Lecture Notes For Reasoning

Logical reasoning can be verbal or non-verbal. It consists of aptitude problems that have some logical level analysis to solve them. And most of the problems are concept based.

Sequence and Series :

It is an important chapter because there are a lot of questions you see in various exams. Sequence and Series having a standard structure and pattern.
All sequence & Series questions are essentially about pattern recognition. Patterns based on alphabets and number series.

Alphabet pattern :
As we know English alphabets have 26 letters.

Forward order position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Alphabets	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Backward order position	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

You should understand the numerical position, maybe you do not remember the whole table but you can keep a few markers in your mind w.r.t. 4,5. eg. E as 5th, J as 10th, M&N as 13, 14 and W as 23rd.

For example :
You know N is 14 and you want to extract what Q is?
As you know the position of N so you can simply go N, O, P, Q rather than starting from A.you will start with N-14, O-15, P-16 and hence Q-17.

NOTE: The sum of going forward and backward alphabets position, series will always be 27 for any alphabets (Z is 26th in the forward direction and 1 in the backward direction. So; sum = 26+1 =27).

For example :
Do you want to extract G from backward direction?
If you go reverse it would be 20th. If you know the position of the forward alphabet you can easily extract backward position alphabets.

Problem 1:
DELHI coded as CCIDD and code JAIPUR will be?

Solution :
As

D	E	L	H	I
↓− 1	↓− 2	↓− 3	↓− 4	↓− 5
C	C	I	D	D

Similarly,

J	A	I	P	U	R
↓− 1	↓− 2	↓− 3	↓− 4	↓− 5	↓ -6
I	Y	F	L	P	L

NOTE : While solving this type of question first you have to write alphabets as reference.

Recognising Numerical Pattern :

The numerical pattern is also based on pattern recognition. Number series based questions are tougher than alphabet patterns. Number series is a very diverse set of patterns.

1. Single Logic patterns :

(a) Simple addition/subtraction :
For example : **3,7,11,15,19,------.**
In the given series, the difference between two consecutive numbers is the same i.e. 4.
In the given series, the number added to each term is in increasing order.

3	7	11	15	19	21
	→	→	→	→	→
	+4	+4	+4	+4	+4

(b) Simple multiplication/division :

In the given series, the ratio between two consecutive numbers is the same.

For example : **3,6,12,24,48,-------.**

In the given series the previous element is multiplied by 2 to obtain the next element therefore the ratio between two consecutive numbers is the same.

3 6 12 24 48 96

→ → → → →

×2 ×2 ×2 ×2 ×2

(c) Progressive addition series :

For example : 1) **5,8,12,17,23,-------.**

In the given series, the difference between two consecutive numbers is in increasing order.

5 8 12 17 23 30

→ → → → →

+3 +4 +5 +6 +7

2) **5,8,13,20,29**

In the given series, the difference between two consecutive numbers is in increasing order.

5 8 13 20 29 40

→ → → → →

+3 +5 +7 +9 +11

(d) Progressive subtraction series :

For example : **29,20,13,8,5,-------.**

Here the difference between two consecutive numbers is in decreasing order.

29 20 13 8 5 4

→ → → → →

-9 -7 -5 -3 -1

(e) Addition/subtraction of progressive squares :

For example : 1) **10,11,15,24,40,-------.**

In the given series, the difference between two consecutive numbers is in increasing order squares.

10 11 15 24 40 65

→ → → → →

+1 +4 +9 +16 +25

1^2 2^2 3^2 4^2 5^2

2) **4,5,21,102,358,-------.**

In the given series, the difference between two consecutive numbers is in increasing order squares of squares.

4 5 21 102 358 983

→ → → → →

+1 +16 +81 +256 +625

1^2 4^2 9^2 16^2 25^2

1^{2^2} 2^{2^2} 3^{2^2} 4^{2^2} 5^{2^2}

(f) Addition/subtraction of progressive cubes :

1) **5,6,14,41,105,-------.**

In the given series, the difference between two consecutive numbers is in increasing order cubes.

