Basics of
Data Interpretation

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Data Interpretation

Data Interpretation is an activity in which one draws conclusion about the data available for analysis. Before attempting to explore data interpretation, let us dwell upon the following facts.

What is data ?

Data is a collection of related facts , figures , information etc. Whenever any data is given always understand the unit of data and scale factor etc. used while reporting the data.

Representation of Data

Next we consider methods to represent data

Tabular Representation of Data

In the method data represented in horizontal rows and vertical column for example let us consider the yearly balance sheet of company ABC.

Year	Revenue (Rs Crore)	Operating Cost (Rs Crore)	Profit (Rs crore)	Sales (Rs crore)
2000	1000	200	300	1200
2001	1200	300	325	1500
2002	1100	250	225	1400
2003	1300	300	425	1500

In the above table each column represents the value for the corresponding variable across the years.

Bar Charts

Bar charts are most suitable when data is to be presented in a format so that comparison is easier to make , Let us consider the total cash reserve of a company aver the years.
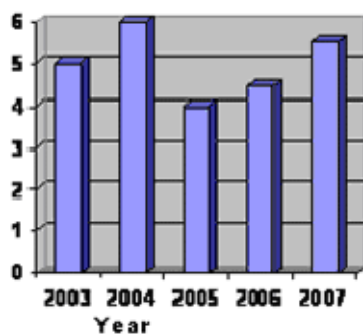
Pie Charts

Pie charts are used generally to show the distribution of whole into sub- components. Let us consider the monthly expression of a family.

Rent – 20%

Food – 15%

Entertainment – 10%

Saving – 25%

Mobile phone bill – 30%

total income – 100%

In a pie chart , a circle is divided into sectors, where the angle of the sector is proportional to the value of the sub component . Total expense of 100% is equal to the angel subtended by the circle that is
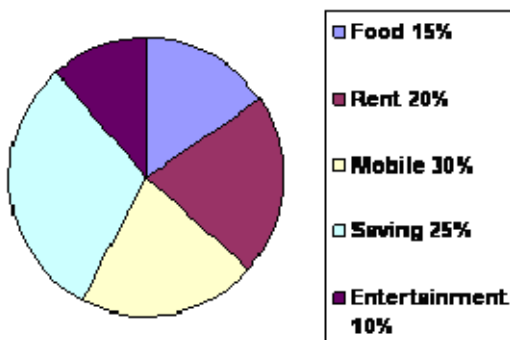
Sector angle for Rent = $\frac{20}{100} \times 360^0 = 72^0$

Sector angle for Food = $\frac{15}{100} \times 360^0 = 54^0$

Sector angel for Entertainment = $\frac{10}{100} \times 360^0 = 36^0$

Sector angle or Saving = $\frac{25}{100} \times 360^0 = 90^0$

Sector angle for Mobile phone bill = $\frac{30}{100} \times 360^0 = 108^0$

Data Sufficiency

The general structure of a data sufficiency problem is as follows:

A question is asked , followed by 2 statements. In order to answer the questions, we have to take support from either of the 2 statements one at a time and then we combine both the statements. Thus we get 4 possibilities.

1- statement 1 alone is sufficient,

2- Statement 2 alone is sufficient,

3- Question can be answered using both statements together,

4- Questions cannot be answered using both the statements together.

Solved Examples

Question

What is the price of mangoes per kg?

1. Ten kg of mangoes and 2 dozen of orange cost Rs. 252.
2. Two kg of mangoes could be bought in exchange for one dozen oranges.

Solution

Statement I alone tells us the combined price of 10kg of mangoes and 2 dozen of oranges cost RS. 252. So from here we cannot change the price of mangoes. II alone gives us the relative comparison of the prices of mangoes and oranges. Hence if we combine both we can find the price of mangoes per kg. Note in data sufficiency problems emphasis is on determining whether question can be answered or not instead on finding what is the answer to the question.

Question

What are the ages of the three brother?

1. The product of their ages is 21.
2. The sum of their ages is not divisible by 3.

Solution

Let us assume the ages of the 3 brothers be x, y, z, then $xyz = 21$. If x, y, z were given as integers then we would have answered this using I alone, but some x, y, z are not given as integers hence we cannot answer this using I alone.

