

INTRODUCTION

Mathematical Reasoning is a skill that allows us to employ critical thinking. It has a logical approach. It is a type of deductive reasoning, which is the process of reasoning from one or more statements (premises) to reach a logical conclusion. In this chapter, we shall learn Coding-decoding, Blood-relations, Odd man out and Syllogism.

LOGICAL REASONING

Logical reasoning is the process of using systematic series of steps based on sound mathematical procedures and given statements to arrive at a conclusion.

Logical reasoning tests are the part of most of the competitive exams. These tests are designed to assess one's ability at skills such as coding-decoding, interpreting patterns, number sequences or the relationships between the persons etc.

In this chapter you will learn about coding-decoding, blood relations, odd man out and syllogism.

Coding-Decoding

Coding is a rule for converting the information in the form of letters, words or phrases into same or other form of representation.

Decoding is the reverse process of coding. It converts the message sent by a source into the information which can be understood by the receiver.

Some basic methods of coding-decoding are given below.

Letter Coding

In this type of coding, the real alphabets in a word are replaced by certain other alphabets according to a specific rule. For decoding, we have to detect that specific rule.

For this type of coding, the knowledge of English alphabets and their positions is very necessary.

Alphabets and their positions:

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
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

For fast recalling of alphabets and their positions, we should write the alphabets in a group of 5 as given below:

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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

For fast recalling of alphabets and their positions, we should write the alphabets in a group of 5 as given below:

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

Remember the word E J O T Y
 5 10 15 20 25

It will help us to recall alphabets and their positions.

For example: For position of alphabet I, we know that I comes just before J, so position of I = 10 - 1 = 9. Similarly, for position of W, we know that W is third alphabet from T, so position of W = 20 + 3 = 23.

In letter coding, we have different patterns given below:

(i) **Repetition pattern:** In this type of pattern, same letters in different order are used for coding. For examples,

1. CRICKET is coded as TEKCIRC.

Here, you can see that letters are written in reverse order.

2. CRICKET is coded as EITKCRC.

Here, vowels are written first then consonants, both in reverse order.

3. CRICKET is coded as CCEIKRT.

Here, letters are written in alphabetical order.

4. MULTIPLICATION is coded as LPITLUMNOITACI.

Here, split the word in two equal parts MULTIPL : ICATION, then write each part in reverse order i.e. LPITLUM : NOITACI.

(ii) **Addition-subtraction pattern:** In this type of pattern, we add or subtract or both to obtain the new position of the letter. For examples,

1. PLAYER is coded as QNDCJX.

Here, P L A Y E R
 +1↓ +2↓ +3↓ +4↓ +5↓ +6↓
 Q N D C J X

2. SPHERE is coded as TOIDSD.

Here, S P H E R E
 +1↓ -1↓ +1↓ -1↓ +1↓ -1↓
 T O I D S D

3. JAIPUR is coded as MDLSXU.

Here, J A I P U R
 +3↓ +3↓ +3↓ +3↓ +3↓ +3↓
 M D L S X U

(iii) **Multiplication pattern:** In this type of pattern, we multiply the positions of letters to obtain new positions. For example,

1. PENCIL is coded as FJBFRX.

Here,	P	E	N	C	I	L
	↓	↓	↓	↓	↓	↓
	16	5	14	3	9	12
	$\times 2$	$\times 2$	$\times 2$	$\times 2$	$\times 2$	$\times 2$
	32	10	28	6	18	24
	-26		-26			
	6		2			
	F	J	B	F	R	X

ILLUSTRATIVE EXAMPLES

Example 1. In a certain language if 'GANGA' is coded as AGNAG, how is 'YAMUNA' coded?

Solution. Clearly, letters of the word GANGA are written in reverse order to obtain AGNAG.

So, 'YAMUNA' is coded as 'ANUMAY'.

Example 2. In a certain language if 'PLATINUM' is coded as 'AILMNPTU', how 'DIAMOND' is coded?

Solution. Clearly, the letters of the word 'PLATINUM' are written in alphabetical order to obtain 'AILMNPTU'.

So, 'DIAMOND' is coded as 'ADDIMNO'.

Example 3. In a certain language if 'COMPUTER' is coded as 'OUECMPTR' how 'CALCULATOR' is coded?

Solution. Clearly, the vowels of the word COMPUTER are written first, then all the consonants without changing their order.

So, 'CALCULATOR' is coded as 'AUAOCLCLTR'.

Example 4. In a certain language if 'LUCKNOW' is coded as 'NWEMPQY', how is 'DELHI' coded?

Solution. Clearly, each letter of the word LUCKNOW is moved two steps forward to obtain the corresponding code

	L	U	C	K	N	O	W
+2	↓	↓	↓	↓	↓	↓	↓
	N	W	E	M	P	Q	Y

So

	D	E	L	H	I
+2	↓	↓	↓	↓	↓
	F	G	N	J	K

∴ 'DELHI' is coded as 'FGNJK'.

Example 5. In a certain language if 'INDIA' is coded as 'KMFHC', how 'AMERICA' is coded?

Solution.

	M		H	
	$-1 \uparrow$		$-1 \uparrow$	
	I	N	D	I
	$+2 \downarrow$		$+2 \downarrow$	$+2 \downarrow$
	K		F	C

Clearly, the letters of the word 'INDIA' are moved 2 steps forward and one step backward alternately.

So

	L		Q		B	
	-1↑		-1↑		-1↑	
A	M	E	R	I	C	A
+2↓		+2↓		+2↓		+2↓
C		G		K		C

∴ 'AMERICA' is coded as 'CLGQKBC'.

Example 6. In a certain language if 'JOKER' is coded as 'QLPVI', how 'CLOWN' is coded?

Solution. We divide the alphabets in two equal parts and draw a line of symmetry in between as shown below:

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
13	12	11	10	9	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	9	10	11	12	13

It is clear that J which is fourth left from line is replaced by Q which is fourth right from the line.

Similarly, O is replaced by L, K is replaced by P, E is replaced by V and R is replaced by I.

So 'CLOWN' is coded as 'XOLDM'.

Example 7. In a certain language if 'SHARPNER' is coded as 'LPBJFBJJ', how 'ERASER' is coded?

Solution. Clearly, new positions of the letters of word 'SHARPNER' are obtained by multiplying the original position by 2.

Here,

S	H	A	R	P	N	E	R
↓	↓	↓	↓	↓	↓	↓	↓
19	8	1	18	16	14	5	18
× 2	× 2	× 2	× 2	× 2	× 2	× 2	× 2
38	16	2	36	32	28	10	36
-26			-26	-26	-26		-26
12			10	6	2		10
L	P	B	J	F	B	J	J

So,

E	R	A	S	E	R
↓	↓	↓	↓	↓	↓
5	18	1	19	5	18
× 2	× 2	× 2	× 2	× 2	× 2
10	36	2	38	10	36
	-26		-26		-26
	10		12		10
J	J	B	L	J	J

'ERASER' is coded as 'JJBLJJ'.

