DATA ARRANGEMENT, BLOOD RELATIONS

DATA ARRANGEMENT

In Analytical Reasoning questions, a set of initial conditions is spelt out while describing a situation. Some of the questions that follow could have some additional conditions too. Each question is to be answered applying the initial conditions and also the additional conditions if any, given in the question. Depending on the situation the conditions cover, an analytical question can be of different types. The more popular types are

- Linear arrangement
- Circular arrangement
- Cross-variable relationship
- Linear relationship

Linear arrangement problems deal with aligning the objects in a sequential fashion based on the information given about their positions.

Finally, you have to determine a unique arrangement of objects based on which the related questions are to be answered. Let us substantiate this with a simple example.

Example 1

Five friends are sitting on a bench facing North. A is to the left of B but on the right of C. D is to the right of B but on the left of E. Who are at the extremes?

Solution

In this case, the objects are the five students, A, B, C, D and E. The positions in which they are to be seated consist of a bench. Let us call these positions 1, 2, 3, 4 and 5. 1 is left most and 5 the right most.

Now, filter the mentioned facts and statements and separate the useful data from the total information given in the question statement.

(1) A is to the left of B but on the right of C.

This statement provides information about A with respect to B and C. In other words, the position of A is between B and C.

(• • •)
C A B

(2) D is to the right of B but on the left of E. This statement provides information about D with respect to B and E. In other words, the position of D is between B and E.

(• • •)
B D E

It further makes it clear that B is the middle position and C and E are at the extremes.

(• • • • •)
C A B D E

Thus it may be noted that the second statement in conjugation with the first statement would provide a unique solution to this problem.

Steps to solve Linear Arrangement Problems

(i) Identify the number of objects and their names.

(ii) Use a pictorial method to represent the objects and their positions.

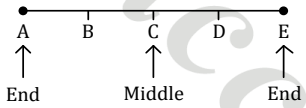
(iii) Filter the information to come up with relevant facts about their positions and try to come up with a unique solution.

(iv) Answer the questions based on the unique solution as determined above.

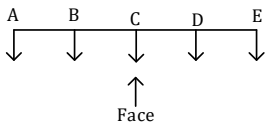
The linear arrangement can further be of two types, based upon the number of rows.

One Row Sequence

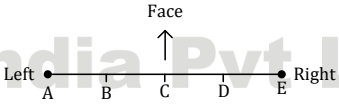
In such an arrangement, objects/persons are placed in a single row as shown below.



If the direction of the face is given, then left and right are taken according to the given direction of face as given below.



If the direction of face is not given, then we should take ourselves as the base to determine the left and right of the objects/persons. In other words, we can say that in such cases our left and right are the left and right of the objects/persons as indicated below.



Two Row Sequence

This type of linear arrangement problem is just an extension of the 'Elements in a single row' problem explained earlier. The difference is that in this case, we have two rows of objects and hence we can also use information about the relative positions of objects across rows to find out how they are arranged.

The following example will make this clear.

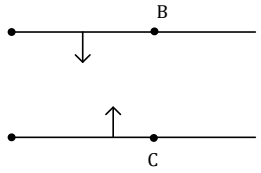
Example 2

Eight persons A, B, C, D, E, F, G and H are sitting in two rows opposite to each other. Each row has four persons. B and C are sitting in front of each other. C is between D and E. H is sitting to the immediate left of E. H and F are diagonally opposite. G and B are not next to each other.

Solution

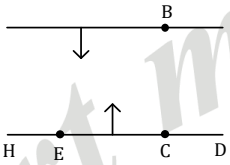
Let as analyze the information given in the question.

(i) B and C are sitting in front of each other. The above implies that B and C are in opposite rows facing each other.



(ii) C is between D and E.

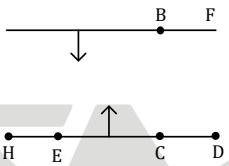
(iii) H is sitting to the immediate left of E.



