

Thoroughly Revised and Updated

Reasoning & Aptitude

for **GATE 2021**
and **ESE Pre 2021**

Comprehensive Theory with Examples
and Solved Questions of
GATE and ESE Prelims

Also useful for

UPSC (CSAT), MBA Entrance, Wipro, SSC, Bank (PO), TCS, Railways, Infosys,
various Public Sector Units and other Competitive Exams conducted by UPSC



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Reasoning & Aptitude for GATE 2021 & ESE 2021 Prelims

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PREFACE

I have immense pleasure in placing this edition of "Reasoning & Aptitude" before the aspirants of Competitive Examinations. The book has been written to meet the growing requirements of candidates appearing for GATE, ESE Prelims, UPSC-CSAT, SSC, various Public Sector Examinations, Bank (PO), MBA Entrance Exams, Railways and Campus Placements of Software Companies etc.

The comprehensive volume would enable the readers to acquire complete and detailed understanding of "Reasoning & Aptitude". It covers all dimensions of Arithmetic, Algebra, Geometry, Reasoning and Data Interpretation. My first-hand experience of coaching the students has been a great source of inspiration and has helped me immensely in writing this book. Preparation for Civil Services Examination taking Mathematics as optional subject also helped me sharpen the ideas and arguments developed here.

I am grateful to my parents and family members, who have been showering their blessings from the very beginning. I offer my deep sense of gratitude to my Teachers, Principals of Navodaya Vidyalayas and Professors of NIT Raipur for their blessings and guidance. I would like to acknowledge the encouragement and useful guidance provided by my colleagues and seniors serving in IAS, IFS, IPS and IRS etc. My publisher Mrs. & Mr. B. Singh have been a constant source of support and encouragement. My special thanks to the entire MADE EASY team for bringing out the book at the earliest in the hands of readers.

Suggestions and constructive comments from the readers for the improvement of the book are welcome.

Nem Singh
(Indian Revenue Service)

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C

Section

Reasoning & Data Interpretation

3.1

CHAPTER

Blood Relationship

In the exams, the success of a candidate in the questions on blood relations depends upon his knowledge about various blood relations. The easiest and non-confusing way to solve these problems would be to draw a family tree diagram and increase the levels in the hierarchy as shown below:

1st stage:

Grand Parents—Grand father, Grand mother, Grand uncle, Grand aunt.

2nd stage:

Parents and in laws—Father, Mother, Uncle, Aunt, Father-in-law, Mother-in-law.

3rd stage:

Siblings, spouse and in laws—Brother, Sister, Cousin, Wife, Husband, Brother-in-law, Sister-in-law.

4th stage:

Children and in laws—Son, Daughter, Niece, Nephew, Son-in-law, Daughter-in-law.

5th stage:

Grand children—Grand son, Grand daughter.

Mother's or father's brother	Uncle
Mother's or father's sister	Aunt
Mother's or father's mother	Grand mother
Mother's or father's father	Grand father
Grand father's or grand mother's brother	Grand uncle
Grand father's or grand mother's sister	Grand aunt
Children's children (Grand son, Grand daughter)	Grand children
Uncle or Aunt's son/daughter	Cousin
Son's wife	Daughter-in-law
Daughter's husband	Son-in-law
Sister's or brother's son	Nephew
Husband's or wife's brother or sister's husband	Brother-in-law
Husband's or wife's sister or brother's wife	Sister-in-law
Children at same parents: siblings (could be brother, all sister's or some brother's & some sister's)	

Example 1.

Pointing to a man in a photograph a man said to a woman "his mother is the only daughter of your father". How is the woman related to the man in the photograph.

- (a) Sister (b) Mother
(c) Wife (d) Daughter

Sol.(b) The only daughter of the woman's father is the woman herself, and hence the man in the photograph is her son. Therefore the woman is the mother of the man in the photograph.

Example 2.

Pointing to a man in photograph a woman said "The father of his brother is the only son of my grand father". How is the woman related to the man in photograph.

Sol.(d) The only son of woman's grand father is the father of woman and the father of the man's brother is the father of the man. On combining these two information together single information emerges that the man's father is the woman's father. Hence woman is sister of the man in the photograph.

Direction for Ex. 3 to 5.

$A + B$ means A is the daughter of B

$A - B$ means A is the husband of B

$A \times B$ means A is the brother of B

Example 3.

