



Unit-5

Mathematical Reasoning

NTA UGC NET PAPER 1 STUDY MATERIAL

STUDY OF EDUCATION

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What is Reasoning?

The **reasoning** is a way of assessment of the thinking ability and solving the problem in a logical pattern. The reasoning supports to identify the potential problem-solving ability in all aspiring candidates (who will be a research scholar or an assistant professor) by assessing verbal and non-verbal thinking.

Types of Reasoning

There are two types of reasoning:

- A. **Verbal Reasoning**
- B. **Non-Verbal Reasoning** (No questions from this type of reasoning in UGC NET Exam)

A. Verbal Reasoning

Verbal reasoning does aware of how a person takes new information by measuring their ability to engage with language, i.e., verbal information. The Verbal Reasoning measures a candidate's ability to engage with the language medium to identify their wider reasoning ability and potential. Verbal reasoning highlights pupils' skills in verbal thinking above and beyond their formal literacy abilities and can be used alone or as part of a wider assessment programme.

Verbal reasoning further divided into two parts:

1. **General Mental Ability:** It includes different type of reasoning questions like, series completion, analogy, classification, coding-decoding, blood relations, direction sense test, logical venn diagrams, alphabet test, alphanumeric sequence puzzle, number, ranking & time sequence test, mathematical operations, logical sequence of words, arithmetical reasoning, etc.
2. **Logical Deduction:** It concludes logic, statement-arguments, statement – assumptions, statement-courses of action, statement-conclusions, deriving conclusions from passages, theme detection, cause and effect reasoning.

B. Non-Verbal Reasoning

Non-Verbal reasoning involves no reading, and it provides insight into the abilities of candidates who think more easily in images than words.

The non-verbal reasoning covers various types of questions, testing vocabulary, verbal analogies, logical reasoning, symbol manipulation using letters, numbers, and words in sentences.

MATHEMATICAL REASONING

Non-Verbal reasoning identifies the potential in the individuals as the assessment is word-free and non-culturally specific, and therefore not biased towards any social, cultural, or linguistic group.

Types of Reasoning based on Arguments

The three types of reasoning based on arguments that are followings:

- a. Deductive Reasoning
- b. Inductive Reasoning
- c. Abductive Reasoning

For more details about the types of reasoning based on arguments, you can visit the Deductive and Inductive Reasoning of Unit- Logical Reasoning.

Number series, Letter series, Codes and Relationships

Series Completion

It is an important topic in reasoning, especially for UGC NET Paper 1. In series completion, the term follows a certain pattern throughout. The candidate is required to identify the pattern either to complete the given series with the most suitable option or to find the wrong or missing term in the series.

There are three types of series completion

1. NUMBER SERIES

In this of series completion, you have to find out the next or the wrong or the missing number in the series, which follows a particular pattern.

E.g., Which number would replace the question mark (?) in series 2, 7, 14, 23, ?, 47 (a) 28
(b) 34 (c) 31 (d) 38

Ans.: The given sequence is +5, +7, +9, and so on. i.e. $2+5=7$, $7+7=14$, $14+9=23$

The missing number would be, $23+11=34$.

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Q. Which is the number that should come next in the following series? 4, 6, 12, 14, 28, 30,

- (a) 32 (b) 64 (c) 62 (d) 60

Ans.: The given sequence is a combination of two series 4, 12, 28, ... and 6, 14, 30,

Clearly the number to be found belongs to the first series. Now the pattern followed is +8, +16, +32.

So, the missing number = $(28 + 32) = 60$, Hence, the answer is (d)

Q. Find the wrong number in the series. 7, 28, 63, 124, 215, 342

- (a) 7 (b) 28 (c) 124 (d) 215

Ans.: The right sequence is $2^3 - 1, 3^3 - 1, 4^3 - 1, \dots$ etc. Here 28 is wrong; so, the answer is (b)

2. ALPHABET SERIES

Alphabet series consists of alphabets placed in a specific pattern. If you keep in your mind the order of the alphabet with their respective position (number), it will help you answer the questions quickly. We all know that the total alphabets are 26.

We can arrange in ascending and descending order, like

1. Position number of letters in English alphabets.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
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

2. Position number of letters in English alphabets in reverse order

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
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

E.g.: What will be the next term in BKS, DJT, FIU, HHV,?

- (a) IJX (b) IGX (c) JGW (d) IGU

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Ans: (c). In each term, the first letter is moved two steps forward, the second letter one step backward, and the third letter one step forward to obtain the corresponding letter of the next term. So, the missing term is JGW.

3. LETTER SERIES

This type of question usually consists of a series of small letters that follow a certain pattern. However, some letters are missing from the series. The candidate is required to choose this alternative as the answer.