Using II alone we find that $x+y+z$ can be any real number except 3,6,9 --- etc

Even if we combine I & II we find that x,y,z cannot be determined, hence answer is (4).

Question

What are the values of 3 integers a, b, c?

1. $ab=8$
2. $bc = 9$

Solution

Using statement I alone we find possible values of a, b as (-1, -8) (-2, -4) (-8, -1) (-4, -2) (1, 8) (8, 1) (2, 4) (4, 2) from these option we cannot find a and b.

Using statement II alone we get, possible values of (b, c) as (1,9) (9,1) (-1, -9) (-9, -1) (3, 3) (-3,-3) again as before we cannot find b, c.

Next if we combine I and II then also we cannot find a, b, c. Hence answer is (4).

Question

Given that x and y are non-negative. What is the value of x?

1. $2x+2y \leqslant 40$ II. $x-2y \geqslant 20$

Solution

Using I and II we get

$x+y \leqslant 20$; $x \geqslant 20-2y$

$x \leqslant 20-y$; $x \geqslant 20+2y$

we find that $20-y \leqslant x \leqslant 20+2y$

$20 \leqslant y \leqslant 20+2y$

$0 \leqslant 3y$

$y \geqslant 0$

we find that putting y = 0, 1,2,3 etc we get different set of values of x. Hence x and y cannot be found out. Hence answer is (4).

Question

If x+y-z+t even?

1. x+y+t is even II. t and z are odd.

Solution

Using I alone we find that x+y+t-z is odd or even accordingly as z is odd or even (as x+y+t is even) hence I alone is not sufficient.

Using II also does not help as II alone does not give us any information about x and y.

Combining I and II we get x+y+z is odd and z is odd hence x+y+t-z is odd, hence answer is (3).

Question

What is the profit Percentage?

1. The cost price is 80% of the selling price.
2. The profit is Rs. 50.

Solution

From I alone we find that CP= 80% of Selling Price.

Selling Price = $\dfrac{10}{8}$ of CP = $\dfrac{5}{4}$ of CP

Profit = SP-CP = $\dfrac{CP}{4}$

Profit % = $\dfrac{Profit}{CP}$ = 25%

Since we have to find the profit percent hence I alone is sufficient. Hence answer is (1). Suppose the problem had been to find the CP on SP, then we have to use both I and II and answer would have been (3).

Deductions

Deduction based problems one in which a set of condition is given and one has to deduce certain facts from these . The answer to the question in obtained by looking at all the facts coherently. Let us consider an example to see how deduction or be made

Solved Examples

Question

Six companies A, B, C, D, E and F belonging to six different sector viz, steel , software, FMCG, petrochemicals, automobile and electronics are from six different countries viz. India, Germany, Holland, Korea, US and Britain. One company operates in only one sector and only one country. Following information is available

1. A is petrochemical company and neither from Holland nor from USA.
2. C is Germany company in the Automobile sector .
3. F is neither in the software sector nor in the Automobile sector .
4. B is neither in steel nor an Indian company.
5. The steel company is Korean origin.
6. E is the electronics sector and F is an British company

Which company is of Indian origin ?

Solution

In this problem we have identify the correct company - sector - country set. A - petrochemical company is a fixed set of data which will go as it is, let is draw a table and is the information given above

Company	Sector	Country	Not Possible
A	Petro		Holland,USA
B			Steel. India
C	Auto	Germany	
D			
E	Eletric		
F		Britain	Software, Automobile

Either D or F is a steel company, Hence from (5) and (6) we can say that D is a Korean company then, as Germany Korea and Britain are already there and as A is not from Holland or USA , A must be Indian origin - I

B must be software - II

Then the company from Holland may be either in the software or in the electronics sector - III

Hence company of Indian origin is A.

Logical Connectives

What is a logic Problem ?

A logic problem aims to test your ability to co organize a given set of information and deduce facts there from that set of information.