If $P + Q - R$, which of the following is true:

- (a) R is the mother of P
(b) R is the sister-in-law of P
(c) R is the aunt of P
(d) R is the mother-in-law of P

Sol.(d) $P + Q - R$ means P is the daughter at Q who is the husband of R. i.e. R is P's mother.

Example 4.

If $P \times Q + R$, which of following is true

- (a) P is the brother of R
(b) P is the uncle of R
(c) P is the son of R
(d) P is the father of R

Sol.(c) $P \times Q + R$ means P is the brother of Q who is daughter of R. i.e. P is son of R.

[Note: Here sex of A & B is not mentioned]

ex. → Seema is wife of Rahul → R – S

ex. → Priya is wife of Rajesh R – P

[Note: It is better to write male on the left & female on the right hand side to avoid any confusion]

(e) Is the sibling of

ex → A is sibling of B

1. A .. B or (A & B are brothers)
2. A .. B or (A is sister of B)
3. A .. B or (B is sister of A)
4. A .. B or (A & B are sisters)

(f) Grand father, Grand son relation

ex. → Ramesh and Param are the two sons of Mr. Shiv Kumar, who is the son of Mr. Sundarlal

Su
→ SK
R, P

(Note: Shiv Kumar and Sundarlal are coded as SK and Su to avoid any confusion)

(g) Where the sex of a person is not confirmed write it in a box

Like Q is the only son of S

(Here Q is male but sex of S is not mentioned)

□□□□



Practice Exercise: I

Direction (Qs. 1 to 6): Read the following information carefully and answer the question below it.

All the six members of a family P, Q, R, S, T and U are travelling together Q is the son of R but R is not the mother of Q. P and R are a married couple. T is the brother of R. S is the daughter of P. U is the brother of Q.

1. How many male members are there in the family?
(a) 1 (b) 2
(c) 3 (d) 4
2. Who is the mother of Q?
(a) S (b) U
(c) T (d) P
3. How many children does P have?
(a) One (b) Two
(c) Three (d) Four

4. Who is the wife of T?
(a) P
(b) U
(c) Q
(d) can't be determined
5. Which of the following is a pair of females?
(a) PT (b) QS
(c) SU (d) PS
6. How is U related to S?
(a) Father
(b) Brother
(c) Uncle
(d) can't be determined

Direction (Qs. 7 to 12): Read the following information carefully and answer the question below it.

A family consists of six members P, Q, R, X, Y and Z. Q is the son of R but R is not mother of Q. P and R are a married couple. Y is the brother of R. X is the daughter of P. Z is the brother of P.

7. Who is the brother-in-law of R?
(a) P (b) Z
(c) Y (d) X
8. Who is the father of Q?
(a) R (b) P
(c) Z (d) None of these
9. How many children does P have?
(a) One (b) Two
(c) Three (d) Four
10. How many female member are there in the family?
(a) One (b) Two
(c) Three (d) Four
11. How is Q related to X?
(a) Husband (b) Father
(c) Brother (d) Uncle
12. Which is a pair of brothers?
(a) P and X (b) P and Z
(c) Q and X (d) R and Y

Direction (Qs. 13 to 15): Read the following information carefully and answer the questions given below it
P is the son of Q. R, Q's sister has a son S and daughter T. U is the maternal uncle of S.

13. How is P related to S?
 (a) Cousin (b) Nephew
 (c) Uncle (d) Brother
14. How is T related to U?
 (a) Sister (b) Daughter
 (c) Niece (d) Wife
15. How many nephew does U have?
 (a) Nill (b) One
 (c) Two (d) Three
16. Ranjan is the brother of Sachin and Manick is the father of Ranjan. Jagat is the brother of Priya and Priya is the daughter of Sachin. Who is the uncle of Jagat?
 (a) Ranjan (b) Sachin
 (c) Manick (d) None of these

Direction (Qs. 17 to 18): Read the following information carefully and answer the questions given below it.

- (i) A is the father of C.
 (ii) E is the daughter of C.F is the spouse of A.
 (iii) B is the brother of C.D is the son of B.
 (iv) G is the spouse of B. H is the father of G.

