Warm-up

There are 6 boys and 10 girls in math class. Find the number of ways we can select a team of students from the class to work on a group project. The team is to consist of 5 girls and 4 boys.

What is the difference between Permutation and Combination?

Monday 2/6/17 1.5 Mutually Exclusive

Key Concept: Mutually Exclusive Events

events that cannot occur at the same time

Probability will be the sum of the events

$$P(X \text{ or } Y) = P(X) + P(Y)$$

$$P(X \cup Y) = P(X) + P(Y)$$

Ex 1. If a bag contains four blue marbles, six yellow marbles, and five green marbles, what is the probability that in one drawing a person will pick either a blue marble or a green marble?

$$P(\text{Blue}) = \frac{4}{15}$$

$$P(\text{Green}) = \frac{5}{15}$$

$$P(\text{B or G}) = \frac{4}{15} + \frac{5}{15} = \frac{9}{15} = \boxed{\frac{3}{5}}$$

Six-sided fair die

Ex 2. If a die is thrown, what is the probability that either a two or a six will come up?

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

$$= \frac{1}{3}$$

Key Concept: Independent Events

- The occurance of one event does not affect the occurance of another

- Probability is the product of the events

$$P(X \text{ and } Y) = P(X) \cdot P(Y)$$

$$P(X \cap Y) = P(X) \cdot P(Y)$$

Ex 3: If a die is thrown twice, what is the probability that a five will come up on the first throw, and a three will come up on the second throw?

$$P(5 \text{ and } 3) = \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36}$$

What if the events are not mutually exclusive?

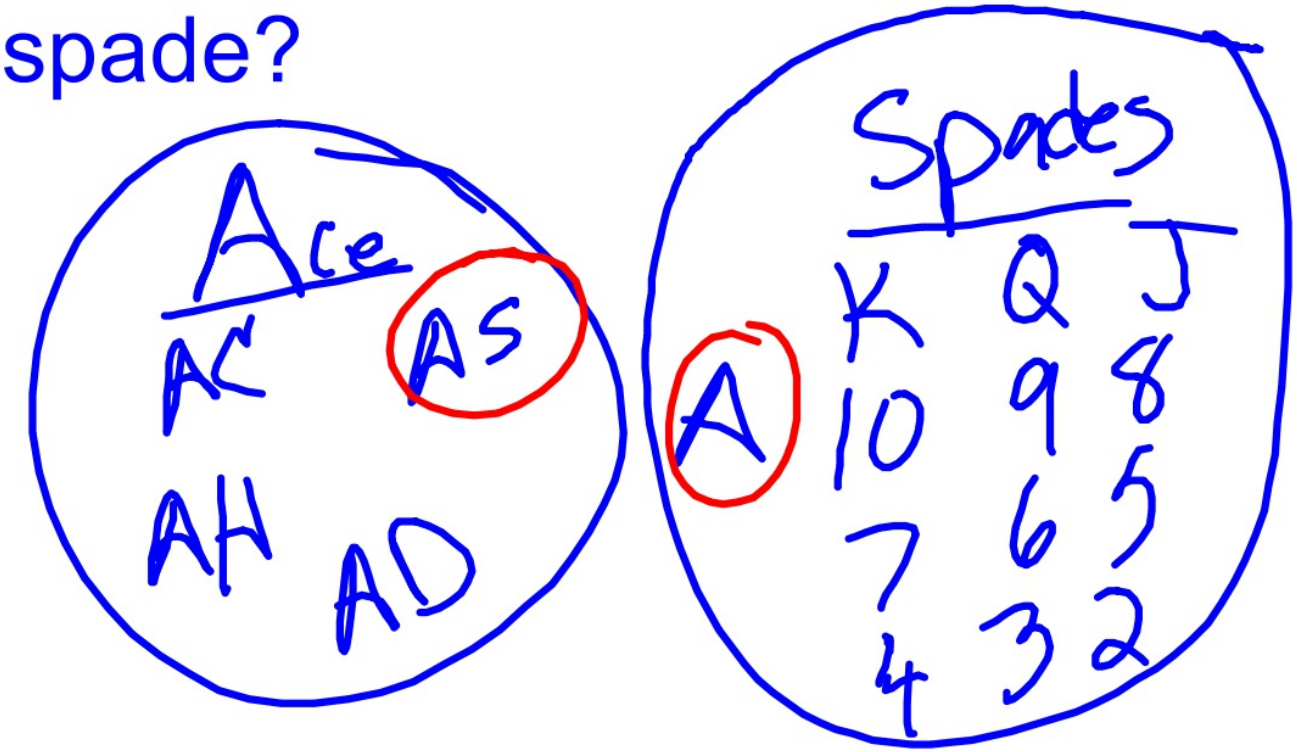
probability of event X or event Y happening, when the two events are not mutually exclusive:

1. Find the sum of the separate probabilities.
2. Subtract the probability that both events will occur from this sum.

$$P(X \text{ or } Y) = P(X) + P(Y) - P(X \text{ and } Y)$$

(Overlap)

Ex 4. When a card is drawn at random from a normal deck of 52 cards, what is the probability that it will be either an ace or a spade?



$P(A \text{ or } S)$

$= \frac{4}{52} + \frac{13}{52} - \frac{1}{52}$

$= \frac{16}{52} = \frac{4}{13}$

Ex 5: Suppose you are drawing a card from a standard deck of 52 cards. You want to choose a King or a Heart. What is the probability of drawing a King or a Heart?

$$P(K \text{ or } H) = \frac{4}{52} + \frac{13}{52} - \frac{1}{52} = \frac{16}{52}$$

$$= \frac{4}{13}$$

Ex. 6: If two dice are thrown, what is the probability that one of them will come up less than five?

1 2 3 4 5 6

$= \frac{4}{6} \cdot \frac{2}{6} = \frac{8}{36} = \frac{2}{9}$

$\frac{4}{6} \cdot \frac{6}{6} = \frac{24}{36}$

Key Concept: Dependent Events

-The occurance of one event affects the probability of the other event

Ex. 7: Consider a box that contains 7 white, 5 green, and 4 blue marbles. If 2 marbles are draw from the box, and the first marble is not replaced before the second marble is drawn, *the outcome the first selection affects the outcome of the second drawing*. What is the probability of drawi a blue marble both times?

$\frac{4}{16}$ total

$P(B \text{ and } B) = \frac{4}{16} \cdot \frac{3}{15} = \frac{12}{240} = \frac{1}{2}$

Closure

1. Mutually Exclusive = OR → Add

∪ Not Mutually Exc.: Subtract 0

2. Independent Events = And → Multiply

∩

3. Dependent Events = And → Multiply

Not Replaced