5 6 14 41 105 230

→ → → → →

+1 +8 +27 +64 +125

1^3 2^3 3^3 4^3 5^3

(g) Progressive multiplication and division :

1) **160,80,120,300,1050,-------.**

In the given series, the ratio between two consecutive numbers is in increasing order and numbers are multiplied by the numbers in increasing order.

160 80 120 300 1050 4725

→ → → → →

× 0.5 × 1.5 × 2.5 × 3.5 × 4.5

1) **600,300,100,25,5,-------.**

In this given series, the elements are divided by 2,3,4,5, and 6 respectively to obtain the next element.

600 300 100 25 5 5/6

→ → → → →

÷ 2 ÷ 3 ÷ 4 ÷ 5 ÷ 6

2. Mixed patterns :

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a) Simple multiplication/division combined with addition/subtraction :

For example :

1) **3,7,15,31,63,--------.**

In the given series, the two consecutive numbers are increasing by a combination of multiplication by 2 and addition by 1.

$$\begin{array}{ccccccccccc} 3 & & 7 & & 15 & & 31 & & 63 & & 127 \\ & \rightarrow & & \rightarrow & & \rightarrow & & \rightarrow & & \rightarrow & \\ & \times 2+1 & & \times 2+1 & & \times 2+1 & & \times 2+1 & & \times 2+1 & \end{array}$$

2) **1,7,43,259,---------.**

In the given series, the two consecutive numbers are increasing by a combination of multiplication by 6 and addition by 1.

$$\begin{array}{ccccccccc} 1 & & 7 & & 43 & & 259 & & 1555 \\ & \rightarrow & & \rightarrow & & \rightarrow & & \rightarrow & \\ & \times 6+1 & & \times 6+1 & & \times 6+1 & & \times 6+1 & \end{array}$$

b) Progressive multiplication/division with addition/subtraction :

For example :

1) 1,3,11,47,--------.

In the given series, the two consecutive numbers are increasing by a combination of multiplication and addition is in increasing order.

$$\begin{array}{ccccccccc} 1 & & 3 & & 11 & & 47 & & 239 \\ & \rightarrow & & \rightarrow & & \rightarrow & & \rightarrow & \\ & \times 2+1 & & \times 3+2 & & \times 4+3 & & \times 5+4 & \end{array}$$

2) 4,13,40,135,---------.

$$\begin{array}{ccccccccc} 1 & & 13 & & 40 & & 135 & & 552 \\ & \rightarrow & & \rightarrow & & \rightarrow & & \rightarrow & \\ & 4\times 1+1\times 9 & & 13\times 2+2\times 7 & & 40\times 3+3\times 5 & & 135\times 4+4\times 3 & \end{array}$$

This type of pattern is very difficult to recognise, but you have to be aware that this pattern could happen inside the series.

c) alternating multiplication/division and addition/subtraction and square/cube :

For example :

5,14,3,18,-3,-------.

$$\begin{array}{ccccccccccc} 5 & & 14 & & 3 & & 18 & & -3 & & 4 \\ & \rightarrow & & \rightarrow & & \rightarrow & & \rightarrow & & \rightarrow & \\ & \times 2+2^2 & & \div 2-2^2 & & \times 3+3^2 & & \div 3-3^2 & & \times 4+4^2 & \end{array}$$

d) Addition/subtraction some set of the previous term of the series to form next term :
For example :
1) 2,3,5,8,13,21,--------.
5 = 2+3, 8 = 3+5, 13 = 5+8, 21 = 13+8 and next term = 21+13 = 34.
This pattern is called a Fibonacci series.

2) 1,1,1,3,5,9,17,31,----------.
3 = 1+1+1, 5 = 1+1+3, 9 = 1+3+5, 17 = 3+5+9, 31 = 5+9+17 and next term = 9+17+31 = 57.