17. Who is the grandmother of D?
 (a) A (b) C
 (c) F (d) H
18. Who is the son of F?
 (a) B (b) C
 (c) D (d) E

Answers

1. (d) 2. (d) 3. (c) 4. (d) 5. (d)
 6. (b) 7. (b) 8. (a) 9. (b) 10. (b)
 11. (c) 12. (d) 13. (a) 14. (c) 15. (c)
 16. (a) 17. (c) 18. (a)

Solutions

Hints (1–6)

- Sol.** → Q is son of R
 → R is not the mother, then R is father of Q
 → P and R are married couple R – P
 → T is brother of R T .. R
 → S is daughter of P P
 S
 → U is brother of Q Q .. U

Complete Solution

T.. R – P
 Q.. U .. S

1. (d)
 2. (d)
 3. (c)
 4. (d)
 5. (d)
 6. (b)

Sol. (7 – 12)

Y .. R – P .. Z
 Q .. X

7. (b)
 8. (a)
 9. (b)
 10. (b)
 11. (c)
 12. (d)

Sol.(13 to 15)

Q .. R .. U
 P S .. I

13. (a)
 14. (c)
 15. (c)

Sol.(16)

M
 R .. S
 P .. J

16. (a)

Sol.(17 – 18)

A – E H
 C .. B – G
 E D

17. (c)
 18. (a) here sex of C is not confirmed



Practice Exercise: II

1. Introducing Asha to guests, Bhasker said, “Her father is the only son of my father”. How is Asha related to Bhasker?

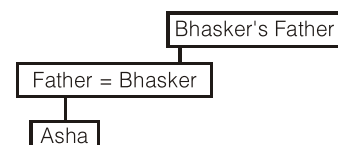
- (a) Daughter (b) Mother
(c) Sister (d) Niece
2. Akash said to Mohit "The boy in blue shirt is younger of the two brothers of the daughter of my father's wife". How is the boy in blue shirt related to Akash?
(a) Father (b) Uncle
(c) Brother (d) Nephew
3. Pointing to a man on the stage, Rita said, "He is the brother of the daughter of the wife of my husband". How is the man on the stage related to Rita?
(a) Son (b) Husband
(c) Cousin (d) Nephew
4. Pointing to a photograph, Vipul said, "She is the daughter of my grand father is only son". How is Vipul related to the girl in the photograph?
(a) Father (b) Brother
(c) Cousin (d) Data inadequate
5. A woman introduce a man as the son of the brother of her mother. How is man related to the woman?
(a) Nephew (b) Son
(c) Cousin (d) Uncle
6. Looking at a picture of a man, Harsh said, "His mother is the wife of my father's son. Brothers and sisters I have none". At whose picture was Harsh looking?
(a) His son (b) His cousin
(c) His uncle (d) His nephew
7. A man said to a lady "your mother's husband's sister is my aunt. How is the lady related to the man?
(a) Daughter (b) Grand daughter
(c) Mother (d) Sister
8. If Meena says, "Anita's father, Raman is the only son of my father-in-law, Mahipal", then how is Bindu, who is the sister of Anita, related to Mahipal?
(a) Grand daughter (b) Daughter
(c) Sister (d) Niece
9. Pointing to a girl in the photograph Amar said, "Her mother's brother is the only son of my mother's father". How is the girl's mother related to Amar?
(a) Mother (b) Sister
(c) Aunt (d) Grand mother
10. Daya has a brother Amit. Daya is the son of Chandra, Bimal is Chandra's father. In terms of relationship what is Amit to Bimal?
- (a) Son (b) Grand son
(c) Brother (d) Grand father
11. Rahul's mother is the only daughter of Monika's father, how is Monika's husband related to Rahul
(a) Uncle (b) Father
(c) Grand father (d) Brother
12. If (i) M is brother of N
(ii) B is brother of N and
(iii) M is brother of D then which of the following statements is definitely true?
(a) N is brother of B (b) N is brother of D
(c) M is brother of B (d) D is brother of M
13. Deepak is brother of Ravi, Rekha is sister of Atul, Ravi is son of Rekha. How is Deepak related to Rekha?
(a) Son (b) Brother
(c) Nephew (d) Father
14. A is B's sister, C is B's mother, D is C's father, E is D's mother. Then, how is A related to D?
(a) Grand mother (b) Grand father
(c) Daughter (d) Grand daughter
15. Given that (i) A is brother of B (ii) C is father of A (iii) D is brother of E (iv) E is daughter of B, then uncle of D is
(a) A (b) B
(c) C (d) D
16. E is the son of A, D is the son of B, E is married to C, C is B's daughter. How is D related to E?
(a) Brother (b) Uncle
(c) Father-in-law (d) Brother-in-law