Number Coding

In this type of coding, the real alphabets in a word are replaced by certain number or digits according to a specific rule.

Example 8. If 'RAHUL' is coded as 22 - 5 - 12 - 25 - 16, then how will you code 'VIRAT'?

Solution. Here R is coded as 22 which is its actual positions 18 + 4.

Similarly, A is coded as 1 + 4 i.e. 5.

H is coded as 8 + 4 = 12, U is coded as 21 + 4 = 25 and L is coded as 12 + 4 = 16.

∴ V is equivalent to 22 + 4 = 26

I is equivalent to 9 + 4 = 13

R is equivalent to 18 + 4 = 22

A is equivalent to 1 + 4 = 5

and T is equivalent to 20 + 4 = 24

∴ 'VIRAT' will be coded as 26 - 13 - 22 - 5 - 24.

Example 9. If 'N' is coded as 28, 'X' is coded as 48 and 'CUT' is coded as 88, then how is 'PUT' coded?

Solution. Here N is coded as 28 which is its actual position 14×2 . Similarly, X is coded as $24 \times 2 = 48$ and $CUT = 3 \times 2 + 21 \times 2 + 20 \times 2 = 88$

∴ $PUT = 16 \times 2 + 21 \times 2 + 20 \times 2 = 114$

Hence 'PUT' is coded as 114.

Example 10. If 'GOMTI' is coded as 74521 and 'YAMUNA' is coded as 835963, then how is 'GANGA' coded?

Solution. Here

G	O	M	T	I	Y	A	M	U	N	A
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
7	4	5	2	1	8	3	5	9	6	3

G is coded as 7, A as 3 and N as 6

∴ 'GANGA' is coded as 73673

Example 11. In a certain language PAC is coded as 61, how will NEP be coded?

Solution. If we arrange the English alphabets in reverse order, then positions of P, A and C are 11, 26 and 24 respectively. When we add these numbers, we get 61. Similarly, the reverse position numbers of N, E and P are 13, 22 and 11 respectively. On adding these numbers, we get $13 + 22 + 11 = 46$.

Hence, NEP will be coded as 46.

Symbols for letters

In this type of coding, the real alphabets in a word are replaced by different symbols such as *, #, @, &, %, ^, v etc according to a specific rule.

Example 12. If MADAM is coded as * ? # ? * and LOOM is coded as & % % *, then how will you code LAD?

Solution. Here, we observe that letter M is coded as *, A by ?, D by #, L by & and O by %. So, LAD will be coded as & ? #.

Group Coding

In this type of coding three or more messages are coded in terms of words or numbers according to a specific rule. To decode a particular word, we take two messages containing the same word or number. The common code words will mean that word or number.

Example 13. In a certain code language 327 means 'Truth is eternal', 7983 means 'Enmity is not eternal' and 9426 means 'Truth does not perish'. What does 'Enmity' mean in this language?

Solution. In the first and second statements common codes are 3 and 7, and common words are 'is' and 'eternal'.

In the first and third statements, common code is 2 and the common word is 'truth'.
 So code 2 means 'truth'

In the second and third statements common code is 9 and the common word is 'not'.

So code 8 stands for word 'Enmity'.

Example 14. In a certain code language 'She is mother' means 'Rahul told father', 'She teaches Chemistry' means 'Rahul plays football' and 'Mother teaches Science' means 'Father plays cricket'. Which word is coded as Science?

Solution. In the first and third statements common code is mother and common word is father.

So father is coded as mother.

In the second and third statements common code is teaches and common word is plays.

So plays is coded as teaches.

∴ Cricket is coded as Science.

Letter for digits

In this type of coding digits are coded as letters in mathematical operations like addition, subtraction, multiplication or division. For decoding, we have to use the basics of mathematical operations.

To decode these type of messages, we follow the rules given below:

1. Each letter must stand for just one digit i.e. each digit must be represented by just one letter.
2. The first digit (from left) of a number cannot be zero. For example, we write the number sixty five as 65 not as 065 or 0065.

Example 15. Find A and B in the addition

$$\begin{array}{r} 12A \\ + 6AB \\ \hline A09 \end{array}$$

Solution. Observe the unit column of the addition.

As $A + B$ cannot exceed 18 and the unit digit in the sum is 9, so $A + B = 9$.

This is possible when

$$A = 1, B = 8; A = 2, B = 7, \dots, A = 8, B = 1.$$

Now, observe ten's column

As $2 + A$ cannot exceed 11 and the digit below the sum of ten's column is 0, therefore $2 + A = 10$

$$\Rightarrow A = 8$$

$$\therefore A = 8, B = 1$$

Now check the sum

$$\begin{array}{r} 12\textcircled{8} \\ + 6\textcircled{8}\textcircled{1} \\ \hline \textcircled{8}09 \end{array}$$

Hence, the required digits are $A = 8, B = 1$.

Example 16. Find the digits A, B and C in the multiplication

$$\begin{array}{r} AB \\ \times 3 \\ \hline CAB \end{array}$$

Solution. Observe the unit column.

For $B \times 3$, we get a number whose unit digit is B.

This is possible only when $B = 5$ or $B = 0$

When $B = 5$, then

$$\begin{array}{r} \textcircled{1} \\ A \ 5 \\ \times 3 \\ \hline C \ A \ 5 \end{array}$$

Now observe the multiplication of 3 by A

$$3 \times A + 1 = CA$$

It means (multiplication of 3 by A) + 1 is a number whose unit digit is A. So, $A \neq 5$.

Now, if A have values 1, 2, 3, 4, 6, 7, 8, 9, then on checking we find that no value of A will satisfy the equation

$$3 \times A + 1 = CA$$

$$\therefore B \neq 5.$$

Now when $B = 0$, then

$$\begin{array}{r} A \ 0 \\ \times 3 \\ \hline C \ A \ 0 \end{array}$$

Observe the multiplication of 3 by A

$$3A = CA$$

It is possible only when $A = 5$

($\because A \neq 0$)

$$3 \times 5 = 15 \Rightarrow C = 1$$

$$\therefore A = 5, B = 0, C = 1.$$



EXERCISE 8.1

- In a certain language 'ORANGE' is coded as 'AEGNOR', how 'PINEAPPLE' is coded?
- In a certain language 'MIXTURE' is coded as 'ERUTXIM', how 'SOLUTION' is coded?
- In a certain language 'REGISTRATION' is coded as 'TSIGERNOITAR', how 'PUBLICATIONS' is coded?
- In a certain language 'START' is coded as UQEMZ and 'EXCEL' is coded as GUGZR. How is 'PANIC' coded?
- In a certain language 'SACHIN' is coded as RZBGHM. How 'ISHANT' is coded?
- In a certain language 'QUEEN' is coded as OVCFL. How is 'KING' coded?
- In a certain language 'TEACHER' is coded as GVZXSVI. How is 'STUDENT' coded?
- If 'REPUBLIC' is coded as TGRWDNKE taken what information can be obtained from the message FGOQETCVKE?
- In a certain language 'AGRA' is coded as 'CUBC', how 'JHANSI' is coded?
- In a certain language 'TABLE' is coded as 'NBDXJ', how 'CHAIR' is coded?
- If 'MIRINDA' is coded as 151120111663 then how is THUMSUP coded?
- In a certain language 'VIOLET' is coded as 196129217. Decode 1215241142.
- If 'POOR' is coded as 46 and 'BLOWER' is coded as 57 then how is 'TOWER' coded?
- In a certain language if 'CORONA' is coded as 6 and 'MALARIA' is coded as 5 then how is 'CANCER' coded?

