Tips, Formulae and shortcuts for Sets and Venn diagrams

By

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Cracku Tip 1 – Sets and Venn diagrams

- Its one of the easiest topics of CAT.
- Most of the formulae in this section can be deduced logically with little effort.
- The difficult part of the problem is translating the sentences into areas of the Venn diagram.
- While solving, pay careful attention to phrases like and, or, not, only, in as these generally signify the relationship.

Cracku Tip 2 – Sets and Venn diagrams

- Set is defined as a collection of well-defined objects.
  Ex. Set of whole numbers
- Every object is called Element of the set.
- The number of elements in the set is called cardinal number

Cracku Tip 3 – Sets and Venn diagrams

Types of Sets

1. Null set:

A set with zero or no elements is called Null set. It is denoted by { } or Ø. Null set cardinal number is 0

2. Singleton set:

Sets with only one element in them are called singleton sets.
Ex. {2}, {a}, {0}

3. Finite and Infinite set:

A set having finite number of elements is called finite set. A set having infinite or uncountable elements in it is called infinite set.

Cracku Tip 4 – Sets and Venn diagrams

Types of Sets

4. Universal set:

A set which contains all the elements of all the sets and all the other sets in it, is called universal set.

5. Subset:

A set is said to be subset of another set if all the elements contained in it are also part of another set. Ex. If A = {1,2}, B = {1,2,3,4} then, Set “A” is said to be subset of set B.

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Types of Sets

6. Equal sets:

Two sets are said to be equal sets when they contain same elements
Ex. A = {a,b,c} and B = {a,b,c} then A and B are called equal sets.

7. Disjoint sets:

When two sets have no elements in common then the two sets are called disjoint sets
Ex. A = {1,2,3} and B = {6,8,9} then A and B are disjoint sets.

Cracku Tip 6 – Sets and Venn diagrams

Types of Sets

8. Power set:

- A power set is defined as the collection of all the subsets of a set and is denoted by P(A)
- If A = {a,b} then P(A) = { { }, {a}, {b}, {a,b} }
- For a set having n elements, the number of subsets are 2^n

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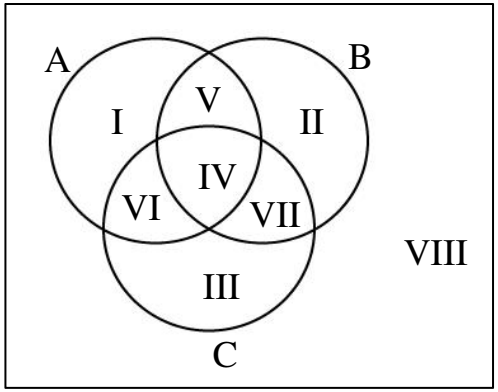
Cracku Tip 7 – Sets and Venn diagrams

Properties of Sets:

- The null set is a subset of all sets
- Every set is subset of itself
- A U (BUC) = (AUB) U C
- A ∩ (B ∩ C) = (A ∩ B) ∩ C
- A U (B ∩ C) = (AUB) ∩ (AUC)
- A ∩ (BUC) = (A ∩ B) U (A ∩ C)
- A U Ø = A

Cracku Tip 8 – Sets and Venn diagrams

Venn diagrams: A Venn diagram is a figure to represent various sets and their relationship.



I,II,III are the elements in only A, only B and only C respectively
IV – Elements which are in all of A, B and C.
V - Elements which are in A and B but not in C.
VI – Elements which are in A and C but not in B.
VII – Elements which are in B and C but not in A.
VIII – Elements which are not in either A or B or C.

Cracku Tip 9 – Sets and Venn diagrams

Union of sets is defined as the collection of elements either in A or B or both. It is represented by symbol “U”. Intersection of set is the collection of elements which are in both A and B.

- Let there are two sets A and B then,

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

- If there are 3 sets A, B and C then,

$$n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$$

Cracku Tip 10 – Sets and Venn diagrams

To maximize overlap,

- Union should be as small as possible
- Calculate the surplus = n(A) + n(B) + n(C) - n(AUBUC)
- This can be attributed to $n(A \cap B \cap C')$, $n(A \cap B' \cap C)$, $n(A' \cap B \cap C)$, $n(A \cap B \cap C)$.
- To maximize the overlap, set the other three terms to zero.

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Cracku Tip 11 – Sets and Venn diagrams

To minimize overlap,

- Union should be as large as possible
- Calculate the surplus = n(A) +n(B) +n(C) - n(AUBUC)
- This can be attributed to $n(A \cap B \cap C')$, $n(A \cap B' \cap C)$, $n(A' \cap B \cap C)$, $n(A \cap B \cap C)$.
- To minimize the overlap, set the other three terms to maximum possible.

Cracku Tip 12 – Sets and Venn diagrams

Some other important properties

- A' is called complement of set A, or A' = U-A
- $n(A-B) = n(A) - n(A \cap B)$
- $A-B = A \cap B'$
- $B-A = A' \cap B$
- $(A-B) \cup B = A \cup B$

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