Answers

1. (a) 2. (c) 3. (a) 4. (b) 5. (c)
6. (a) 7. (d) 8. (a) 9. (c) 10. (b)
11. (b) 12. (c) 13. (a) 14. (d) 15. (a)
16. (d)

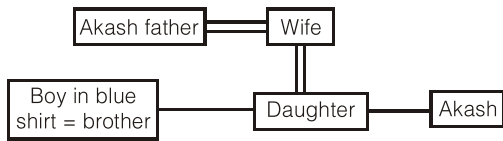
Solutions

1. (a)



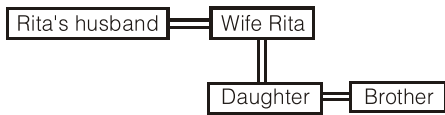
Hence, Asha is Bhasker's daughter.

2. (c)



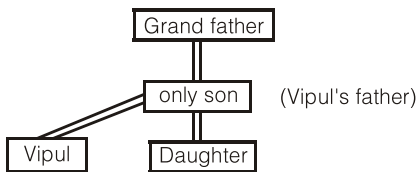
Hence brother.

3. (a)



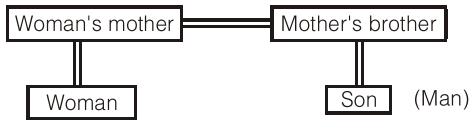
Hence person on stage is Rita's son.

4. (b)



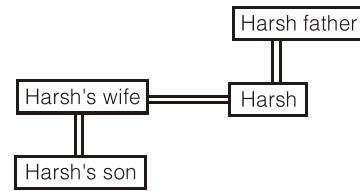
Hence Vipul is brother of girl.

5. (c)



Hence man is woman's Cousin.

6. (a)



Harsh is looking at his son's picture.

7. Sister (d)

8. Grand daughter (a)

9. Aunt (c)

10. Grand son (b)

11. Father (b)

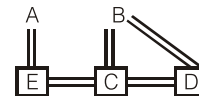
12. M is brother of B (c)

13. Son (a)

14. Grand daughter (d)

15. Uncle of D is A (a)

16. (d)



D is brother in law of E.



3.2

CHAPTER

Coding and Decoding



Practice Exercise

Direction (Qs. 1 to 5): Read the following information carefully and answer the question below it.

- If 'Rat is called Dog', 'Dog is called Mongoose', 'Mongoose' is called Lion;, 'Lion is called Snake' and 'Snake is called Elephant', which animal is reared as pet?
(a) Rat (b) Dog
(c) Mongoose (d) Lion
- If Finger is called Toe, Toe is called Foot, Foot is called Thumb, Thumb is called Ankle, Ankle is called Palm and Palm is called Knee, which one finger has different name?
(a) Thumb (b) Ankle
(c) Knee (d) Palm
- In a certain code language, 'kew xas huma deko' means 'she is eating apples', 'kew tepo qua' means 'she sells toys' and 'su lim deko' means 'I like apples'. Which word in that language means she and apples?
(a) xas & deko (b) xas & kew
(c) kew & deko (d) kew & xas
- If 'gnr tag zog qmp' stands for 'Seoul Olympic Organising Committee', 'hydo gnr emf' stands for 'Summer Olympic Games' and 'esm sdr hyto' stands for 'Modern Games History', which would be the code for Summer?
(a) hyto (b) gnr
(c) emf (d) zog
- In a certain code language, 'Pat Zoo Sim' means 'Eat Good Mangoes', 'Pus Sim Tim' means 'Mangoes and Sweets's and 'Tim Zoo Kit' means 'Purchase Good sweets', which word in the language means Good?
(a) Zoo (b) Pus
(c) Sim (d) Tim

Direction (Qs. 6 to 10): Read the following information carefully and answer the question below.

Δ means 'is greater than', $\%$ means 'is lesser than', \square means 'is equal to', $=$ means 'is not equal to', $+$ means 'is a little more than', \times means 'is a little less than'.

