Experiment **Outcomes** **Sample Space** **Event**

Dice 

What are the outcomes? $\{1\}, \{2\}, \{3\}, \{4\}, \{5\}, \{6\}$

What is the sample space?

"Sample space is the collection of all outcomes" $S = \{1, 2, 3, 4, 5, 6\}$

What is an event? "An event is a subset of a sample space"

Eg: Suppose we bet that the dice outcome is an odd number

$A = \{1, 3, 5\}$ Here, A is an example of an event

Eg: Suppose we bet that the dice outcome less than or equal to 4

$B = \{1, 2, 3, 4\}$ Here, B is an example of an event

Eg: $C = \{1, 3, 5, 7\}$ Is this an event? No!

$\{7\}$ does not belong to sample space

Experiment **Outcomes** **Sample Space** **Event**

Coin Toss

What are the outcomes? $\{H\}, \{T\}$

What is the sample space?

"Sample space is the collection of all outcomes" $S = \{H, T\}$

Examples of events:

$A = \{H\}$ $B = \{H, T\}$ $C = \{\}$ $D = \{T\}$

All four above are events Even the empty set is considered event!!!

Experiment Outcomes Sample Space Event

Two Coin Tosses

What are the outcomes? $\{HH\}$, $\{HT\}$, $\{TH\}$, $\{TT\}$

What is the sample space? $S = \{HH, HT, TH, TT\}$

Examples of events:

$A = \{HH, HT, TH\}$ "Atleast one heads"

$B = \{HH, TT\}$ "Both tosses are the same"

A and B above are events

Experiment Outcomes Sample Space Event

Coin followed by dice

What is the sample space?

$$S = \left\{ \begin{matrix} (H, 1), (H, 2), (H, 3), (H, 4), (H, 5), (H, 6) \\ (T, 1), (T, 2), (T, 3), (T, 4), (T, 5), (T, 6) \end{matrix} \right\}$$

Examples of events:

"Coin is heads"

$$A = \{(H, 1), (H, 2), (H, 3), (H, 4), (H, 5), (H, 6)\}$$

"Dice is 3"

$$B = \{(H, 3), (T, 3)\}$$

Experiment Outcomes Sample Space Event

Penalty kick

Outcomes: Success {S}, Failure {F}

For a single kick, what is the sample space?

$$\text{Sample space} = \{S, F\}$$

For two kicks, what is the sample space?

$$\text{Sample space} = \{SS, SF, FS, FF\}$$

For 3 kicks, how many elements are there in the sample space?

$$2^3 = 8$$

For 5 kicks, how many elements are there in the sample space?

$$2^5 = 32$$

Quiz Time

We are tossing a dice, where the sample space is {1, 2, 3, 4, 5, 6}
Which of these is not an event?

A. {1}
B. {1, 3}
C. {1, 3, 5}
D. {1, 3, 5, 7}

Right answer: D

Quiz Time

We are tossing a coin followed by a dice. How many elements will be there in the sample space?