15. If 'PETER' is coded as 64841, 'SERVENT' is coded as 5412478 and 'MASTER' is coded as 935841, then how is 'PERMANENT' coded?
16. In a certain language 458 means "All is well," 876 means "Well done boys" and 689 means "Boys played well". What does 'played' mean in this language?
17. In a certain language 123 means "He is good", 456 means "You are bad" and 472 means "Good and bad". What does 'and' mean in this language?
18. In a certain language 'fli cdo vas' means 'Doctors save life', 'erp fli si' means 'life is precious' and 'dgo can cdo' means 'Doctors are god'. What word stand for 'Save' in this language?
19. In a certain code 'mte ves rme' means 'Save more time', 'emt rfo two' means 'Wait for me' and 'rme vge emt' means 'Give me more'. What does 'Give' mean in this language?

Find the values of the letters in each of the following and give reasons for the steps involved (20 to 26):

$$\begin{array}{r} 20. \quad 3 \ 1 \ Q \\ + 1 \ Q \ 3 \\ \hline 5 \ 0 \ 1 \end{array}$$

$$\begin{array}{r} 21. \quad 2 \ A \ B \\ + A \ B \ 1 \\ \hline B \ 1 \ 8 \end{array}$$

$$\begin{array}{r} 22. \quad B \ 3 \ 4 \ 5 \\ + C \ 9 \ B \ A \\ \hline 8 \ B \ A \ 2 \end{array}$$

$$\begin{array}{r} 23. \quad B \ A \\ \times B \ 3 \\ \hline 5 \ 7 \ A \end{array}$$

$$\begin{array}{r} 24. \quad A \ B \\ \times 5 \\ \hline C \ A \ B \end{array}$$

$$\begin{array}{r} 25. \quad A \ A \ B \\ \times B \\ \hline 8 \ 8 \ A \end{array}$$

$$\begin{array}{r} 26. \quad A \ B \\ \times B \ A \\ \hline B \ C \\ 1 \ A \ B \ C \\ \hline 1 \ D \ C \ C \end{array}$$

Answers

- | | | |
|------------------|---|-------------------------|
| 1. AEEILNPPP | 2. NOITULOS | 3. CILBUPSNOITA |
| 4. RXRDI | 5. HRGZMS | 6. IJLH |
| 8. DEMOCRATIC | 9. DXCPEA | 10. FPBRJ |
| 12. ORANGE | 13. 18 | 14. 4 |
| 16. 9 | 17. 7 | 18. vas |
| 20. Q = 8 | 21. A = 4, B = 7 | 22. A = 7, B = 2, C = 5 |
| 23. A = 5, B = 2 | 24. A = 5, B = 0, C = 2; A = 2, B = 5, C = 1; A = 7, B = 5, C = 3 | 25. A = 4, B = 2 |
| | 26. A = 2, B = 5, C = 0, D = 3 | |

BLOOD RELATION

Any relation which is either by birth or by marriage is called blood relation.

For example: Relations by birth are mother, father, son, daughter, brother, sister etc and relations by marriage are mother-in-law, father-in-law, son-in-law, sister-in-law, daughter-in-law, brother-in-law etc.

Table given below describes the different type of relations that exist in a family:

Relation	Term Used	Relation	Term Used
Father of father/mother	Grandfather	Daughter of father/mother	Sister
Mother of father/mother	Grandmother	Son/daughter of uncle/aunt	Cousin
Wife of grandfather	Grandmother	Brother of husband/wife	Brother-in-law
Husband of grandmother	Grandfather	Sister of husband/wife	Sister-in-law

Father-in-law of father/ mother	Grandfather	Husband of sister/sister- in-law	Brother-in-law
Mother-in-law of father/ mother	Grandmother	Son of father	Oneself/Brother
Only son of Father's father/mother	Father	Mother of son/daughter	Oneself/Wife
Only daughter-in-law of father's father/father's mother	Mother	Father of daughter/son	Oneself/husband
Husband of mother	Father	Son of son of grandmother/ grandfather	Brother/oneself/cousin
Wife of father	Mother	Daughter of son of grandmother/grandfather	Cousin/oneself/sister
Brother of father	Uncle	Son of brother or sister	Nephew
Brother of mother	Maternal uncle	Daughter of brother/sister	Niece
Sister of father	Aunt	Grandson of father/mother	Son/Nephew
Sister of mother	Maternal Aunt	Granddaughter of father/ mother	Daughter or Niece
Husband of aunt	Uncle	Husband of daughter	Son-in-law
Wife of uncle	Aunt	Wife of brother/brother- in-law	Sister-in-law
Son of grandfather/ grandmother	Father/Uncle	Wife of son	Daughter-in-law
Daughter of father-in-law/ mother-in-law of father	Mother/Aunt	Son of son/Daughter	Grandson
Father of wife/husband	Father-in-law	Daughter of son/Daughter	Granddaughter
Mother of wife/husband	Mother-in-law	Father's/mother's only son/daughter	Oneself
Children of same parents	Siblings	Son of father/mother	Brother

Symbolic representation of a family tree. To build a family tree certain symbols are given below. These symbols help us to indicate the relationship between the family members.

Male = 

Female = 

Husband - Wife =  + 

Brother - Sister =  ↔ 

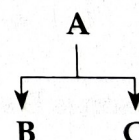
Brother - Brother =  ↔ 

Sister - Sister =  ↔ 

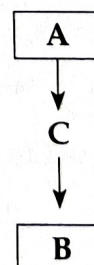
Parent - Child =
(generation gap)

(vertical line)

B and C are children of A



A is grandfather of B
who is son of C



Note

Students can use some other symbols to indicate the relationship.

Some important points:

To solve the problems of blood relations, you have to remember some important points given below:

- (i) Terms used for relations (i.e. relation names) must be clear.
- (ii) Family tree should be drawn.
- (iii) Don't come to any conclusion unless you know the gender.

Example 1. Introducing A, B said "His brother's father is only son of my grandfather". How B is related to A?

Solution. His brother's father means A's father.

The only son of my grandfather means B's father

So, A's father is B's father

∴ B is brother of A.

Example 2. Pointing to a man in the photograph, a woman says "His mother's only daughter is my mother". How is man related to woman?