- If $a \Delta b$ and $b + c$, then
(a) $a \% c$ (b) $c \% a$
(c) $c + a$ (d) can't say
- If $c = a$ and $a = b$, then
(a) $b \Delta a$ (b) $c \square a$
(c) $b = a$ (d) can't say
- If $a \times b$ and $b \square c$, then
(a) $c + a$ (b) $b \Delta c$
(c) $a + c$ (d) $c \square a$
- If $c \% b$ and $b \times a$, then
(a) $a \Delta c$ (b) $c \square a$
(c) $b \Delta c$ (d) $c \Delta a$
- If $ac + bc$ then
(a) $a \square c$ (b) $b \Delta c$
(c) $c \Delta b$ (d) $b \% a$

Direction (Qs. 11 to 15): Read the following information carefully and answer the question below it.

If $>$ denotes $+$, $<$ denotes $-$, $+$ denotes \div , \wedge denotes \times , $-$ denotes $=$, \times denotes $>$ and $=$ denotes $<$, choose the correct statement in each of the following questions.

- (a) $6 + 3 > 1 = 4 + 2 < 1$
(b) $4 > 6 + 2 \times 32 + 4 < 1$
(c) $8 < 4 + 2 = 6 > 3$
(d) $14 + 7 > 3 = 6 + 3 > 2$
- (a) $14 > 18 + 9 = 16 + 4 < 1$
(b) $4 > 3 \wedge 8 < 1 - 6 + 2 > 24$
(c) $3 < 6 \wedge 4 > 25 = 8 + 4 > 1$
(d) $12 > 9 + 3 < 6 \times 25 + 5 > 6$
- (a) $13 > 7 < 6 + 2 = 3 \wedge 4$
(b) $9 > 5 > 4 - 18 + 9 > 16$

31. In the sequence of alphabets, which letter would be eight to the right of the letter which is sixteenth from the left ?

- (a) G (b) Y
(c) Z (d) X

32. CEGJLN ____ XZB. The missing group of letters in the series are ...

- (a) QSU (b) NPR
(c) PRT (d) TUX

Direction (Qs. 33 to 37): Read the following information carefully and answer the question below it.

In each of the Letter Analogy various terms of a letter series are given with one term missing as shown by (?). Choose the missing term out of the given alternatives.

33. HUA GTZ FSY ERX ?

- (a) DWQ (b) DQW
(c) WDQ (d) WQD

34. DF GJ KM NQ RT ?

- (a) UW (b) YZ
(c) XZ (d) UX

35. DCXW FEVU HGTS ?

- (a) LKPQ (b) ABZ
(c) JIRQ (d) LMRS

36. AB DEF HIJK ? STUVWX

- (a) MNOPQ (b) LMNOP
(c) LMNO (d) QRSTU

37. C G L R ?

- (a) Y (b) S
(c) U (d) Z

Answers

1. (c) 2. (b) 3. (c) 4. (c) 5. (a)
6. (b) 7. (c) 8. (a) 9. (a) 10. (d)
11. (c) 12. (b) 13. (b) 14. (d) 15. (a)
16. (b) 17. (d) 18. (a) 19. (b) 20. (b)
21. (b) 22. (a) 23. (d) 24. (b) 25. (d)
26. (b) 27. (d) 28. (a) 29. (d) 30. (d)
31. (d) 32. (a) 33. (b) 34. (d) 35. (c)
36. (a) 37. (a)

Solutions

Answer 1 to 5:

1. (c) 'Dog' is reared as pet. But 'Dog' is called 'Mongoose'. So, a 'Mongoose' is reared as pet.

2. (b) The 'Thumb' is a finger having a different name. But 'Thumb' is called 'Ankle'. So, 'Ankle' is the finger that has a different name.

3. (c) In the 1st and 2nd statements, the common code word is kew and the common word is she. So, kew means she. In the 1st and 3rd statements, the common code is deko and the common word is apples. So, deko means apples.

4. (c) In the first and second statements, the common code word is gnr and the common word is Olympic. So, gnr means Olympic. In the second and third statements, the common code is hyto and the common word is games. So, hyto means games. Thus, in the second statement, emf means summer.

5. (a) From 1st and 3rd statements. Zoo means Good.

Answer 6 to 10:

6. (b) $a \Delta b$ and $b + c \Rightarrow a > b$
and b is a little more than c
 $\Rightarrow a > c$
 $\Rightarrow c < a$
i.e. $c \% a$.

7. (c) $c = a$ and $a = b \Rightarrow c \neq a$ and $a \neq b$
 $\Rightarrow b \neq a$ i.e. $b = a$.