A. 2
B. 6
C. 8
D. 12
E. 32
F. 36

Right answer: D

Set Operations

Set Operations

Intersection Union Complement

Dice 

$S = \{1, 2, 3, 4, 5, 6\}$

$A = \{1, 3, 5\}$

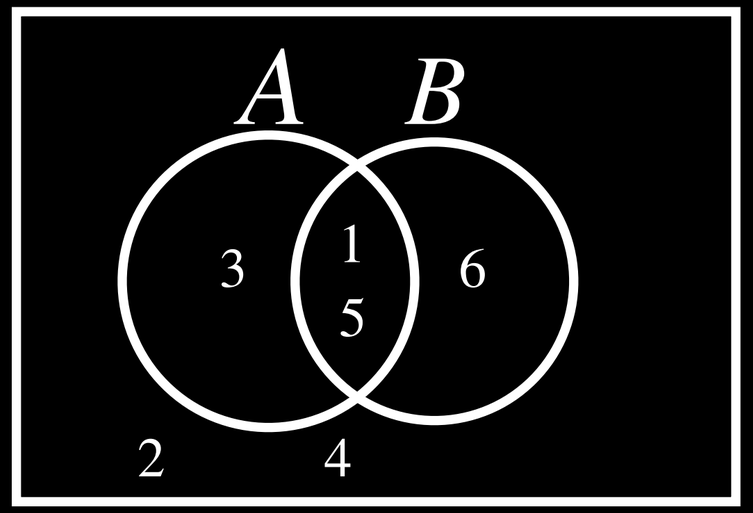
$B = \{1, 5, 6\}$

Outcomes that are in both A and B

$A \cap B = \{1, 5\} = B \cap A$

Outcomes that are in A or B

$A \cup B = \{1, 3, 5, 6\} = B \cup A$



$A^c = \{2, 4, 6\}$ "A complement"

Outcomes that are in S but not in A

$B^c = \{2, 3, 4\}$ "B complement"

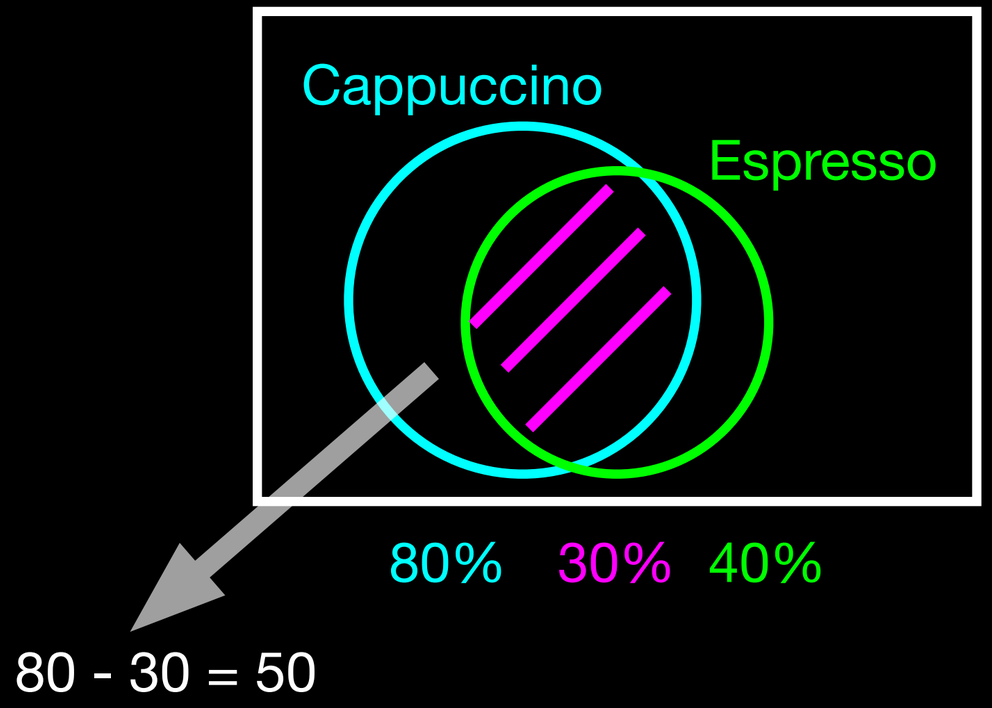
Outcomes that are in S but not in B

Quiz Time

It is known that 80% people like cappuccino, 40% people like espresso, and 30% like both. What percentage of the people like cappuccino, but do not like espresso?