Solution. His mother's only daughter means man's sister.

My mother means woman's mother.

So Man's sister is woman's mother.

∴ Man is maternal uncle of woman.

Example 3. Pointing to a girl, Rishabh said "Her mother's brother is the only son of my mother's father". How is the girl's mother related to Rishabh?

Solution. Her mother's brother means girl's maternal uncle.

Only son of my mother's father means Rishabh's maternal uncle.

So girl's maternal uncle is Rishabh's maternal uncle

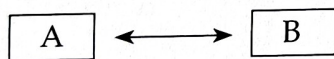
⇒ girl's mother's brother is Rishabh's mother's brother

⇒ girl's mother and Rishabh's mother are sisters

∴ girl's mother is maternal Aunt of Rishabh.

Example 4. A and B are brothers. C and D are sisters. A's son is D's brother. How B is related to C?

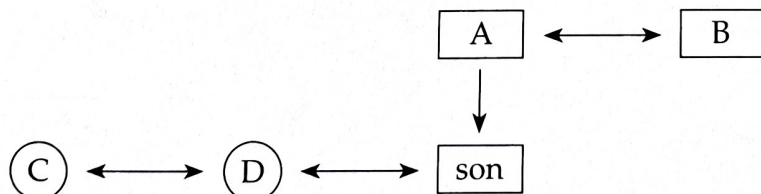
Solution. A and B are brothers



C and D are sisters



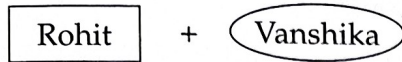
A's son is D's brother



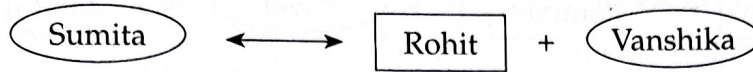
∴ B is C's uncle.

Example 5. Rohit is husband of Vanshika. Sumita is sister of Rohit. Anushka is sister of Vanshika. How Anushka is related to Rohit?

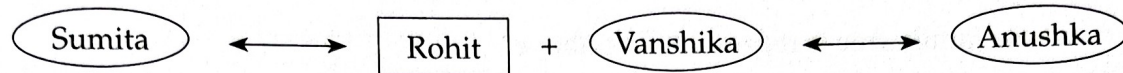
Solution. Rohit is husband of Vanshika



Sumita is sister of Rohit



Anushka is sister of Vanshika



So Anushka is Rohit's wife's sister

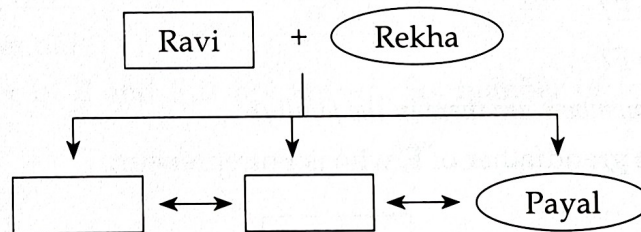
∴ Anushka is sister-in-law of Rohit.

Example 6. Read the information given below and answer the questions that follow:

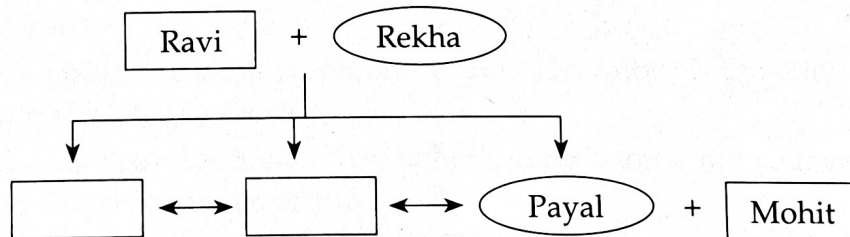
A family of Ravi, Rekha, Gaurav, Saurabh, Payal, Mohit, Monika, Swasti and Shaurya consists of 3 generations. Ravi is husband of Rekha and has 2 sons and one daughter Payal. Mohit is Rekha's son-in-law. Saurabh is Payal's brother and Monika's brother-in-law. Gaurav has two children.

- How is Gaurav related to Mohit?
- How is Saurabh related to Ravi?
- How is Ravi related to Shaurya?
- How is Mohit related to Payal?
- How is Mohit related to Swasti?

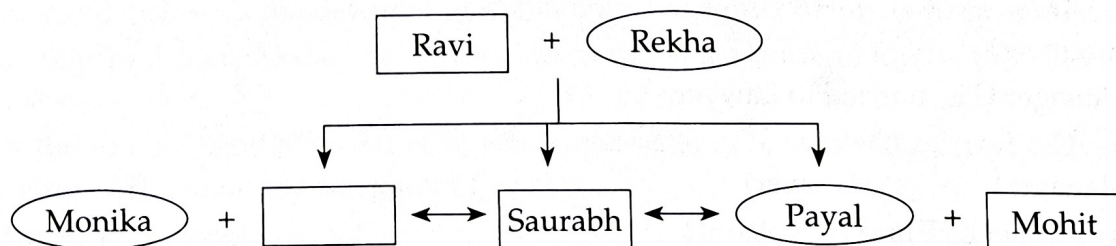
Solution. Ravi is husband of Rekha and has 2 sons and one daughter Payal



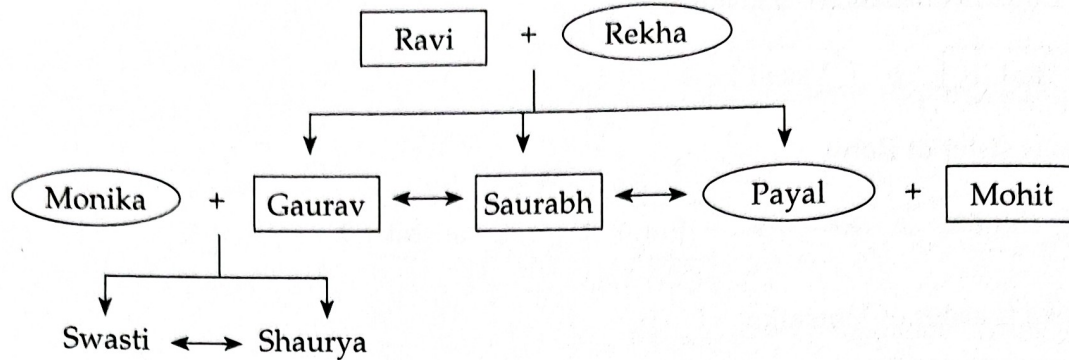
Mohit is Rekha's son-in-law



Saurabh is Payal's brother and Monika's brother-in-law



Since it is family of 3 generations, Gaurav has 2 children so Gaurav has to be married to Monika and Swasti and Shaurya must be the children of Gaurav and Monika.



Hence whole family tree is represented as above

- (i) Gaurav is Mohit's brother-in-law.
- (ii) Saurabh is Ravi's son.
- (iii) Ravi is grandfather of Shaurya.
- (iv) Mohit is husband of Payal.
- (v) Mohit is Swasti's uncle.