The above two imply that H, E, C and D are in the same row with H and D at the two ends. Therefore, A, B, G and F should be sitting in the opposite row with B and C facing each other.

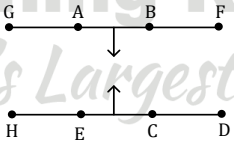
(iv) H and F are diagonally opposite.

This implies that F is in the other row at the end position which is diagonally opposite to the position of H.



(v) G and B are not next to each other.

This implies that G is at the right end of the row (as H is at the left end of the row) with A between G and B.



We thus get the unique solution to the problem as above.

Let us now answer the following questions.

(1) Who is in front of A?

From the above final seating arrangement, it is clear that E is in front of A.

(2) Who is sitting diagonally opposite to G?

Clearly, D is sitting diagonally opposite to G.

We are giving below one more example of two row arrangement for further clarity.

Example 3

Six persons A, B, C, D, E and F are sitting in two rows with three in each row and facing each other.

(i) E is not at the end of any row.

(ii) D is second to the left of F.

(iii) C, the neighbour of E, is sitting diagonally opposite to D.

(iv) B is the neighbour of F.

Solution

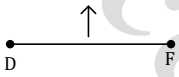
Let us now analyse the above information and arrive at the unique solution.

(i) E is not at the end of any row.

This implies that E is seated in the middle position of the row, either in the 1st or 2nd row.

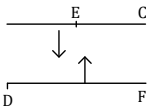
(ii) D is second to the left of F.

This implies that D and F are in the same row and that F has got to be at one end of the row as there are only 3 persons in a row. D will be at the other end.



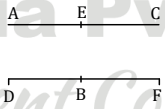
(iii) C, the neighbour of E, is sitting diagonally opposite to D.

This implies that C and E are neighbours in the second row and that C is seated at the end of the row diagonally opposite to D who is in the first row.



(iv) B is the neighbour of F.

This implies that B is in the middle position of the row and consequently A should be in the second row at the end diagonally opposite to F. The final seating arrangement is thus complete.



Final Arrangement

We have thus arrived at the unique solution of the problem and we can now answer the questions.

(1) Who is sitting in front of C?

Ans: It is clear from the final diagram that F is sitting in front of C.

(2) Which of the following groups is in one of the two rows?

(a) A, E and C (b) C, E and B

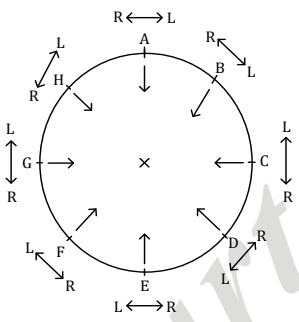
(c) A, E and F (d) F, B and C

Ans: Again, it is clear from the final diagram that A, E and C are seated in one of the two rows.

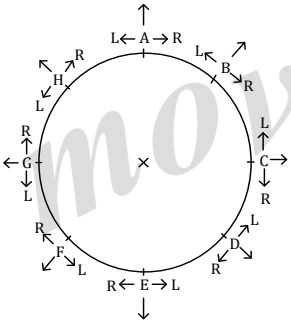
II. CIRCULAR ARRANGEMENT

In this type of arrangement, the objects/persons are placed around a circle either facing the centre or facing the direction opposite to the centre. The left and right of each person/object in both the cases can be understood with the help of the following example.

A, B, C, D, E and F are sitting around a circular table. The left and right of each person is given in the following two diagrams when they are facing the centre and when they are facing the direction opposite to the centre.



Facing the centre



Facing the direction opposite to the centre

In a circular arrangement, there is no 'right end' and left end' as there is in the case of arrangement in a row. What we have essentially done is we have tied up the two ends of a row so that the 'last' person is connected to the 'first' person.

While solving this type of problem the exact position of any object/person does not hold any relevance. Only information regarding relative position of any object/person i.e. its position with respect to the position of any other object/person is important. For instance, in the above example, B sitting between A and C is important.