For example if a clue says "Rita always takes her lunch to school, while singh eats in the canteen." It is clear that Rita is not singh, as in most clues, when two people are mentioned, one by first name and one by surname, it is safe to assume that they are not the same person. Let us take another clue " Rita, Singh and the girl with hazel colored eyes had their lunch an hour earlier than other members of the office"; we can infer that there are 3 different persons Rita, Singh and the girl with hazel colored eyes. However if the clue says " The woman with the red hair (who isn't Rita) taken her lunch hour before miss Singh". Then we know that Ms. Singh does'nt have red hair, but we don't know if Rita is Miss Singh or not.

Let us consider an example to illustrate this let us consider an example.

A game of message passing was being played amongst 7 people standing in arow, viz. Ramesh, Rama, Ram,Shyam, Shyama,Sita and Sarita, not Necessarily in that order. Certain other facts are also known Shyam passed the message to Shyama who was in queue before Rama. Ramesh could only give message while Rama could only accept. Ram and Shyam cannot be next to each other. Sita does not take message from Ramesh.

How many combinations are possible with respect to the seating arrangement amongst Ram, Sarita and Sita, the other conditions being the same ?
1. 1
2. 2
3. 3
4. none of these

From the condition given Ramesh could only give message and Rama could only accept & Ramesh is the first person in the queue and Rama is the last. Also it is given the Shyam passed the message to Shyama who was the 6th person in the Queue, while Shyam was the 5th person in the queue. Ram and Shyam cannot be next to each other so Ram cannot be at the 4th position so he would either be at 2nd position or the 3rd position. Similarly, it is stated that sita does not take message from Ramesh so she would be either at the 3rd or the 4th position

Thus following arrangement can be made

1 2 3 4 5 6 7
Ramesh Shyam Shyama Rama

Now according to the given condition 3 combinations are possible, satisfying the conditions that Ram is not next to Shyam and Sita is not accepting message from Ramesh.

In the 1st case Ram can occupy the 2nd position, Sarita 3rd while Sita 4th. In the second case Sarita can occupy 2nd position, Ram 3rd and sita 4th.
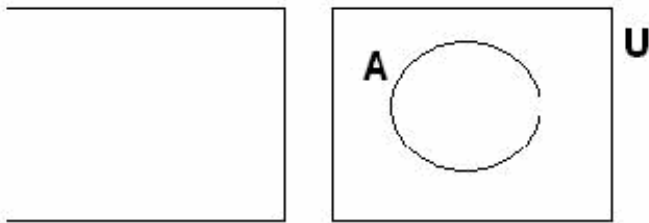
In the 3rd case, Ram can occupy 2nd position, Sita 3rd and Sarita 4th. Hence option (3) is the right answer.

Venn Diagrams

Venn diagrams are a geometrical representation of sets. The geometrical representation makes the solution easier to understand. Given below are the geometrical shapes used to represent sets

Universal set is represented by a rectangle

Any other set is represented by a circle, lying inside the rectangle,as any other set is a subset of Universal set

Representation of Union, Intersection

Representation of Union, Intersection, Difference;Complement, etc of given number of sets in Venn diagrams. Let us consider the following sets:-

Set U, which the set of Natural numbers less than 10.

Set A, set of prime numbers less than 10.
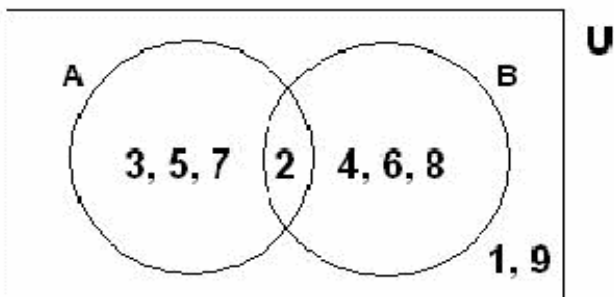
Set B, set of even numbers less than 10.

We first list the elements of each set mentioned above,

U = {1,2,3,............9}

A = {2,3,5,7}

B = {2,4,6,8}

now $A \cap B$ = {2} ;the information is represented in Venn diagram as follows.


As seen above the boundary within which 3,5,7 lie belong to set A only whereas the number '2' lies in a region which belongs to both A and B And 4,6,8 lie in region which belongs to set B only.

