Deck of Cards

How many cards in a deck? 52
How many suits? 4
How many cards in each suit? 13

Warm Up:

Find the probability using a standard 52 card deck.

P(red) P(J) P(<5) P(♥) $\frac{13}{52}$ $\frac{1}{4}$

$\frac{26}{52}$ $\frac{1}{2}$ = .5 $\frac{4}{52}$ $\frac{1}{13}$ = .08 $\frac{4}{13}$ $\frac{16}{52}$ = .31 .25

You conduct a phone survey and discover that 6 out of every 11 households shop at Costco. If there are 67,000 households in Lakewood, how many of those shop at Costco?

$\frac{6}{11} = \frac{X}{67000}$ 36,545

Learning Goal: Today I will learn how to create a union of 2 events.

Success Criteria: I am able to calculate the probability of mutually exclusive or overlapping events.

Compound Probability

Probability Rules

Rules of probability

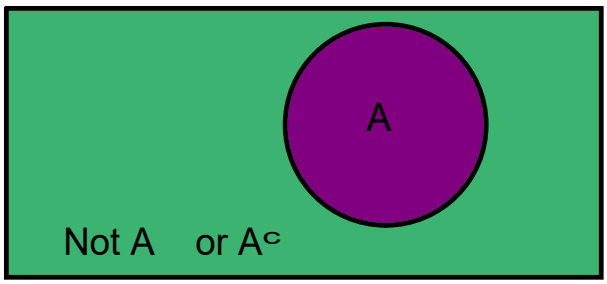
1) The probability of an event must be between 0 and 1

2) The sum of the probabilities of all possible outcomes must equal 1.

3) If two events have no outcomes in common, the probability that one or the other occurs is the sum of their individual probabilities.

4) The probability that an event does not occur is 1 minus the probability that it does occur.

Complement of an event: The probability that an event will NOT occur



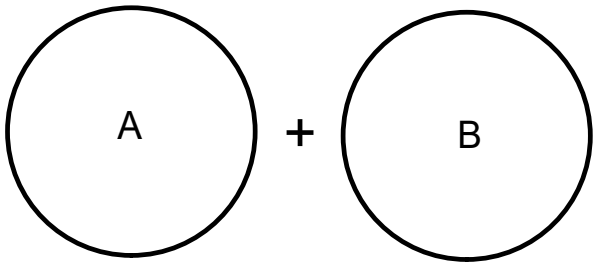
If you have a 30% chance of snow, how likely is it NOT to snow?

Compound Probability

Compound event - combination of 2 or more events using and/or

OR: The Union of events.

Notation: $P(A \cup B)$ (or)



Add the probabilities of event A and event B

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

Mutually Exclusive Events

click for solutions

Mutually exclusive events - no common outcomes

Example: Rolling a die:
P(3 or even)

$$\frac{1}{6} + \frac{3}{6} = \frac{4}{6} = .67$$

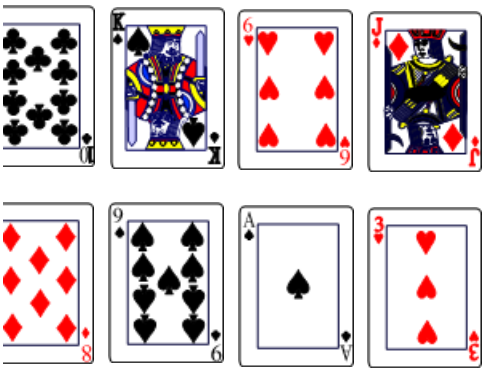
Set A has 1 number, and set B has 3 numbers.

... probabilities together.