Let us look at the following solved examples to understand clearly the solving technique.

Example 1

Four Directors A, B, C and D and four Senior Executives E, F, G and H are sitting around a circular table facing one another.

The following information is furnished.

I. No two Directors or two Senior Executives are sitting side by side.

II. Director C, who is sitting between Senior Executives G and E, is facing the Director D.

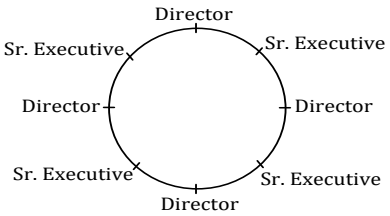
III. The Senior Executive F is between the Directors D and A and is facing the Senior Executive G.

IV. Senior Executive H is to the right of the Director B.

Solution

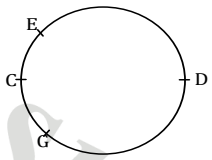
We will now analyse the above information and move towards preparing the diagram and hence answering the questions that follow.

I. Information I goes in to our diagram as follows.



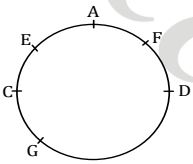
II. C, who is sitting between G and E is facing D.

This information is represented in the diagram as follows.



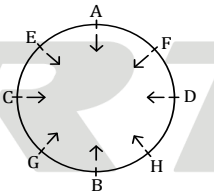
III. F is between D and A and is facing G.

This information goes into the diagram as follows.



IV. H is to the right of B.

This information goes in to the diagram as follows and thus completes the final seating arrangement.



Now, we can answer the questions by referring to the final arrangement.

(1) Who is sitting to the left of Senior Executive E?

Ans: Clearly, Director A is sitting to the left of E.

(2) Director B is facing whom?

Ans: Clearly, Director B is facing the Director A.

(3) Who are seated on either side of the Director B?

Ans: Clearly, the Senior Executives G and H are sitting on either side of the Director B.

Example 2

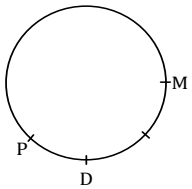
M, P, D, Q, T, R, B and W are sitting around a circular table facing the centre. D is second to the left of M who is third to the right of P. W is third to the right of Q who is second to the left of B. R is third to the right of T.

Solution

Let us analyse the information provided and prepare the diagram to answer the questions that follow.

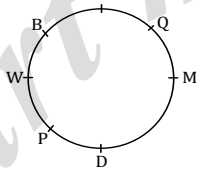
I. D is second to the left of M who is third to the right of P.

The above fixes the position of D and M with reference to P as shown.



II. W is third to the right of Q who is second to the left of B.

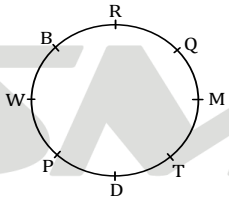
The above fixes the position of W and Q with reference to B as shown.



III. R is third to the right of T.

This fixes the position of R with reference to T and thus completes the sitting arrangement as shown.

We can now answer the questions referring to the final diagram.



Final seating arrangement

(1) Who is third to the left of M?

Ans: From the final arrangement, P is third to the left of M.

(2) Which pair represents the immediate neighbours of R?

Ans: As per the diagram, B and Q are the immediate neighbours of R.

(3) Who is fourth to the right of W?

Ans: As per the diagram, M is fourth to the right of W.

(4) Who is second to the right of P.

Ans: As per the diagram, T is second to the right of P.

(5) In which of the following pairs is the first person sitting to the immediate right of second person?

(a) PD (b) WP (c) BW

(d) RQ (e) MQ

Ans: As per the final diagram, the person R is sitting to the immediate right of Q. In the case of other options, the first person is sitting to the immediate left of the second person.

Hence, the option (d).

COMPLEX ARRANGEMENT

Cross-variable relationship comes under complex arrangement problems. These are similar to Linear Arrangement but unlike linear arrangement where the objects have only one property (their positioning), the objects here have multiple properties. Using these informational clues relating to the properties, you are required to match all the objects with all their different properties. Let us take up a simple example to make things clear.