Intro To Syllogisms :

It is an important chapter of logical reasoning and hence, working knowledge of its rules is expected from a candidate. In this chapter, questions are based on some statements and their conclusions. We are not supposed to apply extra information except for the information given in statements while drawing the conclusion.

To understand the syllogism first you have to understand some standard statements.
1. All A's are B's :
This statement has two possible pictures. The primary statement is A's circle inside B's circle.

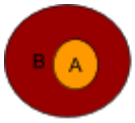


Fig. 1

In this case, some B's are A's while some B's are not A's.
The secondary statement is one circle for A's and B's.

Fig. 2

In this case, it also follows that all B are A.

2. No A is B :

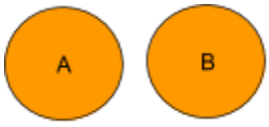
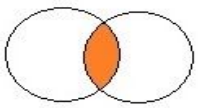


Fig. 1

The conclusion No B is A is a valid conclusion.

3. Some A's are B's :
This can be understood by the following Venn diagram.



Although the above figure also supports conclusion-some B's are not A's, this cannot be taken as a definite conclusion. This is because, when we say that Some A's are B's, it does not mean that there have to be some B's that are not A's.

4. Some A's are not B's :
This can be understood by the following Venn diagrams.

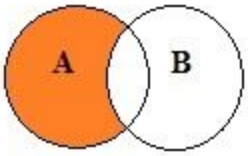


Fig. 1

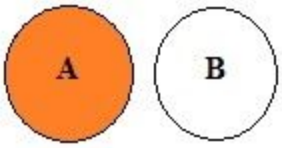


Fig. 2

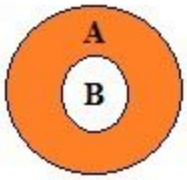


Fig. 3

In syllogism when you solve through a Venn diagram you have tested the conclusion. At that time you see many variant pictures for each of the structures might be one way in which you reject the conclusion.

Problem Solving In Syllogism :

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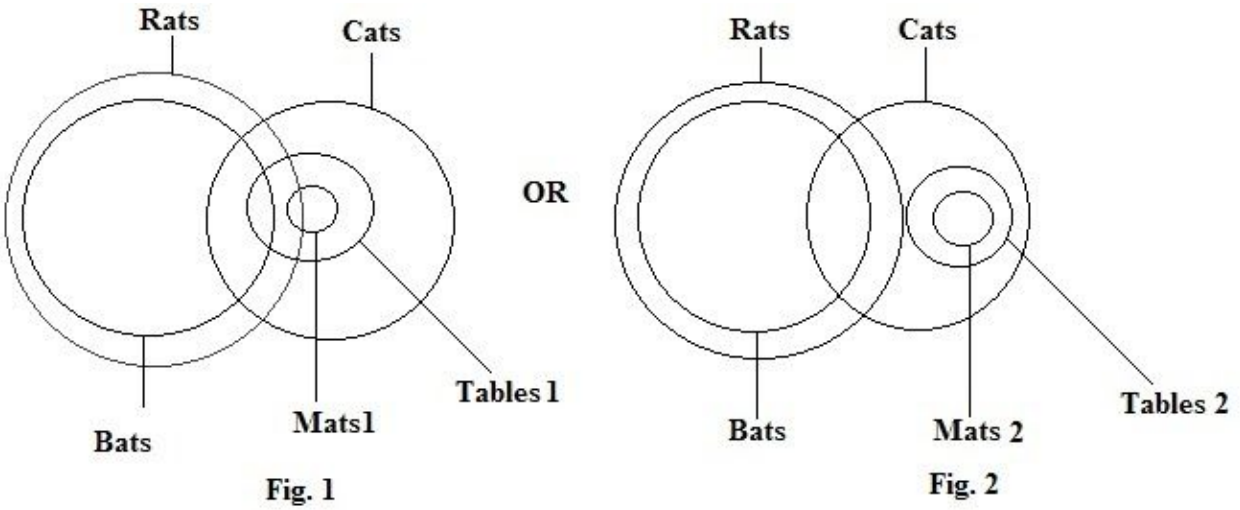
1. Statements:
1. Some cats are bats.
2. All bats are rats.
3. All tables are cats.
4. All mats are tables.