Eg: aab - aaa - bba -

(a) baa (b) abb (c) bab (d) aab

1. The first blank space should be filled in by 'b' so that we have two a's followed by two bs.

1. The second blank space should be filled in either by 'a'. So that we have four as followed by two b or by 'b'.

So that we have three as followed by three b

2. The last space must be filled in by 'a'.
3. Thus we have two possible answers - 'baa' and 'bba'. But only 'baa' appears in the alternatives. So the answer is (a).
4. In case we had both the possible answers in the alternatives, we should choose the one that forms a more prominent pattern, which is aabb/aaabbb/aa. and our answer would have been 'bba'.

CODING-DECODING

A code is a system of signals. Therefore, coding is a method of transmitting messages between the sender and receiver without any knowledge of a third party. The Coding-Decoding test is set up to judge the candidate's ability to decipher the law that codes a particular message and break the code to reveal the message.

Types of coding-decoding

LETTER CODING

In this type of reasoning, the letters are coded in another letters and we have to find out the pattern. After finding the pattern, we have to ask to identify the code for the given letters.

E.g: If COURSE is coded as FRXUVH, how is RACE coded in that code?

- (a) HFDU
- (b) UCFH
- (c) UDFH
- (d) UDHF

In the given code, each letter is moved three steps forward than the corresponding letter in the word. So R is coded as U, A as D, C as F, E as H. Hence (c) is the answer.

NUMBER CODING

In this type of questions, either numerical code values are assigned to a word or alphabetical code values are assigned to numbers. The candidate is required to analyse the code as per directions.

E.g.: If in a certain code ROPE is coded as 6821, CHAIR is coded as 73456. What will be the code for CRAPE?

- (a) 73456
- (b) 76421
- (c) 77246
- (d) 77123

Clearly, in the given code, the alphabets are

coded as follows. R O P E C H A I

6 8 2 1 7 3 4 5

So, CRAPE is coded as 76421. Then, the answer is (b)

DECODING

In these questions, artificial or code values are assigned to a word or a group of words and the candidate is required to find out the original words.

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E.g: If in a certain language FLOWER is written as EKNVDQ, what will be written as GNTRD?

- (a) HEOUS (b) HOUES (c) HUOSE (d) HOUSE

Each letter of the word is one step ahead of the corresponding letter of the code.

E K N V D Q
↓ ↓ ↓ ↓ ↓ ↓
F L O W E R

G N T R D
↓ ↓ ↓ ↓ ↓
H O U S E

Thus, HOUSE is written as GNTRD, So the answer is (d)

Blood Relation

- Family or Blood Relationship means persons connected by relations like – father-mother, son- daughter, brother-sister, grandfather-grandmother, uncle-aunty, nephew-niece, brother-in-law- sister-in-law etc. The list can go on and on adding members from father's side and mother's side etc.
- Questions in Test of Reasoning on Family /Blood Relationship are about the relationship of a particular person with another person of the family, based on the chain of relationships between other members of that family.
- The questions depict relationships among the various members of a family in a roundabout chain. The candidate is expected to find the relation of two particular persons mentioned in the question. An example of a question on Blood Relationship is given below to understand the concept in a better way:

Example 1:

Introducing Neeta, Anil said, 'She is wife of my mother's only son.' How is Neeta related to Anil?

- 1) Mother
- (2) Wife
- (3) Sister
- (4) Daughter-in-law

(5) None of these

Solution: Neeta is the wife of Anil's mother's only son, who is Anil himself. Hence, answer is Neeta is Anil's wife. i.e. (2) Wife.

Example 2:

'Ram' is the father of 'Kusha' but 'Kusha' is not his son. 'Mala' is the daughter of 'Kusha'. 'Shalaka' is the spouse of 'Ram'. 'Gopal' is the brother of 'Kusha'. 'Hari' is the son of 'Gopal'. 'Meena' is the spouse of 'Gopal'. 'Ganpat' is the father of 'Meena'. Who is the grand daughter of 'Ram'?

- (1) Hari
- (2) Mala
- (3) Meena
- (4) Shalaka
- (5) None of these

Solution:



'Mala' is the daughter of 'Kusha' and 'Ram' is the father of 'Kusha'. So, 'Mala' is the granddaughter of 'Ram'. Hence, answer is (2) Mala.

- Family/Blood Relation Tests are an exercise to test the candidate's ability to comprehend and come to the crux of an issue from complex, lengthy and unclear data.
- On a lighter note, this topic of Family/Blood Relations should be of interest to the candidates who are fans of Hindi Cinema, as the nature of the questions on Family/Blood Relations are of the type 'Hum Aapke Hai Kaun'

Family/Blood Relations Described

General

Family/Blood Relations tests largely depend on the candidate's knowledge of family relations. Various family relationships are described below to help the candidates to understand the relationships better and to attempt the questions based on them with confidence.