A. 50%
B. 30%
C. 40%
D. 80%

Right answer: A

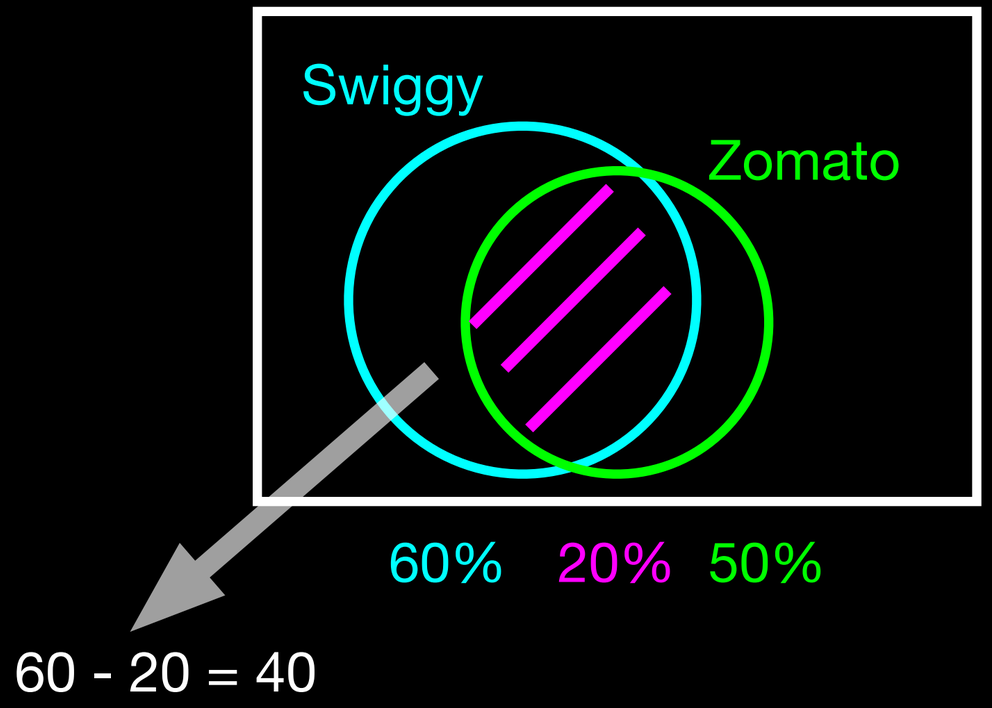


Quiz Time

It is known that 60% people use Swiggy, 50% use Zomato. 20% people use both. What percentage use Swiggy, but do not use Zomato?

