Venn Diagram

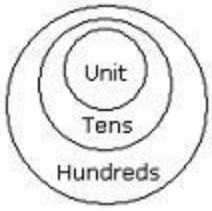
The use of Venn diagram is to test your ability about the relation between some items of a group by diagrams. By good understanding of diagram we can easily solve the problem.

Some examples are given below:-

Eg.1: If all the words are of different groups, then they will be shown by the diagram as given below.
Dog, Cow, Horse

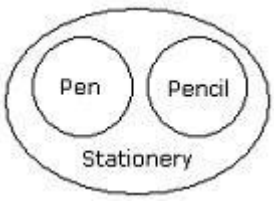
All these three are animals but of different groups, there is no relation between them. hence they will be represented by three different circles.

Eg.2: If the first word is related to second word and second word is related to third word. Then they will be shown by diagram as given below.
Unit, Tens, Hundreds

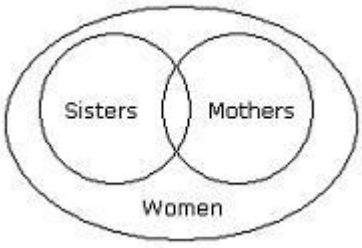


Ten units together make one Tens or in one tens, whole unit is available and ten tens together make one hundreds.

Eg.3: If two different items are completely related to third item, they will be shown as below.
Pen, Pencil, Stationary



Eg.4: If there is some relation between two items and these two items are completely related to a third item they will be shown as given below
Women, Sisters, Mothers

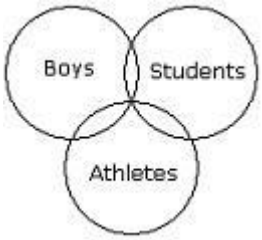


Some sisters may be mothers and vice-versa. Similarly some mothers may not be sisters and vice-versa. But all the sisters and all the mothers belong to women group.

Eg.5: Two items are related to a third item to some extent but not completely and first two items totally different.
Students, Boys, Girls

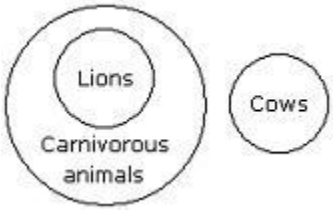
The boys and girls are different items while some boys may be students. Similarly among girls some may be students.

Eg.6: All the three items are related to one another but to some extent not completely.
Boys, Students, Athletes



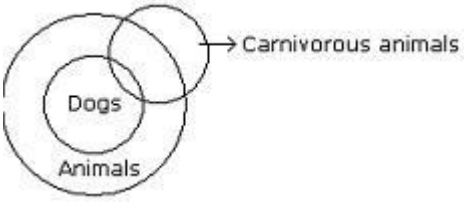
Some boys may be students and vice-versa. Similarly some boys may be athletes and vice-versa. Some students may be athletes and vice-versa.

Eg.7: Two items are related to each other completely and third item is entirely different from two.
Lions, Carnivorous, Cows



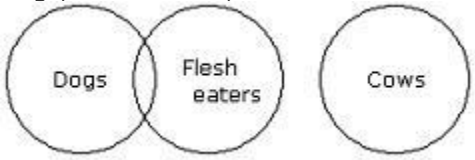
All the lions are carnivorous but no cow is lion or carnivorous.

Eg.8: First item is completely related to second and third item is partially related to first and second item.
Dogs, Animals, Flesh-eaters



All the dogs are belonging to animals but some dogs are flesh eater but not all.

Eg.9: First item is partially related to second but third is entirely different from the first two.
Dogs, Flesh-eaters, Cows



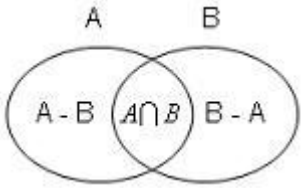
Some dogs are flesh-eaters but not all while any dog or any flesh-eater cannot be cow.

In the corresponding cases we can analyse the data using Venn diagrams, which involves set theory.

Now let us observe the exemplary notes.

