Compound Probability (Section 14-4)

* Independent Events: the occurance of an event does not affect the occurance of another event.

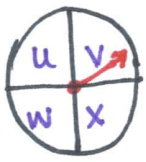
* Dependent Events: one event depends on another

* Compound Event: an event made up of two or more events.

ex: rolling a die, then flip a coin
indep or dep? Independent

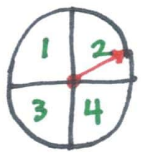
ex: picking two cards from a deck, one after the other.
Dependent

* Two events are independent if and only if $P(A \text{ and } B) = P(A) \cdot P(B)$

ex: 

You roll a die, then spin the spinner.
$P(<3 \text{ and vowel})$?

$P(<3 \text{ and vowel}) = P(<3) \cdot P(\text{vowel})$
$= \frac{2}{6} \cdot \frac{1}{4} = \frac{2}{24} = \boxed{\frac{1}{12}}$

ex: 

Spin the spinner, then choose #1–10.
$P(\text{odd \& even}) = ?$

$P(\text{odd and even}) = P(\text{odd}) \cdot P(\text{even})$
$= \frac{2}{4} \cdot \frac{5}{10}$
$= \frac{10}{40} = \boxed{\frac{1}{4}}$

ex: If $P(A) = 0.3$, $P(B) = 0.4$ & $P(A \text{ and } B) = 0.7$, are these events independent?

$P(A) \cdot P(B) = P(A \text{ and } B)$ if indep.
$(0.3)(0.4) \neq 0.7$
$0.12 \neq 0.7$ ∴ Not independent

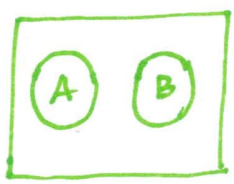
ex. $P(A) = \frac{2}{3}$, $P(B) = \frac{4}{5}$, $P(A \text{ and } B) = \frac{8}{15}$

$\left(\frac{2}{3}\right)\left(\frac{4}{5}\right) = \frac{8}{15}$ ✓
$\frac{8}{15} = \frac{8}{15}$ ∴ Independent

* Mutually Exclusive Events: events that can NOT happen at the same time.

$P(A \text{ and } B) = 0$ and $P(A \text{ or } B) = P(A) + P(B)$

*If its an "OR", you ADD!



ex: 3 blue, 6 black, 2 green, 4 red chips in a bag.

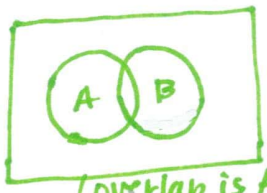
$P(\text{green or red}) = P(\text{green}) + P(\text{red}) = \frac{2}{15} + \frac{4}{15} = \frac{6}{15} = \boxed{\frac{2}{5}}$

$P(\text{blue, black or red}) = P(\text{blue}) + P(\text{black}) + P(\text{red}) = \frac{3}{15} + \frac{6}{15} + \frac{4}{15} = \boxed{\frac{13}{15}}$

* same as P(Not green)

* Probability of Overlapping Events: $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

Not mutally exclusive!



(overlap is A and B)

ex: P(odd # or < 4) when rolling a die.

$P(\text{odd OR } <4) = P(\text{odd}) + P(<4) - P(\text{odd AND } <4)$

$= \frac{1}{2} + \frac{1}{2} - \frac{2}{6}$

$= \frac{4}{6} = \boxed{\frac{2}{3}}$

ex: 4 suits: red, blue, green, yellow
cards # 1–10
} Total cards = 40

P(green or yellow OR card #1)

$= P(\text{green or yellow}) + P(\#1) - P(\text{G or Y AND } \#1)$

$= P(\text{green}) + P(\text{yellow}) + P(\#1) - P(\text{G or Y AND } \#1)$

$= \frac{1}{4} + \frac{1}{4} + \frac{1}{10} - \frac{2}{40}$

$= \frac{10+10+4-2}{40} = \frac{22}{40} = \boxed{\frac{11}{20}}$

P(red or blue OR card < 6)

$= P(\text{red or blue}) + P(<6) - P(\text{red or blue and } <6)$

$= P(\text{red}) + P(\text{blue}) + P(<6) - P(\text{red or blue and } <6)$

$= \frac{1}{4} + \frac{1}{4} + \frac{5}{10} - \frac{10}{40}$

$= \frac{10+10+20-10}{40} = \frac{30}{40} = \boxed{\frac{3}{4}}$