

8-7 Day 2

Mutually Exclusive Events—Think No Overlap—Two events A and B are mutually exclusive if A and B have no outcomes in common. $P(A \text{ and } B) = 0$.

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

If A and B are in the same sample space, the probability of A or B is,

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

Ex 4) One card is selected from a deck of 52 cards. What is the probability that the card is either a heart or a face card?

Handwritten solution for Ex 4:

$$P(\text{heart}) = \frac{13}{52}$$

$$P(\text{face card}) = \frac{12}{52}$$

Overlap
 $P(\text{heart that is a face card}) = \frac{3}{52}$

$$\frac{13}{52} + \frac{12}{52} - \frac{3}{52} = \frac{22}{52}$$

$P(\text{heart or face card}) = \frac{22}{52}$

Ex 5) What is the probability of rolling a sum of 6 or a sum of 9 when tossing 2 dice?

Handwritten solution for Ex 5:

$$P(\text{sum of 6}) = \frac{5}{36}$$

$$P(\text{sum of 9}) = \frac{4}{36}$$

$P(\text{sum of 6 or sum of 9}) = \frac{5}{36} + \frac{4}{36}$
 $= \frac{9}{36} = \frac{1}{4}$

Independent Events—The occurrence of one event has no effect on the occurrence of the other. If A and B are independent events, the probability that both A and B will occur is

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

Ex 6) A random number generator on a computer selects three integers from 1 to 20. What is the probability that all three numbers are less than or equal to 5?

Handwritten solution for Ex 6:

$$P(\text{number} \leq 5) = \frac{5}{20} = \frac{1}{4}$$

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$$\frac{1}{4} \cdot \frac{1}{4} \cdot \frac{1}{4} = \frac{1}{64}$$