The objects in a set are called the members or elements of the set. If A= {1,2,3,3,5,6}, then 1,2,3,3,5 & 6 are the members or Elements of the set A.
If A={x:x is a positive integer divisible by 5 and x<30} or, A= {5,10,15,20,25} then 5,10,15,20,25 are the elements of the set A.

Observe the diagram



A∩B read as A intersection B, is the set having the common elements of both the sets A and B.

A∪B read as A union B is the set having all the elements of the sets A and B.

A-B is the set of elements present in A and are not in B. A-B represents the set A exclusively.

The number of elements of a set A is represented by n(A)

n(A∪B)= n(B∪A)

n(A∩B)= n(B∩A)

n(A-B) is not equal to n(B-A)

By the above Venn diagram it is obvious that

n(A)= n(A-B)+n(A∩B)..... (1)

n(B)= n(B-A)+n(A∩B)..... (2)

n(A∪B)= n(A-B)+n(A∩B)+n(B-A)... (3)

Adding (1) and (2) we get,

n(A)+n(B)= n(A-B)+n(B-A)+n(A∩B)+n(A∩B)

or n(A)+n(B)-n(A∩B)= n(A-B)+n(B-A)+n(A∩B)..... (4)

From (3) and (4) we have

n(A∪B)=n(A)+n(B)-n(A∩B)..... (5)

Exercise Questions

1) Statements : All C's are D's.
All D's are E's.

Conclusions: I. All C's are E's.
II. All E's are C's.
III. Some D's are C's.
IV. Some D's are not C's.

1) Only I and IV follow

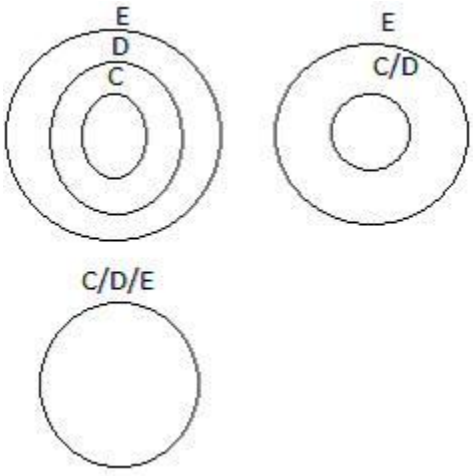
2) Only III and IV follow

3) Only I and III follow

4) All follow

5) None of these

Ans: Choice (3)



Conclusions I and III are true in all the above diagrams. Conclusions II is not true in A and B. Conclusion IV is not true in diagram C, hence it does not follow.

2) Statements : All computers are complicated.
All complicated things are costly.
No machine is costly.

Conclusions: I. All computers are costly.
II. All complicated things are computers.
III. No computer is machine.

(1) Only I, III and IV follow

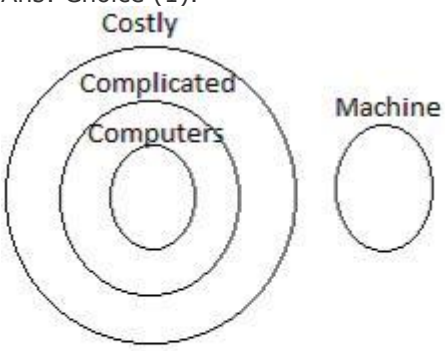
(2) Only II follows.

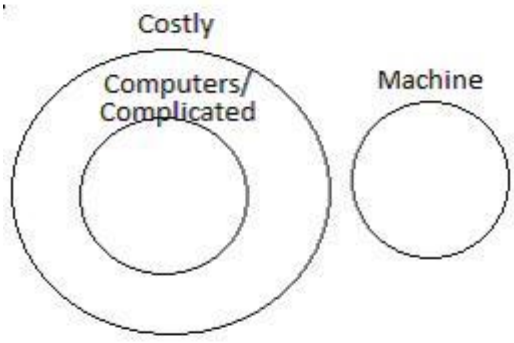
(3) Only III and IV follow.