Conclusion:
a. Some mats are rats.
b. Some tables are bats.
c. Some cats are rats.

d. None of these.

Explanation:



Conclusion (a): Some mats are rats in fig. 1 but it is not necessary because no mats are rats in Fig. 2. So; conclusion (a) not follows.

Conclusion (b): Some tables are bats in fig. 1 but it is not necessary because no tables are bats in Fig. 2. So; conclusion (b) not follows.

Conclusion (c): Some cats are rats true in both the Figures.
Therefore, the conclusion (c) follows.

2. Statement:
Some ships are boats. All boats are submarines. Some submarines are yachts.
Conclusion:
a. Some yachts are boats.
b. Some submarines are boats.
c. Some submarines are ships.
d. Some yachts are ships.
1. All follow.
2. Only ‘b’ and ‘c’ follow.
3. Only ‘c’ follows.
4. Only ‘d’ follows.

Explanation:

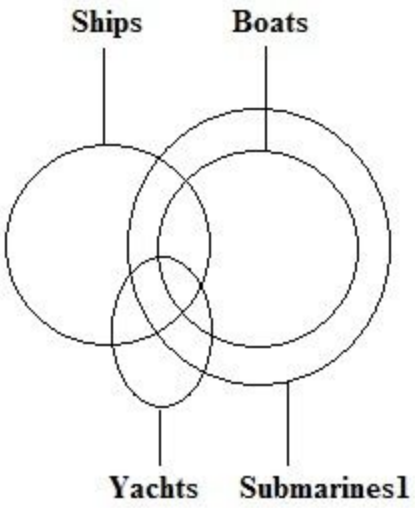


Fig. 1

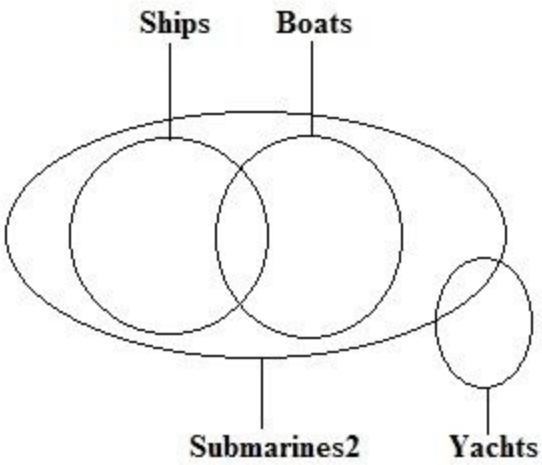


Fig. 2

Conclusion (a): No yachts are boats.
Conclusion (b): Definite conclusion.
Conclusion (c): Definite conclusion.
Conclusion (d): No yachts are ships.
Therefore only ‘b’ & ‘c’ follows.

3. Statement:
1. All cats are dogs.
2. All dogs are brown.

Conclusion:
a. All cats are brown.
b. All brown are dogs.
c. Some brown are not dogs.