8. (a) $a \times b$ and $b \square c \Rightarrow a$ is a little less than b and $b = c$.
 $\Rightarrow a$ is a little less than c .
 $\Rightarrow c$ is a little more than a i.e. $c + a$.

9. (a) $c \% b \Rightarrow c < b$
and $b \times a \Rightarrow b$ is a little less than a .
 $\Rightarrow c < a \Rightarrow a > c$ i.e. $a \Delta c$.

10. (d) $ac + bc \Rightarrow ac > bc \Rightarrow a > b \Rightarrow b < a$ i.e. $b \% a$.

Answer 11 to 15 :

11. (c) Using the proper notations in (3), we get the statements as $8 - 4 + 2 < 6 + 3$ or $6 < 9$, which is true.

12. (b) Using the proper notations in (2), we get the statements as $4 + 3 \times 8 - 1 = 6 \div 2 + 24$ or $27 = 27$.

13. (b) Using the proper notations in (2), we get the statements as $9 + 5 + 4 = 18 + 9 + 16$ or $18 = 18$.

14. (d) Using the proper notations in (4), we get the statements as $31 + 1 - 2 < 4 + 6 \times 7$ or $30 < 46$.

15. (a) Using the proper notations in (1), we get the statements as $7 + 7 - 7 \div 7 < 14$ or $13 < 14$.

Answer 16 to 18:

16. (b) In the second and third statements, the common code word is 'hee' and the common word is

'flowers'. So, 'hee' stands for 'flowers'. Thus, in the second statement, 'silk' stands for 'red'.

17. (d) Since from the given information, we can only find the code for 'are' in the first statement, it cannot be determined which of the remaining two codes for 'roses'.
18. (a) Clearly, the required code will consist of the same codes as in the third statements with the code for 'red' i.e. silk added to it.

Answer 19 to 22:

If, number of Christmas cards = x
 Then, number of Deepawali cards = $2x$
 Number of New Year cards = $4x$
 and number of Birthday cards
 = $x + 2x + 4x$
 = $7x$
 i.e. $7x + (x + 2x + 4x) + 1 = 211$
 $14x = 210$
 $x = 15$
 Thus, number of Birthday cards
 = 15×7
 = 105
 Number of New Year cards
 = 15×4
 = 60
 Number of Deepawali cards
 = 15×2
 = 30
 Number of Christmas cards
 = 15×1
 = 15
 Number of Marriage Anniversary card
 = 1
 Total = 211

19. (b)

20. (b)

21. (b)

22. (a) $105 : 15 = 7 : 1$.

Answer 23 to 28:

Let the digits be x, y, z such that the number is $100x + 10y + z$
 Thus, the other five 3 digit number which we may obtained using these 3 digits will be
 $100x + 10z + y$
 $100y + 10x + z$
 $100y + 10z + x$
 $100z + 10x + y$
 $100z + 10y + x$

Now when we add all the six three digit numbers possible to be formed by these three digits:

$$222(x + y + z) = 2664 \text{ or } x + y + z = 12$$

$$\text{Also } x + z = y/2 \text{ thus } y = 8$$

$$\text{Thus, } x + z = 4$$

As the digits are non zero and distinct thus x and z have to be 1 and 3 but not necessarily in the same order. Thus we cannot say whether the number is 183 or 381.

23. (d)

24. (b)

25. (d)

26. (b)

27. (d)

28. (a)

Answer 29 to 32:

29. (d) All integer should be odd to get odd result.

30. (d) None of the integer should be even.

31. (d)

32. (a)

Answer 33 to 37:

33. (b) All the letters of each term are moved one step backward to obtain the corresponding letters of the next term.

34. (d) There is a gap of one letter between both the letters of first term, a gap of two letters between both the letters of second term and again a gap of one and two letters between the letters of third and fourth terms respectively. Besides, the last letter of each term and the first letter of next term are in alphabetical.

35. (c) First two letters of each term are in reverse order. Similarly third and fourth letters are also in reverse order. Besides, the second letter of each term is the letter next to the first letter of the proceeding term.

36. (a) The number of letters in the term goes on increasing by 1 at each step. Each term consists of letters in alphabetical. The last letter of each term and the first letter of the next term are alternate.

37. (a) There is a gap of three letters between the first and the second term, four letters between the second and the third term; and five letters between the third and the fourth term. So, there should be a gap of six letters between the fourth term and the missing term.

