

LESSON 4 -

***Mutually Exclusive and
Non-Mutually Exclusive Events***

OR

Mutually Exclusive Events are events which cannot happen in a single trial (they have no common parts).

Warm up: What is the probability of rolling a 3 or a 4 with a dice.

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

Investigate: We could use a formula to find the probability of 3 or 4.

$$P(A \cup B) = P(A) + P(B)$$

$$\frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \frac{1}{3}$$

This is the probability formula for mutually exclusive events.
(or means add)

Examples:

1. A single die is rolled. What is the probability of rolling a 2 or a 6?

$$P(2) \text{ or } P(6) = \frac{1}{6} + \frac{1}{6} = \frac{1}{3}$$

2. A single card is drawn from a standard deck of cards. What is the probability of drawing a red card or a black queen?

$$P(R) \text{ or } P(BQ) = \frac{26}{52} + \frac{2}{52} = \frac{28}{52} = \frac{7}{13}$$

3. A card is drawn from a deck of 52 cards. Use the formula to determine the probability that:

$$P(A \cup B) = P(A) + P(B)$$

A nine of diamonds or a heart is drawn

$$= P(9 \heartsuit) \text{ or } P(\heartsuit)$$

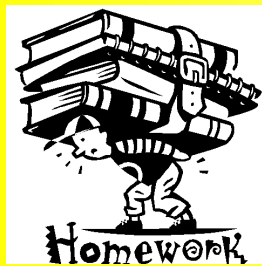
$$= \frac{1}{52} + \frac{13}{52} = \frac{14}{52} = \frac{7}{26}$$

4. Two cards are drawn without replacement from a deck of cards.
What is the probability that they both are heart, or they both are spades?

$$\begin{aligned} & P(\heartsuit) \text{ and } P(\heartsuit) \text{ or } P(\spadesuit) \text{ and } P(\spadesuit) \\ &= \frac{13}{52} \times \frac{12}{51} + \frac{13}{52} \times \frac{12}{51} \\ &= \frac{1}{17} + \frac{1}{17} = \frac{2}{17} \end{aligned}$$

5. Two cards are drawn without replacement from a deck of cards.
What is the probability that they both are kings or they both are queens?

$$\begin{aligned} & P(K) \text{ and } P(\text{King}) \text{ or } P(Q) \text{ and } P(Q) \\ & \frac{4}{52} \times \frac{3}{51} + \frac{4}{52} \times \frac{3}{51} \\ &= \frac{1}{221} + \frac{1}{221} \\ &= \frac{2}{221} \end{aligned}$$



Lesson 4 Worksheet

Non-Mutually Exclusive Events are events that can happen at the same time in a single trial.

The following formula can be used for non-mutually exclusive events.

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

Examples:

1. When randomly selecting a card from a standard deck of playing cards, what is the probability of drawing a 7 or a heart?

$$\begin{aligned} P(A \cup B) &= P(A) + P(B) - P(A \cap B) \\ &= \frac{4}{52} + \frac{13}{52} - \frac{1}{52} \\ &= \frac{4}{13} \end{aligned}$$

note: one draw could result in a 7 and a heart

2. What is the probability of rolling a 2 or an even number on a die?

$$\begin{aligned}
 & P(2) + P(E) - P(2 \cap E) \\
 &= \frac{1}{6} + \frac{3}{6} - \frac{1}{6} \\
 &= \frac{3}{6} \\
 &= \frac{1}{2}
 \end{aligned}$$

3. Jason rolls 2 dice. What is the probability that his roll results in a sum that is greater than 8 or a multiple of 5?

Possible Sums When a Pair of Dice are Rolled						
Die 1/ Die 2	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

$$\begin{aligned}
 & P(A \cup B) = P(A) + P(B) - P(A \cap B) \\
 &= \frac{10}{36} + \frac{7}{36} - \frac{3}{36} \\
 &= \frac{7}{18}
 \end{aligned}$$



Assignment

Assignment #2 Worksheet