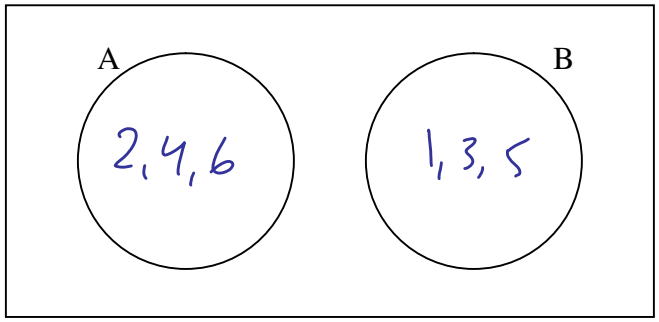
Lesson Notes 3-3 Mutually Exclusive Events

If, in an experiment, the events A and B have no common outcomes, we call events A and B mutually exclusive. For example, if the experiment is rolling a die, and event A is "throwing an even number" and event B is "throwing an odd number", we can draw a Venn Diagram as follows:



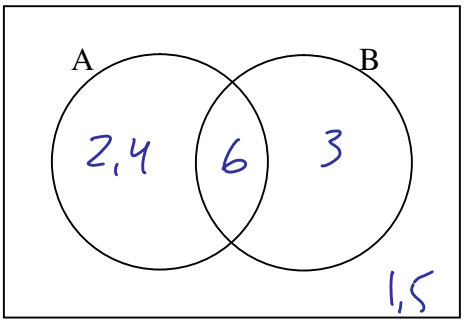
Example 1: Determine:

a) P(A) = $3/6 = 1/2$ (b) P(B) = $1/2$

c) P(A or B) = $6/6 = 1$ (d) P(A and B) = 0

For mutually exclusive events, P(A or B) = P(A) + P(B)

If, in an experiment, the events A and B have common outcomes, we consider events A and B not mutually exclusive. For example, if the experiment is rolling a die, and event A is "throwing an even number" and event B is "throwing a multiple of three", we can draw a Venn diagram as follows:



Example 2: Determine:

a) P(A) = $3/6 = 1/2$ (b) P(B) = $2/6 = 1/3$

c) P(A or B) = $4/6 = 2/3$ (d) P(A and B) = $1/6$

For non mutually exclusive events, P(A or B) = P(A) + P(B) – P(A and B)

Example 3: State whether events A and B are mutually exclusive or not:

a) Experiment: a card is drawn from a standard deck

Event A – a face card is selected Event B – a club is selected

not mutually exclusive

b) Experiment – two dice are thrown

Event A – the dice show some value Event B – the sum of the dice is 11

not mutually exclusive

Example 4: Students in a grade 9 class were surveyed to find out whether they did Math homework or English homework last night. 63% said they did their Math homework, 41% said they finished their English homework and 12% said they didn't do any homework. If a grade 9 student is selected at random from the class, determine the probability that the student did their Math and their English homework.

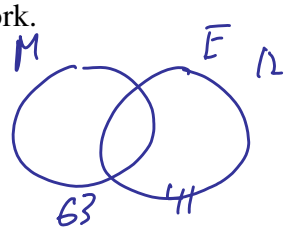
$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$88 = 63 + 41 - x$

$88 = 104 - x$

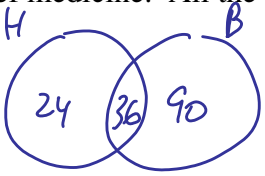
$-16 = -x$

$16 = x$



$100 - 12 = 88$

Example 5: Two hundred people with neurology symptoms, which include headaches and backaches, participated in a study to evaluate a pain relief medicine. All the people took the medicine and the results were as follows:



60 people experienced headache relief
126 people experienced backache relief
36 people experienced relief from both

What is the probability that a person who takes the drug experiences relief from:

a) at least one of the two symptoms?

$24 + 36 + 90 = \frac{150}{200} = \frac{3}{4}$

b) neither of the symptoms? $\frac{50}{200} = \frac{1}{4}$