Saxena, Gupta and Banerjee are three professionals who live in Delhi, Lucknow and Kanpur, not necessarily in that order. Banerjee is a Doctor while the other two are of one of the two professions – Lawyer and Professor. The professor lives in Kanpur. Saxena lives in Delhi.

In this case, the three objects are the three professionals – Saxena, Gupta and Banerjee. The properties are their city of residence and their profession.

Now, analyze the information that is provided and filter the information that is relevant.

Information

1. Banerjee is a Doctor

This is the kind of information that relates an object with a property. It is given that Banerjee is a Doctor which further implies that Saxena and Gupta cannot be Doctors.

2. The Professor lives in Kanpur

This piece of information relates a property type with another property type. It says the person who is the Professor lives in Kanpur. This further implies that Banerjee cannot be that person since it is already known that he is a doctor.

3. Saxena lives in Delhi

This information again relates an object with a property type. It says that Saxena lives in Delhi. This means that he cannot live in Kanpur as the Professor lives. This further implies that Saxena is the Lawyer while Gupta is the Professor who lives in Kanpur. It also means that Banerjee lives in Lucknow.

The final matching arrangement is as follows.

Objects	City of Residence	Profession
Gupta	Kanpur	Professor
Saxena	Delhi	Lawyer
Banerjee	Lucknow	Doctor

Solving Techniques

There are two methods that can be applied.

(A) Consolidated Table Method

(B) Matrix Method

(A) Consolidated Table Method

Here, we prepare a table where the second column lists down the objects and the remaining columns that follow have as headings the properties associated with the objects. The first column is for us to write which property types are to be eliminated for the particular object we are considering in the row.

To understand this more clearly let us take up the previous example and apply the consolidated Table method. In the example, the three objects are Gupta, Saxena and Banerjee. The first property was their city in which they live, the property types of which were Kanpur, Delhi and Lucknow. The second property was their profession, the types being Doctor, Lawyer and Professor. In the table, the first column will be left blank to write down property types that are eliminated for a particular object.

The completed consolidated Table will be as follows.

Eliminated	Name	City	Profession
Professor Delhi Kanpur	B`anerjee	Lucknow	Doctor
Doctor	Saxena	Delhi	Lawyer
Doctor, Delhi	Gupta	Kanpur	Professor

The above final table is used to answer the questions that follow. If the question has additional information, modify the table accordingly.

(B) Matrix Method

In this method, we prepare a table with the first column as our object heading and the remaining column headings as the various property types. Each row of matrix corresponds to the object name. Ticks or crosses are put in the boxes other than in the first column depending on whether the object has that property type or not.

Taking the same example as for the previous method, the m atrix table will be as follows.

Name	Doctor	Lawyer	Professor	Delhi	Lucknow	Kanpur
Saxena		✓		✓		
Gupta			✓			✓
Banerjee	✓				✓	

Comparison between the two methods

The above mentioned methods of solving complex arrangement problems differ only in methodology and not in reasoning and hence both methods can be used to solve the problems. The applicability of the method depends upon various parameters that need to be considered before starting solving the problem.

BLOOD RELATIONS

Blood relation questions involve analysis of information giving the blood relationship among the members of a family. In this, a chain of relationships is given and on the basis of this information, relation between any two members of the chain is required to be found out.

The candidates should be familiar with the knowledge of blood relations in the family and some of the terms used to address relatives are presented below to help solve such questions.

Relationship	Name of relation
Mother's or father's son	Brother
Mother's or father's daughter	Sister
Mother's or father's brother	Uncle
Mother's or father's sister	Aunt
Mother's or father's father	Grandfather
Mother's or father's mother	Grandmother
Son's wife	Daughter-in-law
Daughter's husband	Son-in-law
Husband's or wife's sister	Sister-in-law
Husband's or wife's brother	Brother-in-law
Sister's or brother's son	Nephew
Sister's or brother's daughter	Niece
Uncle's or aunt's son/daughter	Cousin
Sister's husband	Brother-in-law
Brother's wife	Sister-in-law
Grandchild's daughter	Great granddaughter

The following symbols are generally used to represent family relations.