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

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

Mutually Exclusive Events



$P(Spade \overset{or}{\cup} Red) =$

$\frac{13}{52} + \frac{26}{52} = .75$

$P(< 4 \cup > 10) =$

$\frac{3}{13} + \frac{3}{13} = \frac{6}{13}$

$\frac{12}{52} + \frac{12}{52} = \frac{24}{52}$ .46

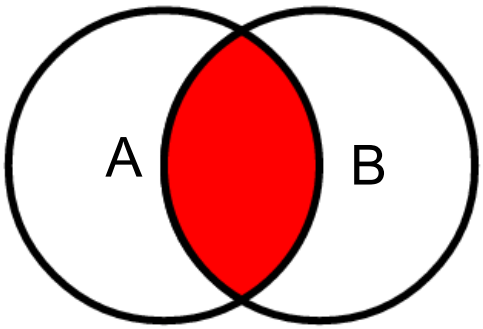
$P(3 \cup 7 \cup K) =$

$\frac{4}{52} + \frac{4}{52} + \frac{4}{52} = \frac{12}{52} = .23$

$\frac{1}{13}$

OR: Overlapping events

2 events can happen at the same time



Middle section counted twice so subtract one

$P(A \overset{or}{\cup} B) = P(A) + P(B) - P(A \; and \; B)$

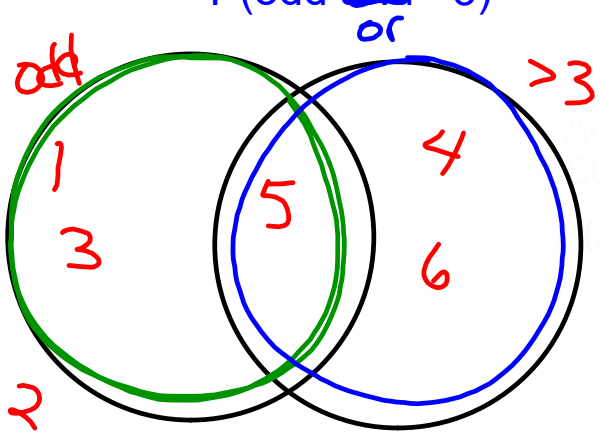
P(both at the same time)

Overlapping Events

Overlapping events - some common outcomes

Example: Roll a die:

P(odd ~~and~~ or >3)



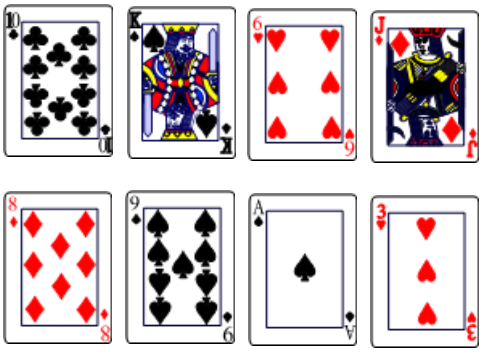
$\frac{3}{6} + \frac{3}{6} - \frac{1}{6} = \frac{5}{6} = .83$

Add probabilities together then SUBTRACT the common outcomes.

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

$P(\text{odd or prime}) = \frac{3}{6} + \frac{3}{6} - \frac{2}{6}$

Overlapping Events



$P(Spade \overset{\text{or}}{\cup} 9) =$

$\frac{13}{52} + \frac{4}{52} - \frac{1}{52} = \frac{16}{52} = .31$

$\frac{1}{4}$

$P(< 9 \cup even) =$

$\frac{8}{13} + \frac{5}{13} - \frac{4}{13} =$

$\frac{32}{52} + \frac{20}{52} - \frac{16}{52} =$ .69

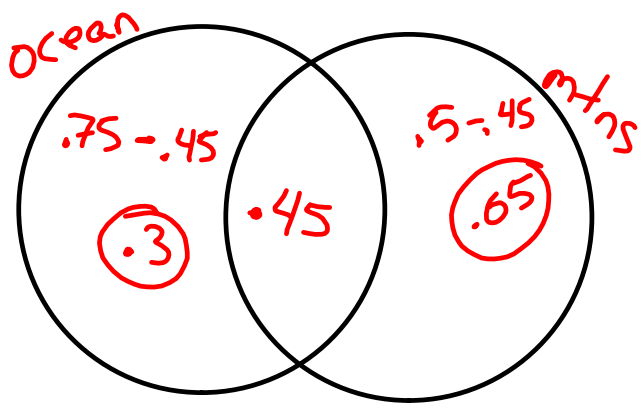
$P(Club \cup Black) =$

$\frac{13}{52} + \frac{26}{52} - \frac{13}{52} = \frac{26}{52} = \frac{1}{2}$

.5

Vacation In a math class, 75% of the students have visited the ocean and 50% have visited the mountains on vacation before. If 45% of the students have visited the ocean and the mountains on vacation before, what is the probability that a randomly selected student has visited the ocean or the mountains?

Draw a Venn Diagram:



Probability:

.75 + .5 - .45 = .8

Closure: Today I learned how to calculate probability for mutually exclusive and overlapping events.