Explanation:

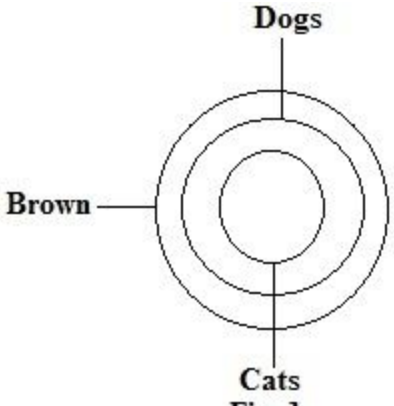


Fig. 1

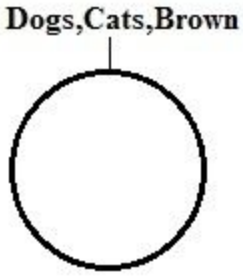


Fig. 2

Conclusion (a): Definite conclusion.
Conclusion (b): To reject this conclusion in fig. 1 some brown are not dogs.
Conclusion (c): To reject this conclusion in fig. 2 all brown are dogs.

4. Statement:
All computers are Pentiums and some Pentiums are machines.
Conclusion:
a. Some computers are machines.
b. Some machines are computers.

Explanation:

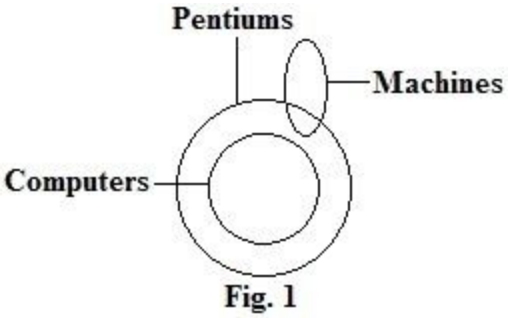
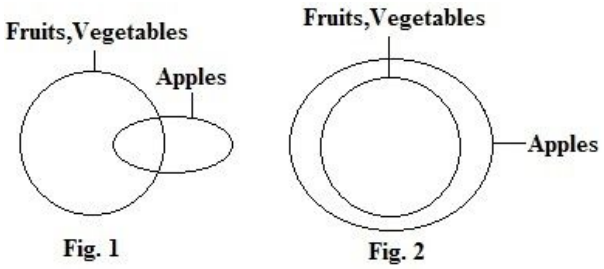


Fig. 1

Conclusion (a): To reject this conclusion in fig. 1 no computers are machines.
Conclusion (b): To reject this conclusion in fig. 1 no machines are computers.

5. Statement:
1. Some apples are fruits.
2. All vegetables are fruits.
3. All fruits are vegetables.
Conclusion:
a. Some apples are vegetables.
b. All vegetables are fruits,
c. All fruits are apples.
d. All vegetables are apples.

Explanation:



Conclusion (a): Definite conclusion.
Conclusion (b): Definite conclusion.
Conclusion (c): To reject this conclusion in fig. 1 some fruits are not apples.
Conclusion (d): To reject this conclusion in fig. 1 some vegetables are not apples.

6. Statements:
1. Some cats are animals.
2. Some animals are mammals.
3. Some mammals are earthlings.

Conclusion:
a. Some earthlings are cats.
b. Some mammals are cats.
c. Some earthlings are animals.
d. Some cats are earthlings.

Explanation:

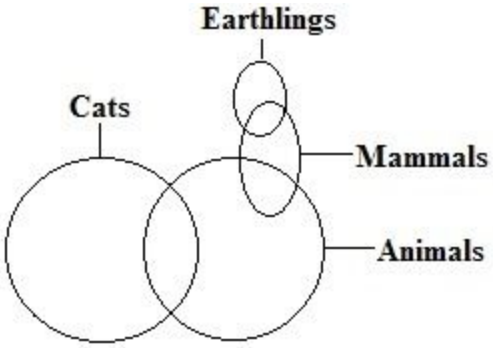


Fig. 1

Conclusion (a): To reject this conclusion in fig.1 no earthlings are cats.
Conclusion (b): To reject this conclusion in fig.1 no mammals are cats.
Conclusion (c): To reject this conclusion in fig.1 no earthlings are animals.
Conclusion (d): To reject this conclusion in fig.1 no cats are earthlings.