Symbols	Meaning	Symbols	Meaning
⊕	Male	⊖ | ⊕	Mother–Son
⊖	Female	⊖ | ⊖	Mother–Daughter
⊕⟷⊖	Husband–Wife	⊕——⊕	Brother–Brother
⊕ | ⊕	Father–Son	⊕——⊖	Brother–Sister
⊕ | ⊖	Father–Daughter	⊖——⊖	Sister–Sister

A relation on the mother's side is called maternal and a relation on the father's side is called paternal. Thus mother's brother is maternal uncle while father's brother is paternal uncle.

The different types of questions under this subject are as follows.

(i) Blood relation based on conversation
(ii) Blood relation based on puzzles
(iii) Symbolically coded blood relationship

(i) Blood relation based on conversation

Under conversation, a roundabout description is given in the form of small relationships and you are required to analyse the whole chain of relationship and decipher the direct relationship between the persons concerned.

Application 1

Ram said, pointing to Krishna, "His father is my father's only son". How is Ram related to Krishna?

(a) Grandfather (b) Grandson
(c) Son (d) Father

Solution: (d)

Clearly, the only son of Ram's father is Ram himself. This means that Ram is the father of Krishna.

Application 2

Pointing to a lady in the photograph, Shoba said "Her son's father is the son-in-law of my mother". How is Shoba related to the lady?

(a) Aunt (b) Mother
(c) Sister (d) Cousin

Solution: (c)

The lady's son's father is the lady's husband. So, the lady's husband is the son-in-law of Shoba's mother. Thus, Shoba is the lady's sister. Hence, the option (c).

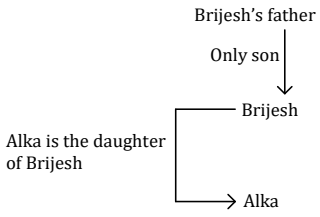
Application 3

Introducing Alka to guests, Brijesh said "Her father is the only son of my father". How is Alka related to Brijesh?

(a) Daughter (b) Mother
(c) Sister (d) Niece

Solution: (a)

From the information given, let us draw the family relationship.



Clearly, Brijesh is the only son of his father. This means Brijesh is the father of Alka. Hence, Alka is the daughter of Brijesh.

(ii) Blood relation based on puzzles

In this type of questions, information about blood relations of more than two persons is given in the form of some puzzle. The candidate is required to analyse the information, workout a family chart and then answer the given questions.

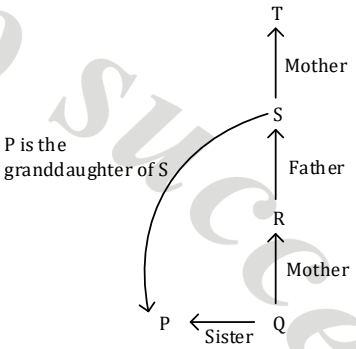
Application 4

If P is Q's sister, R is Q's mother, S is R's father and T is S's mother, then how is P related to S?

(a) Aunt (b) Daughter
(c) Granddaughter (d) Mother

Solution: (c)

From the information given, the family chart is as follows.



Clearly, P is the granddaughter of S.

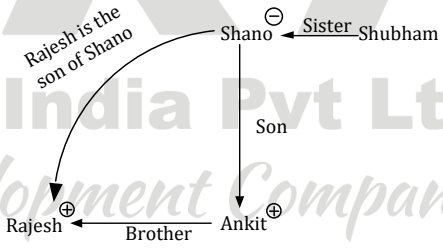
Application 5

Rajesh is the brother of Ankit. Shano is the sister of Shubham. Ankit is the son of Shano. How is Rajesh related to Shano?