A. 60%
B. 50%
C. 40%
D. 20%

Right answer: C

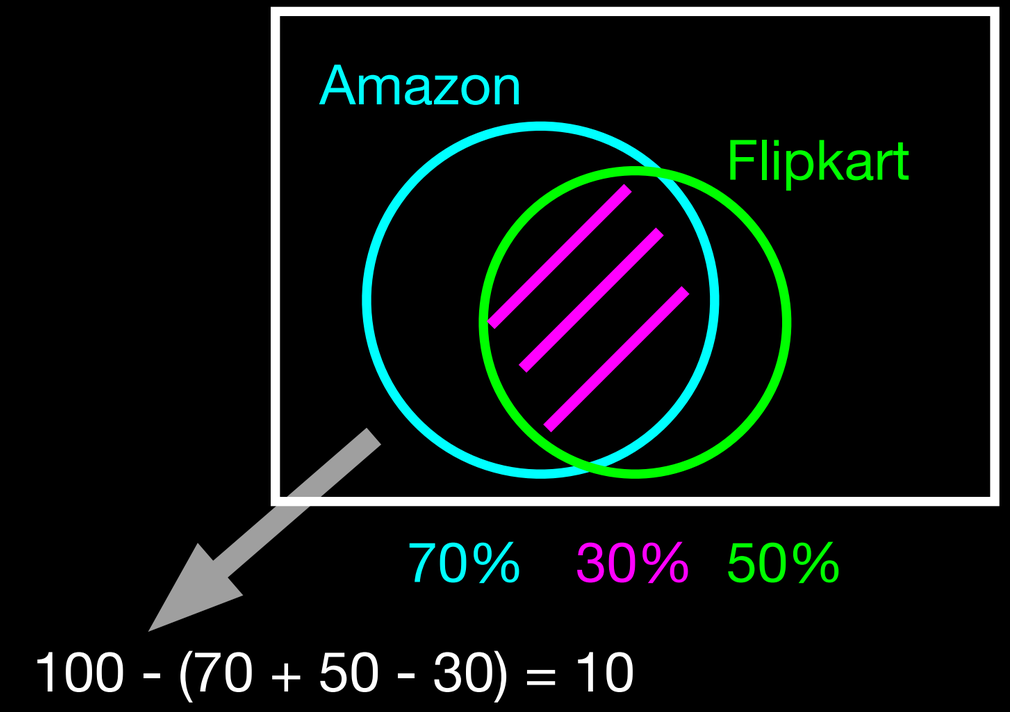


Quiz Time

It is known that 70% people use Amazon, 50% use Flipkart. 30% people use both. What percentage of people use neither Amazon, nor Flipkart?

A. 10%
B. 20%
C. 30%
D. 40%

Right answer: A



Probability Coin Toss

$$S = \{H, T\}$$

$$P(H) = \frac{1}{2}$$

$$P(T) = \frac{1}{2}$$

Probability Dice

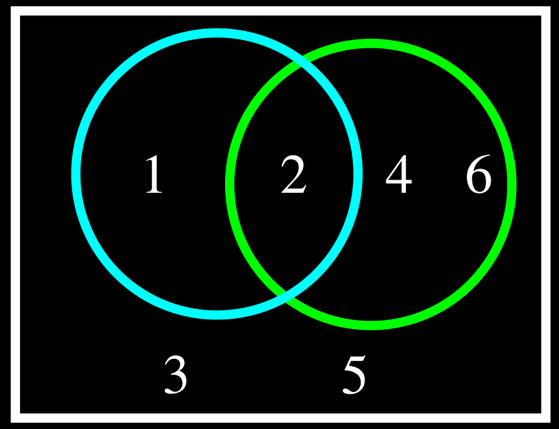
$S = \{1, 2, 3, 4, 5, 6\}$

$A = \{2, 4, 6\}$ $P(A) = \frac{3}{6}$ $A^c = \{1, 3, 5\}$ $P(A^c) = \frac{3}{6} = 1 - \frac{3}{6}$

$B = \{1, 2\}$ $P(B) = \frac{2}{6}$ $B^c = \{3, 4, 5, 6\}$ $P(B^c) = \frac{4}{6} = 1 - \frac{2}{6}$

$P(A \cap B) = P(\{2\}) = \frac{1}{6}$

$P(A \cup B) = P(\{1, 2, 4, 6\}) = \frac{4}{6}$



Why can't we say $P(A \cup B) = P(A) + P(B)$?

$\{2\}$ is common in both A and B

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

$C = \{1, 3, 5\}$

$A \cap C = \{\}$ A and C are "Mutually exclusive" or "Disjoint"