Remember that in syllogism you have to disprove rather than prove. The approach has to visualize the first 2 or 3 circles, draw them and then visualize the next one without drawing it. Just try to fix that one so that you can reject the conclusion.

Coding-Decoding pattern 1:

You always get coding-decoding questions in various exams.

Type 1: Interchange of letters inside the words

Problem 1:
GLORIOUS coded as GOLRIOSU. What will be the codes for JUDICIAL?

Solution:
In GLORIOUS 2nd and 3rd letters are interchanged and after that, the next 3 letters are the same and the last two letters are also interchanged.
GLORIOUS → GOLRIOSU
Do the same thing in JUDICIAL. Therefore, JUDICIAL → JDUICILA.

Problem 2:
SUDHIR is coded as HIRSUD. What will be the code for VISHES.

Solution:
In SUDHIR 1st 3 letters are interchanged with the last 3 letters.
SUDHIR → HIRSUD
Do the same thing in VISHES. Therefore, VISHES → HESVIS.

Problem 3:
PURPOSE is coded as UPPRSOE. What will be the code for SUDHI?

Solution:
In PURPOSE interchanging of 1st and 2nd letters, interchanging of 3rd and 4th letters, interchanging of 5th and 6th letters and last letters kept as it is.
PURPOSE → UPPRSOE
So, in the case of SUDHI
1st two letters interchange to 'US', 'DH' interchange to 'HD' and last letter 'I' will be as it is.
Therefore, SUDHI → USHDI

Type 2: Word coding

Problem 1:
SUDHIR is coded as QTBGGQ. What will be code for RAVI?

Solution:

S	U	D	H	I	R
↓− 2	↓− 1	↓− 2	↓− 1	↓− 2	↓-1
Q	T	B	G	G	Q

Therefore, RAVI → PZTH

R	A	V	I
↓− 2	↓− 1	↓− 2	↓− 1
P	Z	T	H

Type 3: Replace letters with numbers

Problem 1:

PAINT is coded as 74128 & EXCEL is coded as 93596. What will be the code for ACCEPT?

Solution:

P → 7	E → 9
A → 4	X → 3
I → 1	C → 5
N → 2	E → 9
T → 8	L → 6

Therefore, ACCEPT is coded as:

A → 4
C → 5
C → 5
E → 9
P → 7
T → 8
ACCEPT → 455978.

Type 4: Numeric pattern based

Problem 1:

1000 is coded as 1728 and 125 coded as 343. What will be code for 512?

Solution:

1000 → 1728 & 125 → 343

10^3 → 12^3 & 5^3 → 7^3

That means there is an increment of +2 on the cube.

512 is a cube of 8. And +2 increment on the cube will be 10^3 .
Therefore, 512 is coded as 1000
512 → 1000

Problem 2:
L is coded as 12 and G is coded as 7. What will be the code for 9?

Solution:
Code is just an alphabet order placed.

ABCDEFGHIJKL…..Z
↓ ↓ ↓
7 9 12
Therefore, 9 is coded as I.

Type 5: Language coding

Problem 10:
"Tee See Pee" means "drink fruit juice", "See Kee Lee" means " juice is sweet", "Lee Ree Mee" means "he is intelligent". What is the code for the word "sweet"?

Solution:
In the first and second statement, the common word is **'juice'** and the common code word is **'See'**. So **'See'** means **'juice'**.
In the second and third statements, the common word is **'is'** and the common code is **'Lee'**. So,**'Lee'** means **'is'.**
Thus, in the second statement, the remaining word is **'sweet'** which is coded as **'Kee'**.
Hence, code for the word **'sweet'** is **'Kee'**

Problem 2:
In a certain code, '786' means 'study very hard', '958' means 'hard work pays' and '645' means 'study and work'. Which of the following is the code for 'very' ?