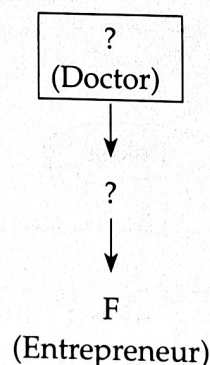
Example 7. Read the information given below and answer the questions that follow:

In a family there are 6 persons A, B, C, D, E and F. They are Entrepreneur, Lawyer, Teacher, Manager, Doctor and Engineer. The doctor is the grandfather of F, who is an Entrepreneur. The Engineer D is married to A. C the Manager is married to Lawyer.

B is the mother of E and F. There are two married couples in the family.

- (i) What is the profession of B?
- (ii) What is the profession of E?
- (iii) How A is related to E?
- (iv) How D is related to F?
- (v) How many female members are there in the family?

Solution. The doctor is the grandfather of F, who is Entrepreneur:



The Engineer D is married to A.

D + A
(Engineer) (?)

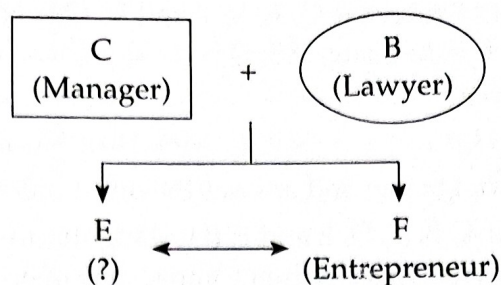
The Manager C is married to Lawyer.

C + ?
(Manager) (Lawyer)

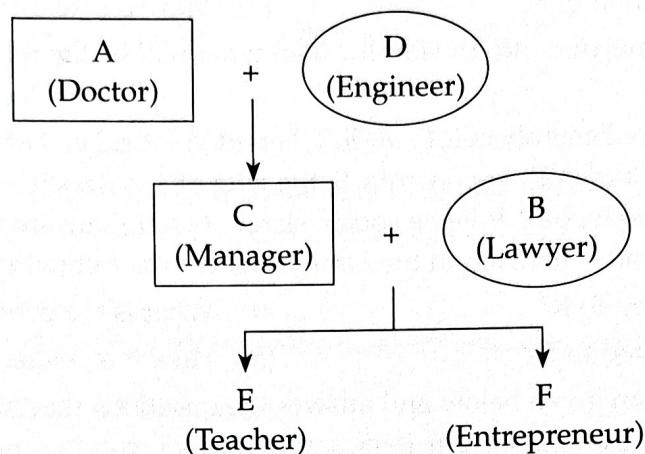
B is the mother of E and F

⇒ B is female and of second generation. Because F is in third generation.

So, we have



Also, given that there are two married couples. So, we have the married couple of first generation.



Hence whole family tree with their professions is represented above.

- (i) B is a Lawyer.
- (ii) E is a teacher.
- (iii) A is grandfather of E.
- (iv) D is grandmother of F.
- (v) Since the gender of E and F is not known. So, number of female members cannot be determined.



EXERCISE 8.2

1. A's mother is the only daughter of B's father. If B is female then how B is related to A?
2. Pointing to a man Parul said "He is the only son of my mother-in-law". How is the man related to Parul?
3. Pointing to a girl in the photograph, Ajeet said "Her father is the only son of my father". How is that girl related to Ajeet?
4. A man looks at a picture and says "Her father's sister's son is my younger brother". How is he related to the person in the picture?
5. Introducing to a man, a lady said "The father of his brother is the only son of my mother". How is that man related to the lady?
6. Arun said, 'Ishika is the daughter of my mother's daughter'. How is Arun related to Ishika?
7. Pointing to a man Akshay said, 'His son is my son's uncle'. How is the man related to Akshay?
8. P is the son of Q and husband of R, who is the sister of S, who is the father of T, who is the brother of U, who is the daughter of V.
 - (i) How is P related to V?
 - (ii) How is R related to U?
 - (iii) How is P related to S?
 - (iv) How is S related to V?

9. Read the information given below and answer the questions that follow:

In a family, there are six members P, Q, R, S, T and U. Q is wife of P. S is the only son of R, who is the brother of P. T is the sister of S. Q is the daughter-in-law of U, who is widow.

(i) How U is related to P?

(ii) How T is related to R?

(iii) How R is related to Q?

(iv) How S is related to U?

10. Read the information given below and answer the questions that follow:

In a family of 6 members A, B, C, D, E and F. B is daughter-in-law of F. D is grandchild of A. C is the only uncle of D. A has two children F and C, one male and one female. E is the father of C.

(i) Who is the mother-in-law of B?

(ii) Who is the grandfather of D?

(iii) How D is related to F?

(iv) How B is related to D?

(v) If a girl G is married into the family, then what will be the relationship between G and E?

11. In a family, there are 7 members P, Q, R, S, T, U and V. P the head of the family is a Lawyer. R and T are brothers and both are doctors. S, the wife of T is a social worker. Q is the son of U, who is daughter-in-law of P. V is the cousin sister of Q. If there are two married couples and a female teacher who is married in the family, answer the following questions:

(i) Who is married to R?

(ii) What is the profession of U?

(iii) How T is related to V?

(iv) How P is related to S?

12. Read the information given below and answer the questions that follow:

In a family, there are 9 members A, B, C, D, E, F, G, H and I. This family consists of 3 generations and 3 married couples. I is the grandson of A, who is married to a doctor. C is the mother of D. F is the daughter-in-law of C. G, the teacher is the father of H, who is the first cousin of E and I. E is the daughter of F, who is an engineer. D is the sister of B. There is a male lawyer, a female politician and three unmarried students, while the eldest member of the family is retired.

(i) Who is the politician?

(ii) Who is the lawyer?

(iii) What is the profession of C?

(iv) Name the three students.

(v) How many children does the engineer have?

(vi) How A is related to H?

Answers

1. B is mother of A

2. Parul's husband

3. Daughter of Ajeet

4. Cousin brother

5. Nephew

6. Arun is uncle of Ishika

7. Man is Akshay's father

8. (i) P is brother-in-law of V

(ii) R is aunt of U

(iii) P is brother-in-law of S

(iv) S is husband of V

9. (i) U is mother of P

(ii) T is daughter of R

(iii) R is brother-in-law of Q

(iv) S is the grandson of U

10. (i) F

(ii) E

(iii) D is the son of F

(iv) B is the wife of D

(v) G will be the daughter-in-law of E

11. (i) U

(ii) Teacher

(iii) T is father of V

(iv) P is mother/father-in-law of S

12. (i) D

(ii) B

(iii) Doctor

(iv) H, E and I

(v) Two

(vi) A is the grandfather of H

ODD MAN OUT

Odd man out problem are very common in competitive exams. In these type of problems, all the terms (alphabets, words, numbers etc.) except first, follow a specific rule or pattern. The term which does not follow the specific rule or pattern is called odd term or odd man.

