Mutually Exclusive vs. Inclusive

Example Mutually Exclusive

A particular bag of marbles contains 4 red, 6 green, 2 blue and 5 white marbles. If 3 marbles are picked, what is the probability of picking all reds or all greens?

$P(R \cup G) = P(R) + P(G)$

P(green or red) = P

$P(\text{red or green}) = P(\text{red}) + P(\text{green})$

$$P(R \cup G) = \left[\frac{4}{17} \cdot \frac{3}{16} \cdot \frac{2}{15}\right] + \left[\frac{6}{17} \cdot \frac{5}{16} \cdot \frac{4}{15}\right]$$

$$= \frac{24}{4080} + \frac{120}{4080} = \frac{144}{4080} = \boxed{\frac{3}{85}}$$

Example Inclusive Event

Slips of paper numbered 1 to 15 are placed in a box. A slip of paper is drawn at random. What is the probability that the number picked is either a multiple of 5 or an odd number?

$P(\text{mult. of 5} \cup \text{odd}) = P(\text{mult. of 5}) + P(\text{odd}) - P(\text{5 and odd})$

$$P(\text{mult. of 5 or odd}) = \frac{3}{15} + \frac{8}{15} - \frac{2}{15}$$

$$= \frac{9}{15} = \boxed{\frac{3}{5}}$$

## You Try!

Cassidy is looking for someone to take her to Homecoming this year. She has been asked by 3 freshman, 5 sophomore, 10 juniors and 22 seniors. What is the probability that she will choose to go with someone who is a sophomore or someone who is a junior?

$P(S \cup J) = P(S) + P(J)$

$P(\text{soph. or junior}) = \frac{5}{40} + \frac{10}{40} = \frac{15}{40} = \boxed{\frac{3}{8}}$

## You Try!

If you randomly choose one of the integers from 1 to 10, what is the probability of choosing a number that is either even or bigger than 7?

$P(\text{even} \cup >7) = P(\text{even}) + P(>7) - P(\text{even} \cap >7)$

$P(\text{even} \cup >7) = \frac{5}{10} + \frac{3}{10} - \frac{2}{10} = \frac{6}{10} = \boxed{\frac{3}{5}}$