(a) Father (b) Brother
(c) Son (d) Nephew

Solution: (c)

The family diagram as per information is as follows



It is clear that Rajesh is the son of Shano.

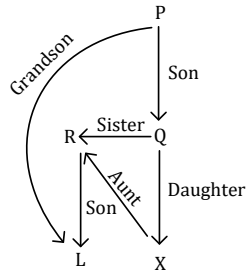
Application 6

Q is the son of P. X is the daughter of Q. R is the aunt of X and L is the son of R. Then, what is L's relation with P?

(a) Son (b) Nephew
(c) Grandson (d) Cousin

Solution: (c)

We can draw the family chart from the information given as follows.



It is clear from the chart that L is the grandson of P.

(iii) Symbolically coded blood relationship.

In this type of questions, the relationship is represented by certain specific codes or symbols such as +, –, ×, ÷, *, $, @, ◘, O, £, etc. The candidate is then required to analyse some given codes to determine the relationship between a set of persons or to express a given relationship in the coded form.

Application 7

If 'P+Q' means 'P is the father of Q', 'P×Q' means 'P is the brother of Q', 'P – Q' means 'P is the mother of Q', then which of the following is definitely true about C – A + B?

(a) A is the son of C (b) B is the son of A
(c) C is the mother of B (d) B is the father of A

Solution: (a)

Taking into account the relationships for which the given symbols stand, 'C – A + B' means 'C is the mother of A who is the father of B'. It is, therefore, clear that A is a male and hence, the son of C. Hence the option (a).

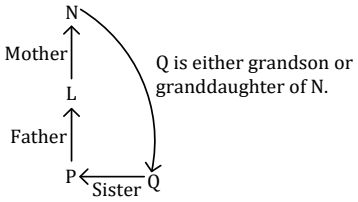
Application 8

If 'P$Q' means 'P is the father of Q, 'P#Q' means 'P is the mother of Q', 'P*Q' means 'P is the sister of Q', then how is Q related to N in N#L$P*Q?

(a) Nephew (b) Granddaughter
(c) Grandson (d) Data inadequate

Solution: (d)

By decoding the symbols, we get the following family chart for N#L$P*Q.



Clearly, Q can either be the grandson or granddaughter of N, depending upon the gender of Q which is not given. Therefore, the data is inadequate to establish the correct relationship between N and Q.

CLASS WORK

Directions for Q1 to Q5: Study the given information carefully and answer the following questions.

Seven boxes G, K, M, D, C, H and A of different colours viz. Blue, White, Grey, Peach, Violet, Yellow and Pink are placed one above the other, but not necessarily in the same order. The position of these boxes were numbered from 1 to 7 (7 being the topmost).

Box K is placed immediately below box C. More than two boxes are placed below the Blue box. Box M is placed above the box which is Blue color. The box which is Peach colour is placed immediately below box G. Only one box is placed between the box which is Blue in colour and box H. Box A is placed immediately below the box which is Yellow colour. White colour box is placed below the box K. Only two boxes are placed between White box and Pink box. The Grey box is not placed on the top. Box M is placed immediately below Box H. There are two boxes placed between the boxes which are Peach and Blue in colour. Box A is not Blue colour box.

1. What is the colour of box H?
   (a) Peach (b) Violet
   (c) White (d) Grey

2. Find the odd one out?
   (a) C (b) G (c) M (d) H

3. What is the difference in position number of grey and yellow box?
   (a) 2 (b) 3 (c) 4 (d) 5

4. Which box among the following were not kept adjacent to each other?
   (a) Peach, Grey (b) Yellow, Pink
   (c) Blue, Grey (d) Violet, Grey

5. How many boxes are kept above pink box?
   (a) 4 (b) 1 (c) 2 (d) 3

Directions for Q6 to Q10: Read the following information and answer the given questions.