The region which belongs to set A only is the set A-B. The region which belongs to set A and B is the set $A \cap B$. The region which belongs to set A only or set A and set B or set B only represents the set $A \cup B$.

3 set Venn Diagram

Let us consider the Venn diagram drawn below and understand which set is represented by what region.
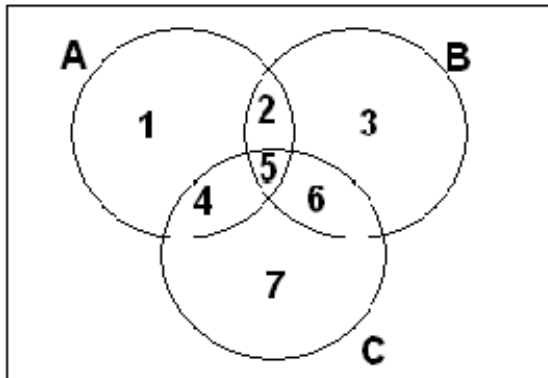
Region 1- Represents count of those elements which belong to set A only.

Region 2- Represents count of those elements which belong to set $A \cap B$ only I..e common to set A and set B but not set C.

Region 3 -Represents count of those elements which belong to set B only.

Region 4 -Represents count of those elements which belong to set $A \cap C$ only.

Region 5 -Represents count of those elements which belong to all the 3 sets A,B and C

i..e ($A \cap B \cap C$)

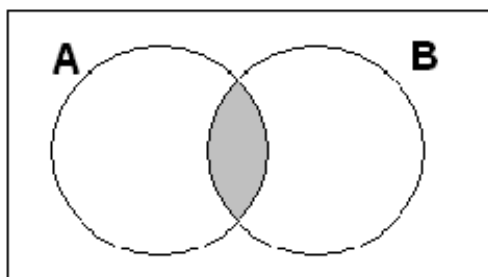Region 6 -Represents count of those elements which belong to set $B \cap C$ only.

Region 7 -Represents count of those elements which belong to set C only.

Region 8 -Represents count of those elements which belong to neither of A,B or C.

Note – Each of these regions are non-overlapping regions they do not have anything in common.
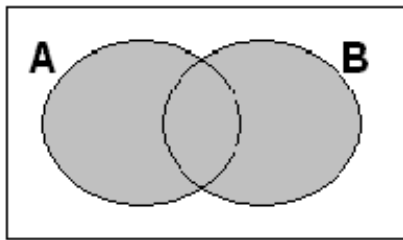
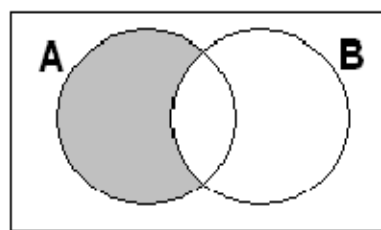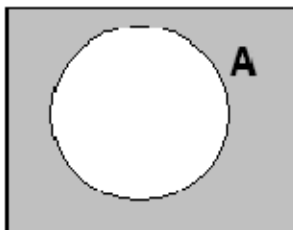Representation of few sets in Venn diagrams

$A \cap B$

The Shaded region represents the set $A \cap B$ in Venn – Diagrams

A∪B

A'   A - B

Solved Examples

Question

In a tourist but consisting of 40 passengers, 35 speak German language and 20 speak French. If all the tourists speak at least one of the 2 languages, Find

(i)How many speak both the languages ?

(ii)How many speak exactly one language ?

Solution

Let G denote the set of tourists speaking German language and F denote the set of tourists speaking French language then as each tourist speaks one of the 2 languages hence Universal set is same as the Union of the 2 sets. Therefore we need not draw the rectangle for Universal set. The Venn diagram will appear as follows.
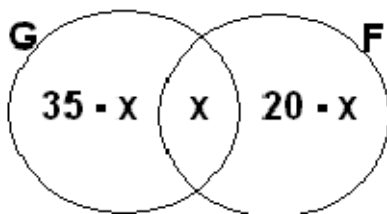
Let x number of tourists speak both the languages then 35-x speak German only and 20-x speak French only. Sum total of all the 3 categories Should be equal to total number of tourists

35-x + x+20-x = 40 => x = 15

Hence (i) 15 speak both the languages.