These problems can be classified into three types:

1. Alphabets problems
2. Words problems
3. Numbers problems

Find odd man out in the following examples:

Example 1. B, C, D, E, F, G, H

Solution. E is odd man, because all other alphabets are consonants.

Example 2. WU, DB, OL, RP, KI, NL

Solution. OL is odd man, because in all other pairs of alphabets gap is -2 .

See, W is 23rd alphabet so $23 - 2 = 21$ th alphabet is U. Similarly, D which is 4th alphabet, so $4 - 2 = 2$ which is B and so on. But in case of OL, O is 15th alphabet and $15 - 2 = 13$ th alphabet is M.

Example 3. Red, Yellow, Blue, Green.

Solution. Yellow is odd man because all other are primary colours.

Example 4. Apple, Potato, Orange, Mango, Cherry.

Solution. Potato is odd man, because potato is vegetable where as all other are fruits.

Example 5. Include – Exclude, Import – Export, Admit – Deny, Scared – Afraid.

Solution. Scared – Afraid is odd man because in this pair of words both the words have the same meaning, whereas in all other pairs, both words are opposite in meaning.

Example 6. 1, 4, 9, 16, 25, 37, 49.

Solution. Odd man is 37, because all other numbers are perfect squares.

Example 7. 8, 27, 64, 100, 125, 216, 343

Solution. 100 is odd man, because all other numbers are perfect cubes.

Example 8. 12, 18, 21, 27, 34, 42.

Solution. 34 is odd man because all other numbers are multiple of 3.



EXERCISE 8.3

Find odd man out in the following questions (1 to 19):

1. AC, BD, CE, DG, EG, FH
2. BCD, CDE, DEF, EFG
3. BDF, GIK, LMN, OQS, TVX
4. Venus, Jupiter, Mercury, Pluto, Moon, Neptune
5. Dog and Bitch, Cock and Hen, Cow and Buffalo, Lion and Lioness
6. Peaceful – Quiet, Small – Tiny, Borrow – Land, Want – Desire
7. Violet, Indigo, Black, Green, Yellow, Orange, Red
8. City, Town, District, Village, Towel
9. Reader, Writer, Printer, Publisher
10. Attractive, Pretty, Beautiful, Marvelous, Repulsive
11. 26, 38, 50, 62, 76, 86, 98
12. 67, 65, 62, 60, 57, 55, 53, 50, 47

13. 15, 25, 45, 55, 65, 72, 75, 85
15. 2, 3, 5, 7, 11, 13, 15, 17, 19, 23
17. 16, 36, 64, 81, 100, 144, 196
19. 7, 26, 63, 124, 217, 342, 511

14. 2, 5, 10, 17, 26, 37, 50, 64, 82, 101
16. 725, 871, 642, 954, 863, 734, 541
18. 231, 352, 473, 524, 682, 781, 891
20. 6, 24, 60, 120, 210, 336, 505

Answers

- | | | | |
|--------------------|----------------|----------|----------|
| 1. DG | 2. BCD | 3. LMN | 4. Moon |
| 5. Cow and Buffalo | 6. Borrow-Land | 7. Black | 8. Towel |
| 9. Reader | 10. Repulsive | 11. 76 | 12. 53 |
| 13. 72 | 14. 64 | 15. 15 | 16. 863 |
| 17. 81 | 18. 524 | 19. 217 | 20. 505 |

SYLLOGISM

Syllogism came from a greek word Syllogismos, which means conclusion. Syllogism is a kind of a logical argument in which a conclusion is drawn from two or more given propositions or statements that are assumed to be true.

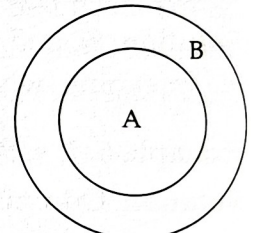
The easiest method of solving Syllogism problems is using Venn diagrams.

In this method we draw all possible Venn diagrams representing all the statements given in the question. If the conclusion can be deduced from all the possible Venn diagrams then the conclusion is true otherwise it is false.

To solve Syllogism problems, let us understand that how the statements can be represented using Venn diagrams.

Statement. All A are B

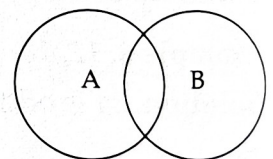
It means A is contained in B i.e. A is a subset of B but converse may not be true i.e. B may not be a subset of A.



Venn diagram

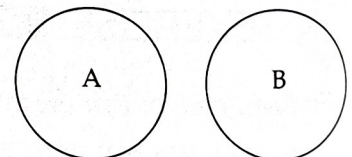
Statement. Some A are B Or Some A are not B

It means A and B intersects each other. So, we can also say that some B are A.



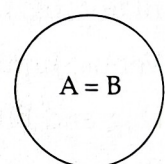
Statement. No A are B Or No B are A

It means there is nothing common in A and B i.e. A and B are disjoint sets.



Statement. A = B

It means A is subset of B and B is a subset of A.



In the following examples, which of the two conclusions is/are true on the basis of given statements:

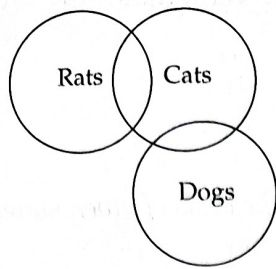
Example 1. Statements I: Some rats are cats

II: Some cats are not dogs

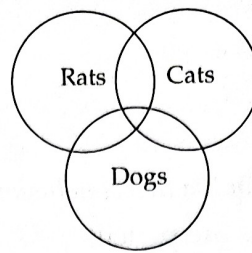
Conclusions I: Some cats are rats

II: Some dogs are rats

Solution. For the given statements; two possible Venn diagrams are shown below:



(i)



(ii)

Since conclusion I can be deduced from both the Venn diagrams, so conclusion I is true. But conclusion II cannot be deduced from Venn diagram (i), so conclusion II is false.

Example 2. Statements I: Some cups are plates

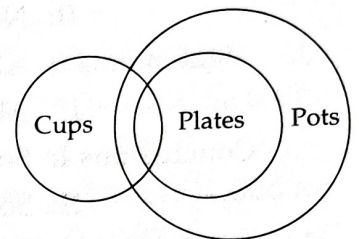
II: All plates are pots

Conclusions I: Some plates are cups

II: Some pots are cups

Solution. For the given statements, the possible Venn diagram is shown in the adjacent figure.

Since both the conclusions can be deduced from the Venn diagram, so both the conclusions are true.