In an international meet, representatives A, B, C, D, E, F, G, and H are from eight different countries viz. Thailand, France, Holland, Austria, USA, Spain, India and Germany (not necessarily in the same order) sit around a circular table facing center. A represents Germany and sits third to the left of E. The representative from India sits to the immediate right of A.

D, who is from Holland sits second to the right of B. C, who is from Spain, sits exactly in the middle of people representing USA and India. G, the representative from France, sits second to the left of H, who is from Thailand. B and C are not Neighbours.

The representatives from Austria and USA are not immediate neighbours of each other.

6. Who is representing India?
(a) F (b) E (c) D (d) C

7. B is the representative of which country?
(a) USA (b) Spain
(c) Austria (d) India

8. Who is sitting exactly opposite to the person representing USA?
(a) Person representing Spain
(b) Person representing Holland
(c) Person representing Thailand
(d) Person representing India

9. Who is sitting third to the left of person representing spain?
(a) B (b) D (c) G (d) A

10. Who is sitting between B and D?
(a) E (b) F (c) G (d) H

Directions for Q11 to Q15: Read the following information and answer the questions asked below.

Eight students A, B, C, D, E, F, G and H like different subject namely – English, Hindi, Physics, Computer, Math, Sanskrit, Chemistry and Biology but not necessarily in the same order.

E likes Sanskrit. B likes either Math or Physics. H does not like Hindi and English. A likes Chemistry. G neither likes English nor Hindi. D does not like English. G and H do not like Computer. Neither G nor H likes Math. G does not like Biology. Neither C nor D likes Hindi.

11. Which of the following combination is true?
(a) B – Physics (b) G – Math
(c) D – Computer (d) E – Biology

12. Who among the following like Hindi?
(a) B (b) E (c) G (d) F

13. E likes which of the following subject?
(a) Sanskrit (b) Computer
(c) English (d) Physics

14. Who among the following likes Biology?
(a) H (b) F (c) C (d) G

15. Which of the following subject C likes?
(a) Biology (b) English
(c) Hindi (d) Sanskrit

16. Jerry pointed out to a person and said, "Sarin is your only brother's brother-in-law's sister". How is Sarin related to me?
(a) Sister (b) Cousin
(c) Aunt (d) Sister-in-law

17. Pointing to a man, a girl said, "He is the husband of the granddaughter of the mother of my mother". How is the man related to the girl?
(a) Cousin (b) Brother-in-law
(c) Brother (d) Father

18. Pointing to a man in a photograph, another man said, "He is the father of my daughter's son. How is the man in the photograph related to the man?
(a) Brother (b) Son-in-law
(c) Father (d) Son

19. M and N have two children A and B. F is the spouse of B. D is the child of F. P is the son-in-law of N. K is the child of P. Who is the male child of M and N?
(a) B (b) D (c) A (d) K

20. Pointing to a girl child in a photograph, a woman said, "Her mother's sister is the wife of my son". How is the woman related to the child?
(a) Mother (b) Daughter
(c) Sister (d) None of these

21. Rahul went to his mother's mother-in-law's only son's daughter's husband's son's maternal uncle and asked for some money. How is this person related to Rahul?
(a) Brother (b) Cousin
(c) Father (d) Uncle

22. Pointing to a lady in the photograph, a man tells Meetu, "I am the only son of this lady and her daughter is your maternal Aunt". How is the speaker related to Meetu's mother?
(a) Husband (b) Father
(c) Brother (d) Cousin

23. Seema is Tanya's mother's son's only sister's husband's daughter. What is the relationship between Seema and Tanya?
(a) Sisters (b) Cousins
(c) Niece and aunt (d) Cannot be determined

24. Pointing to a girl, Arvind said "She is the daughter of the only child of my father," How is Arvind's wife related to that girl?
(a) Daughter (b) Mother
(c) Aunt (d) Sister

25. Looking at a picture, X said that the lady in the picture is her father's mother's mother-in-law's only daughter-in-law's only granddaughter. Who is the lady in the picture?
(a) X herself (b) X's grandmother
(c) X's mother (d) X's daughter