1. Count of exactly one language speakers is = 35-x + 20-x = 25

Question

In a Housing Society, out of 100 children, 32 play chess, 64 play ludo and 40 play Chinese checkers, 14 play chess and ludo, 15 play ludo and Chinese checkers, 13 play chess and Chinese checkers. Only 6 children play all the 3 games. If all the children play at least one of the 3 games then :-
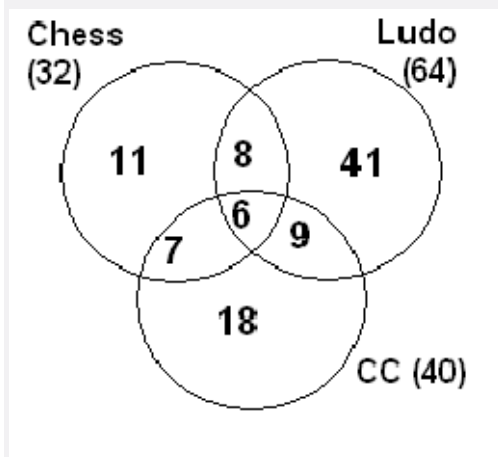
(a) How many Children play only one games ?

(b) How many Children play at least two game ?

How many Children play chess or ludo but not Chinese Checkers.

Solution

We draw the Venn diagrams for the problem

If 6 Children play all 3 games and 14 play chess and ludo it means 8 play only chess and ludo similarly we can find the number of children who play ludo and Chinese checkers only, I.e 9 likewise we can reason out all the numbers in the Venn – diagram. Now we can answer all the questions

(a) 11 + 41 + 18 = 70

(b) (8 + 7 + 9) + 6 = 30

(c) (11 + 4) + 8 = 60

Coding, Decoding & Relationships

Problems based on coding generally a pattern which could be either between a set of numbers or set of numbers or set of alphabets etc. We illustrate this more by considering examples on possible coding schemes.

Series having a constant difference between any two consecutive terms find the next term of the series 5,7,9 .... Answer is 11 as difference between 7 and 5 is 2 and so is the difference between 9 and 7 hence next terms should difference from the previous term by 2.

Series of power of numbers

Example

Find the next term in the series 4, 9, 16, 25, ... here the first term is 2^2 , next is $3^2, 4^2\ 5^2$ etc. hence next term should be 6^2 .

Letter Series

If this type of coding scheme, the pattern is generated by skipping a few alphabets in the alphabetical series , at a regular internal.

Example

Find the next term of the series

A, C, F, K........ Here we skip one alphabet between A and C and then 2 alphabets viz $D_1 e$ between cdf and then 3 alphabets between f and k viz $b_1 h_1$ and z . Hence we will skip alphabets between k and next term viz , $l_1 m_1 n$ and 0 to get p as the answer.

Coding using position number of alphabet in the alphabetic order. We present the alphabetic and assign number to them as follows

A	B	C	D	E	F	G	H	I	J	K	L	M
1	2	3	4	5	6	7	8	9	10	11	12	13

N	O	P	Q	R	S	T	U	V	W	X	Y	Z
14	15	16	17	18	19	20	21	22	23	24	25	26

Ex: - If 'word' is coded as 2315184 then how will 'simple' be coded as ?

Here we observe 'W' has been replaced by its position code that is by 23 similarly 'O' has been replaced by 15 therefore the word 'SIMPLE' will be coded as

S - 19, I - 9, M - 13, P - 16, C - 12, E - 5

Hence required code 1991316125

We start by listing the relational names of people
1.   Husband's or wife sister - Sister's-in-law
2.   Sister's husband - Brother's-in-law
3.   Brother-'s wife Sister-in-law etc.