Some Common Terms

Meaning of some terms often used in questions on family relationship are given below:

- a) Parent – Mother or father
- b) Child – Son or daughter (even if an adult)
- c) Sibling – Brother or sister (Including half-brother and half-sister - one parent in common)
- d) Spouse – Husband or wife

Basic Relationships

Aunt, Uncle, Niece and Nephew

- Most English speakers use “uncle” for any of four relationships: father’s brother, mother’s brother, father’s sister’s husband, or mother’s sister’s husband.
- Again, “aunt” in English could mean father’s sister, mother’s sister, father’s brother’s wife, or mother’s brother’s wife.
- Brother’s or sister’s son is called nephew. Brother’s or sister’s daughter is called niece.
- Children of aunt or uncle are called cousins.

Relationships Involving the Term ‘-in-law’

General

- Any relationship term ending with -in-law indicates that the relationship is by marriage and not by blood. In other words, -in-law will be a blood relative of the spouse.
- In-law relationship terms are always written with hyphens. And the plural is formed on the part before the “-in-law”; for example, “brothers-in-law” and not “brother-in-laws”. The only exception is the general term “in-laws”, which is always plural.

Father-in-law, Mother-in-law, Son-in-law and Daughter-in-law

- Father-in-law is the father of spouse; mother-in-law is the mother of spouse. If parents get divorced and remarry, their new spouses are called stepparents, not mother-in-law and father-in-law.
- The husband of daughter is son-in-law; the wife of son is daughter-in-law. If spouse has children from a previous marriage, those are called stepchildren, not sons-in-law or daughters-in-law. The person is their stepfather or stepmother, not their father-in-law or mother-in-law.

Brother-in-law and Sister-in-law

Brother-in-law” and “Sister-in-law” each have two or three meanings as follows:

- a) **Sister-in-law could be**
 - i) The sister of spouse, or
 - ii) The wife of brother, or
 - iii) The wife of spouse's brother.
- b) **Similarly, Brother-in-law could be**
 - i) The brother of spouse, or
 - ii) The husband of sister, or
 - iii) The husband of spouse's sister.

Relationships Involving the Terms 'Grand' and 'Great'

- The relationships of the second generation are prefixed with the word Grand. For example, for a person, the first generation below him/her would be that of his/her child/children. The next/second generation would be the children of the children who would be called Grand Children of that person. The next/ third generation children would be called Great Grand Children of that person. This also applies to Niece and Nephew. For example, Son of nephew of a person is called Grand Nephew and so on.
- Similarly, for a person, the first generation above him would be that of his/her parents (Father/ Mother). The next/second generation above him/her would be the parents of the parents who would be called Grand Parents/ Grand Father/ Grand Mother of that person. The next/ third generation parents would be called Great Grand Parents/ Great Grand Father/ Great Grand Mother of that person.
- This also applies to the collateral relationships. For example, Son of nephew of a person is called Grand Nephew; Brother of Grand Father is called Grand Uncle and so on.

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- The fourth-generation relationships are called Great Great Grand. For example, Son of Great Grand Son is Great Great Grand Son.

Half Sibling and Step Relations

- Questions on Half Sibling and Step Relations are not very common in Bank exams. The information given below is only for very discerning candidates.
- A half sibling (half-brother or half-sister) is a sibling with one shared biological parent.
- When a parent remarries, the new spouse is the stepfather or stepmother of any children from the previous marriage. The children from a previous marriage are stepsons and stepdaughters. One is called stepbrother or stepsister if they have no parents in common, but their parents have married each other.

There are two ways Martha could have a stepsister:

- If Martha's mother marries second time, and her new husband (Martha's new stepfather) already has a daughter from a previous marriage, that daughter is Martha's stepsister because one of her parents is married to one of Martha's parents.
- If Martha's father marries second time, and his new wife already has a daughter, that daughter is again Martha's stepsister.

A similar rule gives the two ways for stepbrother.

