Mutually Exclusive vs. Inclusive

Name: Key

Two events that have NO outcomes in common are called **mutually exclusive** (i.e. they cannot occur at the same time)
Here are some examples:

- **Taking a M/C test by guessing:** The outcomes **getting the #1 correct** and **getting # 1 wrong** are Mutually Exclusive
- **Drawing a card from a standard deck:** The outcomes **Ace** and **Numbered Cards** are Mutually Exclusive
- **Rolling a die:** The outcomes **Even number** and **Odd number** are Mutually Exclusive.

Two events that have outcomes in common are sometimes referred to as **inclusive** (i.e. they can occur at the same time)
Here are some examples:

- **Taking a M/C test by guessing:** The outcomes **getting the #1 correct** and **getting # 2 wrong** are Inclusive.
- **Drawing a card from a standard deck:** The outcomes **Ace** and **Red Card** are Inclusive.
- **Rolling a die:** The outcomes **Even number** and **Number greater than 3** are Inclusive.

For both mutually exclusive and inclusive events the addition rule can be applied:

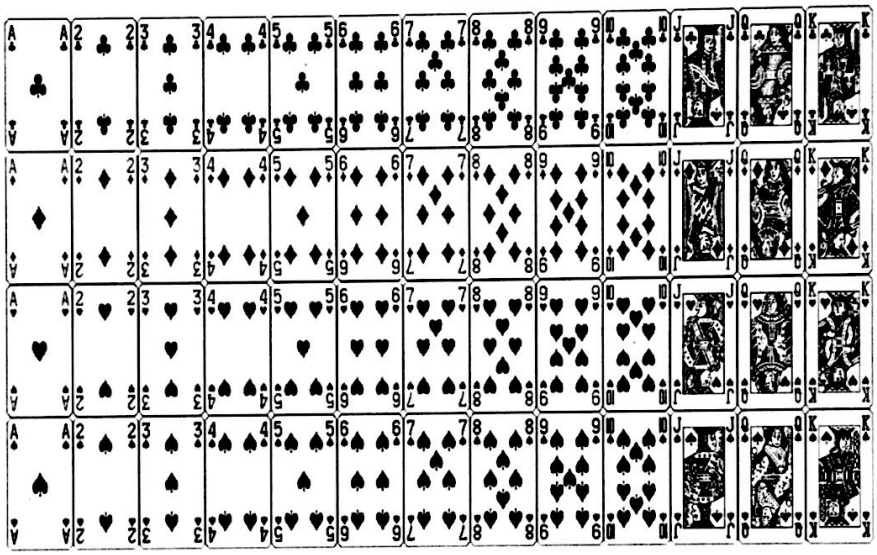
- **P(A or B) = P(A) + P(B) – P(A and B)**

1. What is the probability of randomly selecting a card from a standard 52 card deck and having the card be a **black card** or a **face card**?

$\frac{26}{52} + \frac{12}{52} - \frac{6}{52} = \frac{32}{52}$

Circle one of the following: Mutually Exclusive / **Inclusive**

Reduced Fraction: $\frac{8}{13}$



2. What is the probability of randomly selecting a card from a standard 52 card deck and having the card be a **face card** or an **odd numbered card**?

$\frac{12}{52} + \frac{16}{52} = \frac{28}{52}$

Circle one of the following: **Mutually Exclusive** / Inclusive

Reduced Fraction: $\frac{7}{13}$

3. What is the probability of randomly selecting a card from a standard 52 card deck and having the card be an **even card** or **red numbered card**?

$\frac{20}{52} + \frac{26}{52} - \frac{10}{52} = \frac{36}{52}$

Circle one of the following: Mutually Exclusive / **Inclusive**

Reduced Fraction: $\frac{9}{13}$

4. What is the probability of randomly selecting a card from a standard 52 card deck and having the card be a **heart with a number on it** or a **spade with a letter on it**?

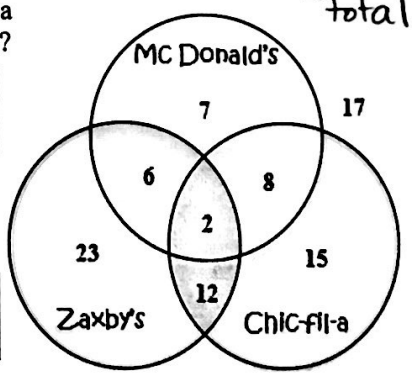
$\frac{9}{52} + \frac{4}{52}$

Circle one of the following: **Mutually Exclusive** / Inclusive

Reduced Fraction: $\frac{13}{52}$

5. The following shows a VENN diagram with the results of a survey a teacher gave to all of her students. It represents where all of the students have gone to eat over the last month. What is the probability of the following?

90 total



   i. What is the probability of randomly selecting a person from this group and picking a student that has **NOT eaten at any of the restaurants** OR they ate at **McDonald's**?

Circle one of the following: **Mutually Exclusive** / Inclusive

$\frac{17}{90} + \frac{23}{90} = \frac{40}{90}$

Reduced Fraction: $\frac{4}{9}$

   ii. What is the probability of randomly selecting a person from this group and picking a student that has eaten at **Mc Donald's** OR **Chick-fil-a**?