Question

1.   Brother
2.   Son
3.   Father
4.   Uncle

Solution

If X is the brother of Y $\rightarrow$ X is male Y is male or Female

Y is the son of C $\rightarrow$ X is the son of C as X is the brother of Y

C is the uncle of D $\rightarrow$ X is the son of D as X is son of C

Hence answer is option (2)

Question

If x is the brother of Y , Y is the son of C and C is the wife of D , then how is A related to D ?

Summan told Ram - your father's wife's brother is my father's, how is Ram related to Summan ?

Solution

Ram father's wife is Ram's mother and brother of Ram's uncle . Therefore Summan is Ram's uncle's daughter will be Ram's cousin.

Question

If 'SQUARE' is coded as 'QSAVER' then how is 'CIRCLE' codded as

Solution

Here we observe SQ has been replaced by QS VA is replaced by VA etc. Hence we are considering 2 letters of the given word at a time and reversing the order . Therefore 'CIRCLE' will be coded as 'ICCREL' .

Analytical Reasoning

Problems based on analytical reasoning are essentially problems where one is expected to first refer all the facts given in the problem, and then arrange the facts, so that all the conditions given in the problem are satisfied. Let few examples to illustrate this.

Question

5 horses, Red, white, Grey, Black and spotted participated in a race. As per the rules of the race, the persons betting on the winning horse get four times the bet amount and those betting on the horse that came in second get thrice the bet amount. Moreover, the bet amount is returned to those betting on the horse that came in third, and the rest lose the bet amount. Raju bets Rs.3000, Rs. 2000, Rs.1000 on Red, White and Black horses respectively and ends up with up no profit and no loss.

Which of the following cannot be true?
(i) At least 2 horses finished before spotted.
(ii)Red finished last
(iii)There were 3 horses between Black and Spotted..
(iv) There were 3 horses between White and Red.
(v) Grey came in second.

Solution

Let us first understand the constraint of the problem, Raju betted Rs. 3000, 2000 and 1000 and ended up with no profit or loss, that means he betted total amount of 6000 and get back Rs.6000.
Let us next observe how the money is returned.
Winning horse – 4 times the bet amount.
Horse coming second- 3 times the bet amount
Horse coming third- The bet amount is returned.
Horse coming third- The bet amount is returned.
So if Raju got back 6000 then let us see what are the possibilities.

Position of horses Amount betted Amount received
I 3000 12000 -----------(i)
I 2000 8000 ------------(ii)
I 1000 4000 ------------(iii)
II 3000 9000 -----------(iv)
II 2000 6000 -----------(v)
II 1000 3000 -----------(vi)
III 3000 3000 ----------(vii)
III 2000 2000 ----------(viii)
III 1000 1000 ----------(ix)

Since Raju received Rs.6000 we need to observe from the above possibilities which combinations can give us Rs. 6000.

Possibilities (I) and (ii),(iv) are more than 6000 so those cannot be the possibilities.Combination (iii) and (viii), (v); (vi) and (vii); and no other possibilities exists.Hence we get following possibilities for the Rank of horses.

Rank I II III IV V R-Red

Horse Black Grey/Spotted White R/G/S R/G/S G-Grey

amt. Received 4000 2000 0 0 S- Spotted

Horse G/S White G/S R/G/S/B R/G/S/B

amt Received 6000

Horse G/S Black Red W/G/S W/G/S

amt received 3000 3000

Looking at the table above we find

(i)can be true

(ii)can be true as R can be the last horse in each of the 3 possibilities.

(iii)Can be true.

(iv)Cannot be true as in none of the options White is first and Red is last.

Hence option(iv) is the answer.

Question

Suppose, in addition, it is known that Grey came in fourth, Then which of the following cannot be true?

(i) Spotted came in first.

(ii) Red finished last.

(iii) White came in second.

(iv) Black came in second.

(v) There was one horse between Black and White.

Solution

If Grey came in 4 th then we get possible rank of horses

I II III IV V

Black Spotted White Grey

RedWhite Grey Not possible

Spotted Black Red Grey White

So we have only 2 rank orders possible for the horses

    (i) can be true spotted in either first or second.

    (ii) can be true as Red is last in one of the possibilities.

    (iii) cannot be true as White is either third or fifth.

    Hence correct option is (iii).