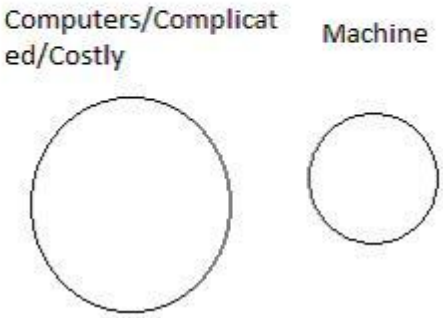
(4) All follow

(5) None of these

Ans: Choice (1).







Conclusions I, III and IV are true in all the above diagrams, hence they follow. II is not true in diagram A, hence it does not follow.

3) Statements: All flowers are yellow.
All yellow things are fresh.
No lemon is fresh.

Conclusions: I. All flowers are fresh.
II. No yellow thing is fresh.
III. No lemon is fresh.

(1) Only I and III follow

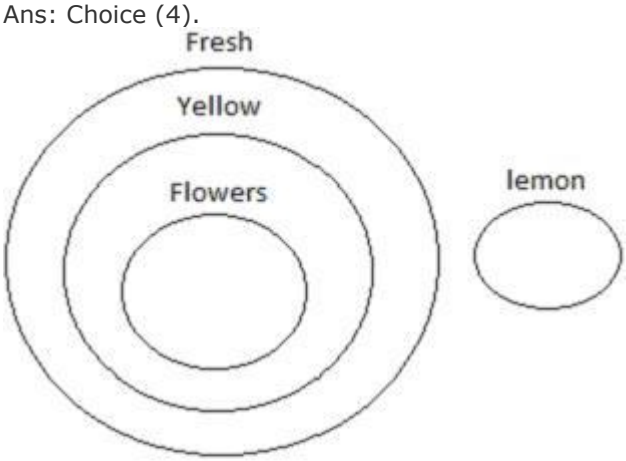
(2) Only II follows.

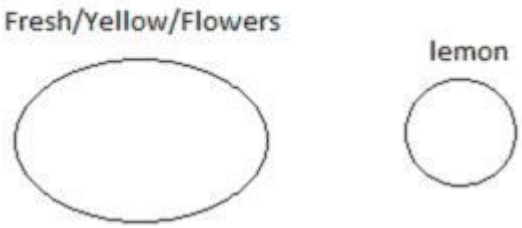
(3) Only III follow.

(4) Both (1) and (3)

(5) None of these

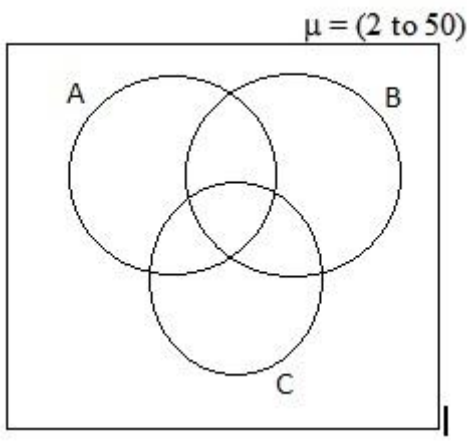
Ans: Choice (4).





Conclusion I and III are true in both the above diagrams. Conclusion II is not true in either of the two diagrams. Hence it does not follow.

I. Directions for questions 1 to 5: These questions are based on the following diagram.



Circle A represents even numbers from 2 to 50.

Circle B represents odd numbers from 2 to 50.

Circle C, represents prime numbers from 2 to 50.

1. How many elements are there in set A only?

a. 25 b. 24 c. 23 d. 22

2. How many elements are there in set B only?

a. 14 b. 25 c. 10 d. 13

3. How many elements are there in B n C?

a. 14 b. 11 c. 24 d. 13

4. How many elements are there in A U C?

a. 0 b. 1 c. 2 d. 3

5. How many elements are there in C' (complement of C)?

a. 35 b. 25 c. 34 d. 14

II. Directions for questions 6 to 10: Read the following data and then answer the questions that follow.

In a class, there are 60 students. For every 8 students learning Judo there are 4 students who learn Karate. For every 14 students learning Judo there are 7 students who learn both Judo and Karate and 7 students learning none.

