Events are **independent events** if the occurrence of one event does not affect the probability of the other.

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

Ex. There are 10 marbles in a bag: 5 red, 2 blue, and 3 yellow. The probability of picking a red marble out of a bag, putting the marble back in the bag, and then picking a yellow marble.

$$P(\text{red and yellow}) = P(\text{red}) \cdot P(\text{yellow}) = \frac{5}{10} \cdot \frac{3}{10} = \frac{15}{100}$$

Events are **dependent events** if the occurrence of one event affects the probability of the other.

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

Ex. There are 10 marbles in a bag: 5 red, 2 blue, and 3 yellow. The probability of picking a red marble out of a bag, leaving the marble out of the bag, and then picking a yellow marble.

$$P(\text{red and yellow}) = P(\text{red}) \cdot P(\text{yellow/red}) = \frac{5}{10} \cdot \frac{3}{9} = \frac{15}{90}$$

Conditional Probability, $P(B|A)$ is the probability that event B happens given that event A has already happened

Ex. A die is tossed. Find P(less than 5/even).

*We need to find the probability that the number on the die is less than 5 given that the number is even.

-There are **three** even numbers on the die: 2, 4, 6. These are all of the total possible outcomes.

-Of the 3 even numbers 2, 4, 6, two of them, 2 and 4, are less than 5. There are **two** favorable outcomes.

$$P(\text{less than 5/even}) = \frac{2}{3}$$

Union, $A \cup B$, the objects that belong to set A or set B
Intersection, $A \cap B$, the objects that belong to both set A and set B
Complement, ~A, the objects that are in the sample space but NOT in set A

Ex. Sample Space: {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}
Set A: {1, 2, 3, 4, 5, 6}
Set B: {4, 5, 6, 7, 8}

$A \cup B = \{1, 2, 3, 4, 5, 6, 7, 8\}$
$A \cap B = \{4, 5, 6\}$
$\sim A = \{7, 8, 9, 10\}$

A **two-way table** is a useful way to organize data that can be categorized by two variables.

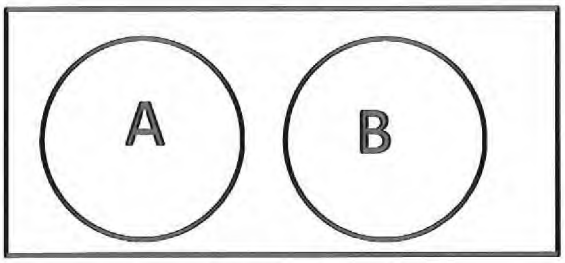
Ex. Suppose you asked 20 children and adults whether they liked broccoli. The table shows one way to arrange the data in a two-way table.

	Yes	No	Total
Children	3	8	11
Adults	7	2	9
Total	10	10	20

P(Like Broccoli | Children) = $\frac{3}{11}$

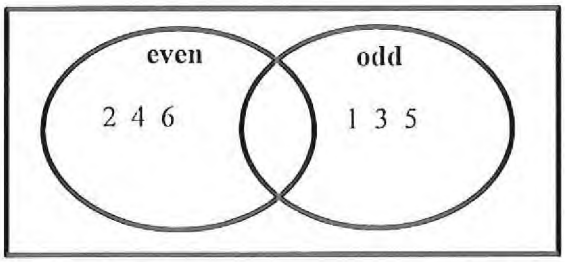
P(Adult | Don't Like Broccoli) = $\frac{2}{10}$

Mutually exclusive events are events that cannot both occur in the same trial of an experiment.



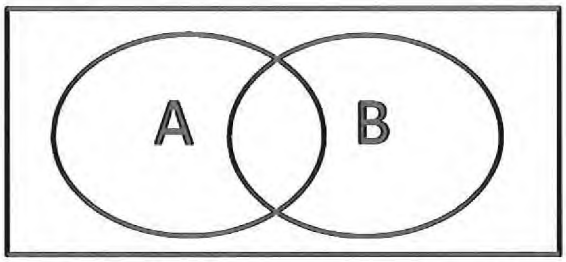
P(A or B) = P(A) + P(B)

Ex. When a number cube is rolled, find the probability of rolling an even or an odd.



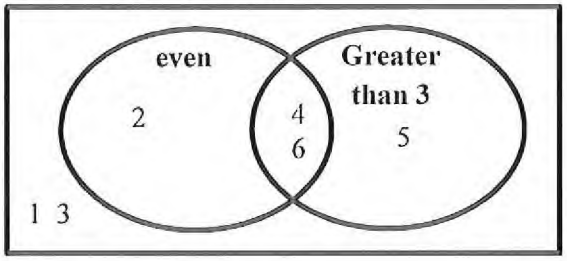
P(even or odd) = P(even) + P(odd) = $\frac{3}{6}+\frac{3}{6}=\frac{6}{6}=1$

Inclusive events are events that have one or more outcomes in common.



P(A or B) = P(A) + P(B) – P(A and B)

Ex. When a number cube is rolled, find the probability of rolling an even or a number greater than 3.



P(even or >3) =
P(even) + P(>3) – P(even and >3)=
$\frac{3}{6}+\frac{3}{6}-\frac{2}{6}=\frac{4}{6}$