Circle one of the following: Mutually Exclusive / **Inclusive**

$\frac{23}{90} + \frac{37}{90} - \frac{10}{90}$

$= \frac{50}{90}$

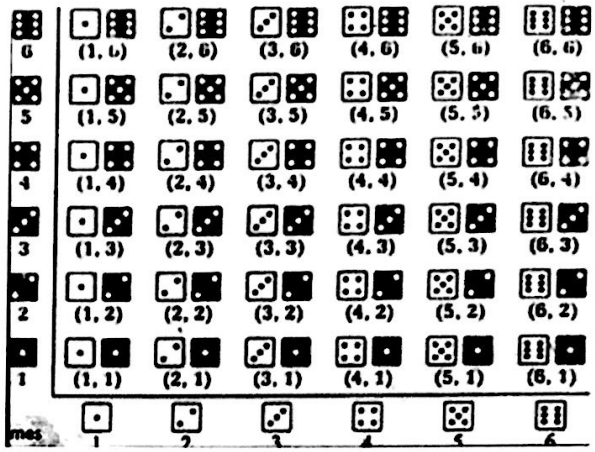
Reduced Fraction: $\frac{5}{9}$

6. What is the probability of rolling two dice and having getting a sum of 4 OR getting a sum greater than 10?

$3/36 + 3/36 = 9/36$

Circle one of the following: (Mutually Exclusive) Inclusive

Reduced Fraction: $1/4$



7. What is the probability of rolling two standard number cubes to a sum that is even or a sum that is greater than 9?

$\frac{18}{36} + 6/36 - 4/36 = 20/36$

Circle one of the following: Mutually Exclusive (Inclusive)

Reduced Fraction: $5/9$

8. Consider the VENN diagrams at the right to help you answer the following.

A. P(A) = .5 Decimal: .5

B. P(A and B) = $P(A \cap B)$ = Decimal: .2

C. P(A or B) = $P(A \cup B)$ = Decimal: .6

D. P(A^c) = P(A') = Decimal: .5

E. P(A and B^c) = $P(A \cap B')$ = Decimal: .3

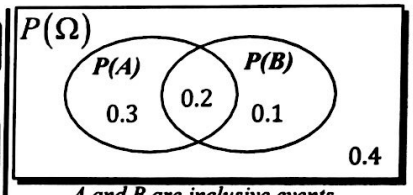
F. P(C) = Decimal: .4

G. P(C and D) = $P(C \cap D)$ = Decimal: 0

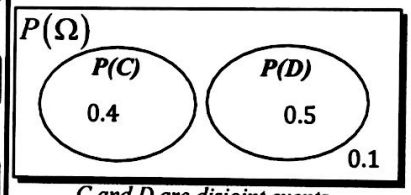
H. P(C or D) = $P(C \cup D)$ = Decimal: .9

I. P(C^c) = P(C') = Decimal: .6

J. P(C^c and D^c) = $P(C' \cap D')$ = Decimal: .1

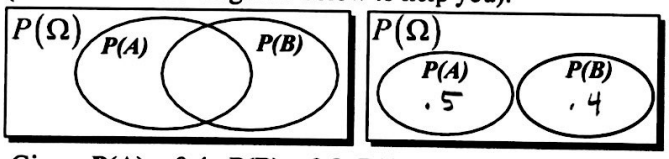


A and B are inclusive events.



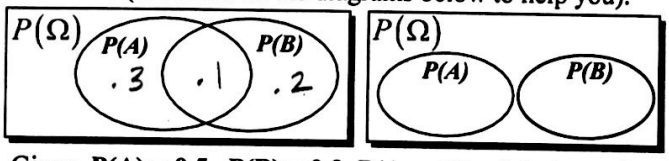
C and D are disjoint events.

9. Given, **P(A) = 0.5, P(B) = 0.4** , determine the probability of **P(A and B)** if the two events are **mutually exclusive** (use either of the diagrams below to help you).



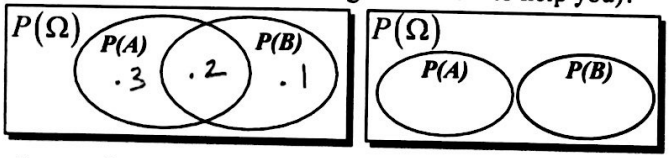
Decimal: 0

10. Given, **P(A) = 0.4, P(B) = 0.3, P(A and B) = 0.1** , determine the probability of **P(A or B)** if the two events are **inclusive** (use either of the diagrams below to help you).



Decimal: .6

11. Given, **P(A) = 0.5, P(B) = 0.3, P(A or B) = 0.6,** determine the probability of **P(A and B)** if the two events are **inclusive** (use either of the diagrams below to help you)?



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

$.6 = .5 + .3 - P(A \text{ and } B)$

$P(A \text{ and } B) = .2$

Decimal: .2

12. Jason asks each member of his class what type of phone they have. The class consists of 12 women and 8 men. 5 of the women said they had android based phones and 4 of the men said they had android based phones. What is the probability of randomly picking a student in the class that is a man or that does not own a android based phone?

$P(M \text{ or no android}) = P(M) + P(\text{no android}) - P(M \text{ w/ no and.})$

$= \frac{8}{20} + \frac{11}{20} - \frac{4}{20} = \frac{15}{20}$

Decimal: .75