6. How many students learn only Karate?

a. 20 b. 30 c. 0 d. 40

7. How many students learn only Judo?

a. 20 b. 40 c. 0 d. 14

8. How many students learn both Karate and Judo?

a. 0 b. 10 c. 60 d. 20

9. If the students who learn both Judo and Karate stop learning Judo, then what percentage of the total number of students learn Judo?

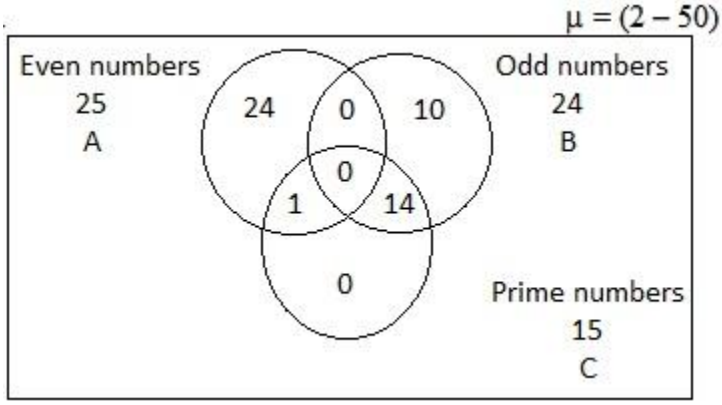
a. 50% b. 33 1/3% c. 40% d. 55%

10. If 50% of those learning only Karate stop learning Karate and start learning Judo, then what is the ratio of the number of students learning Judo to those learning Karate?

a. 3 : 1 b. 2 : 1 c. 4 : 1 d. Cannot be determined

Answer & Explanations

I.



Number of even numbers from 2 to 50 are 25.

Number of odd numbers from 2 to 50 are 24.

Number of prime numbers from 2 to 50 are 15.

1. Number of elements in set A only = 24

   i.e, the even numbers which are not primes. Choice (2).

2. There are 10 elements in only set B, i.e, there are 10 odd numbers which are not primes.

   Choice (3).

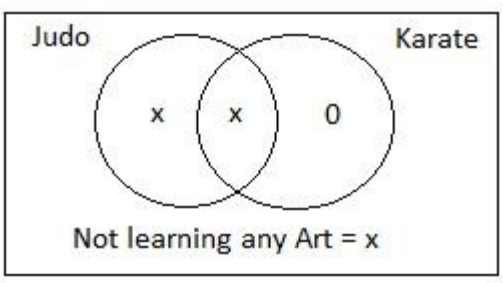
3. There are 14 elements in B n C i.e, there are 14 odd prime numbers. Choice (1).

4. There is only one element in A n C i.e, 2 is the only even prime number. Choice (2).

5. Number of elements in C' = the elements which do not belong to the set C. There are

   (24 + 10) = 34 such numbers i.e, numbers are non primes. Choice (3).

II. From the given data, we get the following diagram.



Taken = 60 students

J : K = 8 : 4 = 2 : 1

J : Both : None = 14 : 7 : 7 = 2 : 1 : 1 @ 2x, x, x (After removing the ratio)

=> x + x + x = 3x = 60

= x = 20

Hence

1. x = 20 students learn only Judo.
2. None learn only Karate.

3. x = 20 students learn both.

6. None learn only Karate. Choice (3)

7. 20 students learn only Judo. Choice (1)

8. 20 students learn both. Choice (4)

9. 20 students learn both Judo and Karate. If they stop learning Judo then only 20 students would learn Judo. The total number of students is 60.

   Percentage of class learning only Judo = 20/60 x 100

   = 33 1/3%. Choice (2)

10. Since none learn only Karate, so the given statement does not make any sense. The number of students learning Judo therefore remains the same.

    2x = 2 x 20 = 40 students learn Judo.

    Ratio : 40 : 20 = 2 : 1. Choice (2)