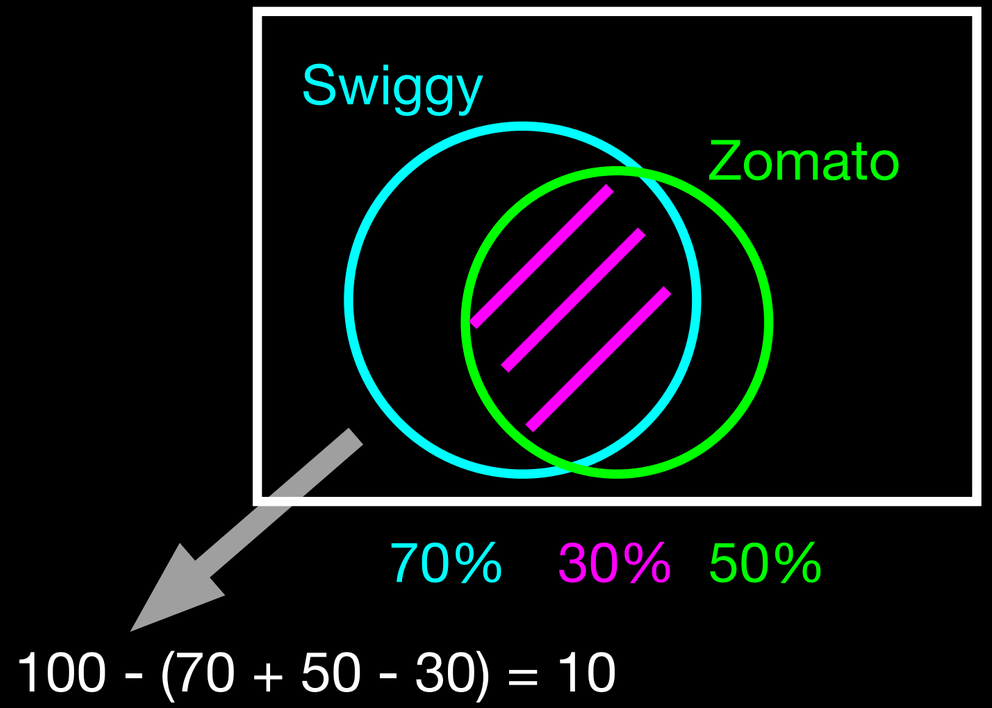
$P(A \cap C) = 0$

Quiz Time

Which of the following represent mutually exclusive sets?

A. Youtube premium Vs Non-premium users
B. People who like Cappuccino Vs Espresso
C. Users of Swiggy Vs Zomato
D. Users of Amazon Vs Flipkart

Right answer: A

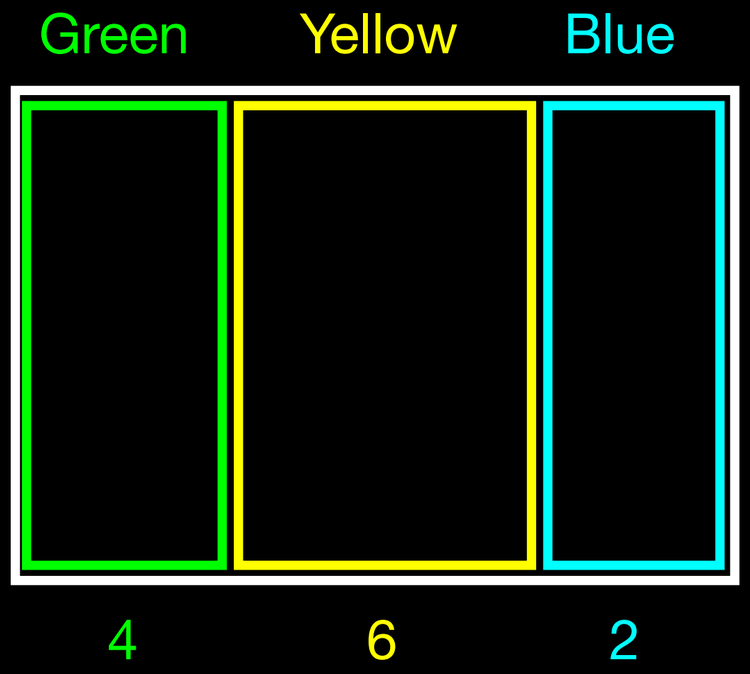


Quiz Time

There are 4 green balls, 6 yellow balls, and 2 blue balls in a bag. A random ball is chosen. Find the probability that a yellow or blue ball is chosen

A. 4/12
B. 6/12
C. 8/12
D. 10/12

Right answer: C



Quiz Time

In an NPS survey, it is seen that 90% are either promoters or neutral. 30% percent are neutral or detractor. What percent of people are neutral?

A. 10%
B. 20%
C. 30%
D. 70%

Right answer: B