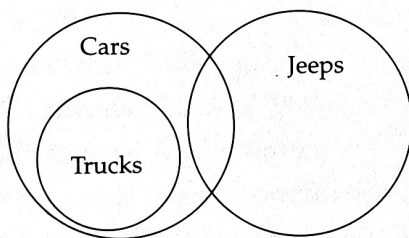
Example 3. Statements I: Some cars are jeeps

II: All trucks are cars

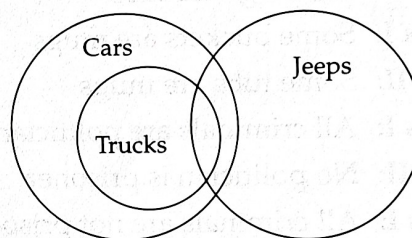
Conclusions I: No truck is jeep

II: Some jeeps are cars

Solution. For the given statements two possible Venn diagrams are shown below:



(i)



(ii)

Since conclusion I cannot be deduced from Venn diagram (ii). So conclusion I is false. Conclusion II can be deduced from both the Venn diagrams, so conclusion II is true.

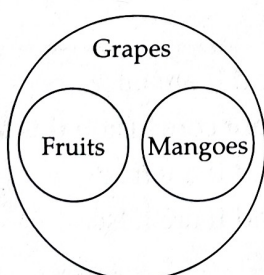
Example 4. Statements I: All fruits are grapes

II: All mangoes are grapes

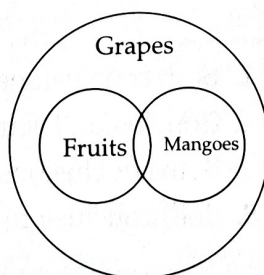
Conclusions I: Some fruits are mangoes

II: Some grapes are mangoes

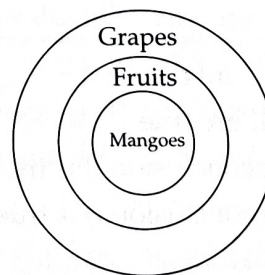
Solution. Four possible Venn diagrams are shown below:



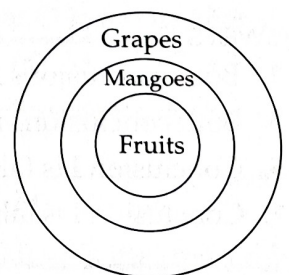
(i)



(ii)



(iii)



(iv)

Conclusion I can be deduced from the Venn diagrams (ii) and (iii) but not by (i) and (iv), so conclusion I is false. Conclusion II can be deduced by all the four Venn diagrams, so conclusion II is true.



EXERCISE 8.4

In the following questions, which of the two conclusions is/are true on the basis of given statements:

1. **Statements I:** All pens are pencils
II: Some books are pens
Conclusions I: Some pencils are books
II: Some pencils are pens
2. **Statements I:** Some cats are pets
II: No pet is lion
Conclusions I: No lion is cat
II: No pet is cat
3. **Statements I:** All fruits are oranges
II: All oranges are onions
Conclusions I: Some onions are oranges
II: Some fruits are onions
4. **Statements I:** Some rajors are brushes
II: Some brushes are not combs
Conclusions I: Some brushes are rajors
II: Some combs are rajors
5. **Statements I:** All buckets are tubs
II: All mugs are tubs
Conclusions I: Some buckets are mugs
II: Some tubs are mugs
6. **Statements I:** All criminals are politicians
II: No politician is prisoner
Conclusions I: All criminals are not prisoners
II: Some politician are criminals
7. **Statements I:** All rectangles are quadrilaterals
II: No quadrilateral is a triangle
Conclusions I: All quadrilaterals are rectangles
II: No triangle is a rectangle.
8. **Statements I:** Some sheeps are goats
II: All animals are sheeps
Conclusions I: Some animals are goats
II: No goat is sheep

Answers

- | | |
|--|--|
| 1. Both conclusions I and II are true | 2. Both conclusions I and II are false |
| 3. Both conclusions I and II are true | 4. Conclusion I is true but conclusion II is false |
| 5. Conclusion I is false but conclusion II is true | 6. Both conclusions I and II are true |
| 7. Conclusion I is false but conclusion II is true | 8. Both conclusions I and II are false. |

MULTIPLE CHOICE QUESTIONS

Choose the correct answer from the given four options in questions (1 to 28):

1. If 'MAHENDRA' is coded as OCJGPFTC then 'DINESH' will be coded as
(a) FKPGUJ (b) GLQHVK (c) BGLCQF (d) EJDFTI
2. If 'KOLKATA' is coded as 111512111201 then 'MUMBAI' will be coded as
(a) 1220121268 (b) 132113219 (c) 1422142210 (d) 1523152311
3. In a code language 'TAPE' is written as 4825, SMART is written as 91834 and 'BONE' is written as 7605, then how is 'BASERA' written?
(a) 789198 (b) 785198 (c) 789538 (d) 789138
4. In a certain language, if 'DPT' is coded as 'EQU', then how will 'TRY' be coded?
(a) SQX (b) USZ (c) SUZ (d) QSX
5. In a certain language, if 'BLOWN' is coded as 'BLNOW', then how will 'RIGHT' be coded?
(a) HIRGT (b) SJHIU (c) GHIRT (d) THIGR
6. If 'BRED' is coded as # * ? %, then 'BREEZE' will be coded as
(a) # & % % ? % (b) ? * ? % % # (c) # * ? ? @ ? (d) ? ? ? % # @
7. In a certain language, if 'CAMEL' is coded as 'DBNFM', then how will 'ROOM' be coded?
(a) NPPQ (b) SPPN (c) PPON (d) NQQP
8. If 'BLEPIN' is coded as '987416', 'MATPCN' is coded as '123416', then 'TABLE' coded as
(a) 32987 (b) 32897 (c) 38987 (d) 21987
9. In a certain language,
'hi mi si' means 'Air is life',
'si ni zi' means 'Balloon of air',
'ci zi mi' means 'Life of Pi'.
Which of the following represents 'Pi' in that language?
(a) hi (b) mi (c) ci (d) si
10. In a certain language,
321 means 'Glass of Tea',
426 means 'Tea is Brown',
796 means 'Trunks are Brown'.
Which of the following represents 'is' in that language?
(a) 6 (b) 7 (c) 4 (d) 2
11. Pointing to a picture the man said, 'The lady in the picture is my nephew's maternal grandmother'. How is the lady in the picture related to the man's sister who has no other sister?
(a) Cousin (b) Sister-in-law (c) Mother (d) Mother-in-law
12. Meenakshi is Kirti's sister. Kaavya is Kirti's mother. Dipesh is Kaavya's father. Esha is Dipesh's mother. Then how is Meenakshi related to Dipesh?
(a) Grandfather (b) Grandmother (c) Daughter (d) Granddaughter
13. P + Q means P is the brother of Q. R - S means R is the father of S. S/T means S is the sister of T, T x U means T is the mother of U, which of the following means that O is the mother of N?
(a) L + M/N - O (b) L - M x O/P (c) N/M x L/O (d) M + L/O x N
14. Pointing to a woman in a photograph, Ramesh said "She is the daughter of the father of the sister of my brother". How is that woman related to Ramesh?
(a) Wife (b) Sister (c) Daughter (d) Mother
15. A woman introduces a man as the son of the brother of her mother. How is that man related to the woman?
(a) Son (b) Uncle (c) Nephew (d) Cousin

