, 3, 4, 5, and 6 are collectively exhaustive, because they encompass the entire range of possible outcomes
What are complementary events? (with example)	Two outcomes of an event that are the **only two possible outcomes**. E.g., heads and tails of a coin. *This is a type of mutually exclusive events.*