Solution:
In the first and second statements, the common word is **'hard'** and the common code digit is **8**. So, **'8'** means **'hard'**.
In the first and third statements, the common word is **'study'** and the common code digit is **'6'**. So, **'6'** means **'study'**.
Thus, in the first statement, **'7'** means **'very'**.

Problem 3:
In a certain code language
“lu ja ka hu” means ‘we provide study material’,
“fa ka la ju” means ‘we score maximum selection’,
“la fu ja ju “ means “study score the selection”
“ju lu na fu” means “selection of the material”.
What is the code of “ provide of maximum”?

Solution :
In the 1st and 4th statement, the common word is **'material'** and the common code word is **'lu'**. So **'lu'** means **'material'**.

In the 3rd and 4th statements, the common words are **'selection & the'** and the common codes are **'ju & fu'**. Thus, in the 4th statement **‘of’** means **‘na’.**

In the 2nd and 3rd statement, the common word is **'selection'** and the common code word is **'ju'**. So **'selection'** means **'ju'**. Thus, in the 4th statement **‘the’** means **‘fu’**

In the 2d and 3r statements, the common word is **'score'** and the common code is **'la'**. So,**'score'** means **'la'.** Thus, in the 3d statement, the remaining word is **'study'** which is coded as **'ja'**.

In the 1st and 2nd statement, the common word is **'we'** and the common code word is **'ka'**. So **'ka'** means **'we'**.Thus, in the 1st and 2nd statement, the remaining words are **'provide & maximum'** which are coded as **'hu & fa'** respectively.
Therefore, the code of “ provide of maximum” is “ hu na fa”.

Some Questions For Practice:

Coding-Decoding questions:

1. If in a certain language MYSTIFY is coded as NZTUJGZ, how is NEMESIS coded in that language?
   Ans: OFNFTJT.

2. In a certain code, SIKKIM is written as THLJJL. How is TRAINING written in that code?
   Ans : UQBHOHOF.

3. If in a certain language, MADRAS is coded as NBESBT, how is BOMBAY coded in that code?
   Ans: CPNCBZ.

4. In a certain code, TRIPPLE is written as SQHOOKD. How is DISPOSE written in that code?
   Ans: CHRONRD.

5. If in a code language. COULD is written as BNTKC and MARGIN is written as LZQFHM, how will MOULDING be written in that code?
   Ans: LNTKCHMF.

Syllogism questions:

Question 1 to 3:
Give answers (a) if only the conclusion I follow.
(b) if only conclusion II follows.
(c) if either I or II follows.
(d) if neither I nor II follows
(e) if both follow

1. Statements:
   (A) All cats are dogs.
   (B) All dogs are brown.
   Conclusions:
   I. All cats are brown.
   II. All brown are dogs.
   Ans : a.

2. Statements:
   (A) All computers are Pentiums.
   (B) Some Pentiums are machines.
   Conclusions:
   I. Some computers are machines.
   II. Some machines are computers.
   Ans : d.

3. Statements:
   (A) Some apples are fruit.
   (B) Some fruits are sour.

Conclusions:
I. Some apples are sour.
II. Some sours are fruit.
Ans: c.

4. Statements: (A) Some apples are fruits.
(B) All vegetables are fruits.
(C) All fruits are vegetables.
Conclusions: I. Some apples are vegetables.
II. All vegetables are fruits.
III. All fruits are apples.
IV. All vegetables are apples.
(a) Only I and II follow.
(b) Only II follows.
(c) Only I and IV follow.
(d) Only II and IV follow.
(e) None of these.
Ans: a.

5. Statements: (A) Some cars are four-wheelers.
(B) All four-wheelers are vehicles.
(C) Some vehicles are SUVs.
Conclusions: I.Some SUVs are four-wheelers.
II. Some vehicles are four-wheelers.
III. Some vehicles are cars.
IV. Some SUVs are cars.
(a) All follow
(b) Only II & III follow
(c) Only III follows
(d) Either III or IV follows
(e) None of these
Ans : b.