16. P and Q are sisters and R and S are brothers. P's daughter is R's sister. What is Q's relation to S?

- (a) Grandmother (b) Mother (c) Aunt (d) Sister

17. Find the odd man out

- (a) Rickshaw (b) Bus (c) Aeroplane (d) Train

18. Find the odd man out

- (a) Sphere (b) Circle (c) Cylinder (d) Cube

19. The odd man in the number sequence

141, 273, 385, 462, 543, 672 is

- (a) 543 (b) 462 (c) 385 (d) 141

20. Which number is odd man in the numbers 3, 5, 11, 14, 17, 21?

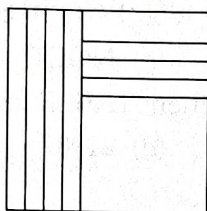
- (a) 21 (b) 17 (c) 14 (d) 3

21. Find the odd man out from the given alternatives

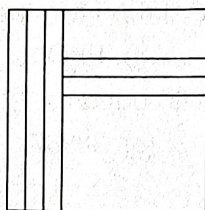
- (a) Insurance (b) Provident Fund (c) Salary (d) Shares

22. Find out the odd man from the figures given below:

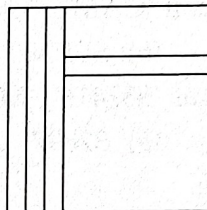
(a)



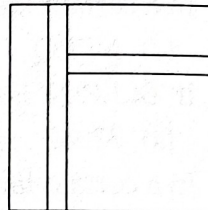
(b)



(c)



(d)



Instructions: In questions (23 to 28), two statements followed by two conclusions are given. Read the given statements and conclusions carefully and answer the questions by choosing one of the options given below:

- (a) Only conclusion I is true.
(b) Only conclusion II is true.
(c) Neither conclusion I nor conclusion II is true.
(d) Both the conclusions I and II are true.

23. **Statements I:** Some goats are vegetarians.

II: All vegetarians are blessed.

Conclusions I: Some goats are blessed.

II: Atleast some blessed are vegetarians.

24. **Statements I:** Some pictures are beds.

II: All beds are trees.

Conclusions I: Some pictures are trees.

II: Atleast some trees are beds.

25. **Statements I:** Some actors are singers.

II: All the singers are dancers.

Conclusions I: Some actors are dancers.

II: No singer is actor.

26. **Statements I:** All harmoniums are instruments.

II: All instruments are flutes.

Conclusions I: All flutes are instruments.

II: All harmoniums are flutes.

27. **Statements I:** Some mangoes are yellow.

II: Some fruits are mangoes.

Conclusions I: Some mangoes are green.

II: Fruits are yellow.

28. **Statements I:** Some ants are parrots.

II: All parrots are apples.

Conclusions I: All apples are parrots.

II: Some ants are apples.

Answers

- | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|
| 1. (a) | 2. (b) | 3. (c) | 4. (b) | 5. (c) | 6. (c) | 7. (b) |
| 8. (a) | 9. (c) | 10. (c) | 11. (c) | 12. (d) | 13. (d) | 14. (b) |
| 15. (d) | 16. (c) | 17. (c) | 18. (b) | 19. (c) | 20. (c) | 21. (c) |
| 22. (c) | 23. (d) | 24. (d) | 25. (a) | 26. (b) | 27. (c) | 28. (b) |

FILL IN THE BLANKS

Fill in the blanks in questions (1 to 5):

1. CIRCLE : HNWHQJ : : PARABOLA :
2. JAIPUR : QZRKFI : : : YSLKZO
3. TABLE : 16232481 : : CHAIR :
4. If A is the only daughter of the only son of the wife of the father-in-law of B's wife, then A is the of B.
5. If Ria's father is the only son of Priya's father-in-law, then Priya is the of Ria.

Answers

1. UFWFGTQF
2. BHOPAL
3. 24423514
4. daughter
5. mother

CASE-STUDY BASED QUESTIONS (Unsolved)

1. Coding is a method of converting information in the form of letters, words or phrases into same or other form for the purpose of secrecy.

Decoding is a method of converting the message sent by a source into the original form.

Some basic methods of coding-decoding are

- (i) Letter coding (ii) Number coding (iii) Group coding (iv) Letter for digits

Based on the above information, answer the following questions:

- (i) In a certain language if 'MATHEMATICS' is coded as 'PDWKHPDWLFV'. How is 'STATISTICS' coded?
(a) VWDWLVWLFV (b) VVDVLUWKFU
(c) VWCWLWLVFV (d) VWEWLWLVFV
- (ii) In a certain language if 'INCOME' is coded as 'HOBPLF'. How is 'EXPENSES' coded?
(a) DYFOMTDT (b) DYFODTMT
(c) DYOFMTDT (d) DYOFDTMT
- (iii) In a certain language if 'AMITABH' is coded as 3-15-11-22-3-4-10. How is 'DHERMENDRA' coded?
(a) 6-7-10-15-20-7-16-6-20-3 (b) 6-10-7-20-15-7-16-6-20-3
(c) 6-10-7-15-20-7-16-6-20-3 (d) 6-7-10-20-15-6-16-20-3
- (iv) In a certain language if 'ORANGE' is coded as 'LIZMTV'. How is 'APPLE' coded?
(a) ZLLOV (b) ZMMVO (c) ZKKOV (d) ZKKVO
- (v) In a certain language if 'SPHERE' is coded as 'EREHPS'. How is 'SQUARE' coded?
(a) AEURQS (b) EARUQS (c) ERAQUS (d) ERAUQS

2. In a family, there are seven members, A, B, C, D, E, F and G. A and B are married couple. A being the male member. D is the only son of C, who is the brother of A. E is the cousin sister of D. G is the daughter in law of F, whose husband has died.

Based on the above information, answer the following questions:

(i) How E is related to B?

(a) E is daughter of B

(b) E is granddaughter of B

(c) E is mother of B

(d) E is mother in law of B

(ii) How G is related to C?

(a) G is a sister of C

(b) G is husband of C

(c) G is wife of C

(d) G is mother of C

(iii) How A is related to F?

(a) A is a father of F

(b) A is a son of F

(c) A is a grandson of F

(d) A is a brother of F

(iv) How D is related to A?

(a) D is a son of A

(b) D is a daughter of A

(c) D is father of A

(d) D is a nephew of A

(v) How F is related to D?

(a) F is mother of D

(b) F is father of D

(c) F is daughter of D

(d) F is son of D

Answers

1. (i) (a)

(ii) (c)

(iii) (b)

(iv) (c)

(v) (d)

2. (i) (a)

(ii) (c)

(iii) (b)

(iv) (d)

(v) (a)