Summary of Some Common Relationships

Summary of some common Relationships is given below in tabular forms:

Relation	Commonly Used Terms
Grandfather's or Grandmother's only son	Father
Grandfather's or Grandmother's only daughter-in-law	Mother
Father's father or Mother's	Grandfather
Father's Mother or Mother's	Grandmother
Father's brother or Mother's	Uncle
Father's sister or Mother's	Aunt
Son's wife	Daughter-in-law
Daughter's husband	Son-in-law

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Husband's or wife's sister	Sister-in-law
Husband's or wife's brother	Brother-in-law
Brother's wife	Sister-in-law
Brother's or sister's son	Nephew
Brother's or sister's daughter	Niece
Uncle's or aunt's son or daughter	Cousin
Sister's husband	Brother-in-law
Brother's wife	Sister-in-law
Grand son's or grand daughter's daughter	Grand Grand Daughter
and son's or grand daughter's son	Great Grand Son

Types of Questions on Blood Relations

Questions on Blood Relations are of the following types:

- I. Mixed-Up Relationship Descriptions.
- II. Relationships Riddle.
- III. Coded Relations.

Type I - Mixed-Up Relationship

Description

- In questions of Mixed-Up Relationship Descriptions, a cluttered and round about description of relationships is given. The candidate is required to decipher the whole chain of relations and identify the direct/ actual relationship between the concerned persons.
- A solved example of the Mixed-Up Relationship Descriptions is given below to understand the concept and questions based on it.

Example: Pointing to a gentleman, Dinesh said "His only brother is the father of my daughter's father." How is the gentleman related to Dinesh?

- (1) Uncle
- (2) Grandfather
- (3) Father
- (4) Brother- in-law

(5) None of these

Solution: The gentleman's only brother is the father of Dinesh (Dinesh daughter's father is Dinesh himself.). Gentleman is brother of Dinesh's father. Gentleman is Dinesh's uncle. Hence, answer is **(1) Uncle.**

Basic Skills and Tips for Solving Questions on Mixed-Up Relationship Descriptions

- To make the chain of relationships clear, where necessary a rough sketch of family tree may be prepared in pencil on question paper on the basis of descriptions given in the question. The persons of same generation may be placed on same horizontal level and that of different generation one below the other. It may sometimes be necessary to draw two different diagrams and then put them together based on the link provided.
- The relationship may be shown by drawing lines / arrows. Short forms as follows may be used to indicate the nature of relationships:

g – Gentleman/ Male	s – Sister	u – Uncle	snl – Son-in-law
l – Lady/ Female	b – Brother	a – Aunt	dl – Daughter-in-law
sp -Spouse	sn – Son	cb – Cousin Brother	pu – Paternal Uncle
ch – Child	d – Daughter	cs – Cousin Sister	mu – Maternal Uncle
h – Husband	gf – Grandfather	nf – Nephew	
w - Wife	gm – Grandmother	nc – Niece	
m – Mother	gs – Grandson	bl – Brother-in-law	
f – Father	gd – Granddaughter	sl – Sister-in-law	

- Use of Small letters is suggested to indicate the nature of relationships to avoid confusion of Capital alphabets used in the questions like 'A is mother of C', 'D is sister of B's husband'.
- Sometimes even re-writing the given information using the short forms helps in reducing the confusion. The candidates may also, where possible try to correlate the given relationships with their own kith and kin. This works wonderfully in understanding the relationship.
- It is observed that the names given in the questions are sometimes deceptive as to the gender. Candidates are advised to follow the instructions given in the question ignoring the name of the gender as at times it is deceptive. e.g. Kamal, Milan, Preetam, Kiran, Jasbir, Jasprit and etc.

MATHEMATICAL REASONING

- Quite often descriptions of superfluous (unnecessary/ redundant) are given. It is thus better to first identify relationship between which two persons is exactly required to be found out in the question. And then proceed to track the relationship based on the descriptions connected to them.
- Again, properly understanding the relationship between which two persons is exactly required to be found out in the question is important as the relationship between A and B would be different than between B and A. For example, if Ravi and Mala are brother and sister, Ravi is related to Mala as brother, whereas Mala is related to Ravi as sister.
- Also remember that terms like ‘only son’ only means that the person do not have another son, but it does not mean that the person doesn’t have daughter/s. However, when it is said a person does not have any brothers and sisters, it can be safely concluded that he is the only child of his father/ mother.
- Quite often a candidate depending upon whether he is male, or female presumes that a person whose sex is not explicitly referred to in the relationships is of the same sex as that of his/her. Such bias about the sex of the persons referred to the relationships should be avoided, and the candidate should go strictly by the description given in the question.

Often the relationships are described in a roundabout way. Some examples of such descriptions and their actual/direct meaning is given below:

- Only son of my grandfather – My Father
 - Only son of my grandmother – My Father
 - Only daughter of my grandfather – My Mother
 - Only daughter of my grandmother – My Mother
 - Sister of my mother – My Aunt
 - Son/Daughter of my husband – My son / daughter
 - Son/Daughter of my wife – My son / daughter
 - Only daughter of my grandfather’s only son – My Sister
 - Grandmother of my father’s only son – My Grandmother
 - Father of my daughter’s father – My Father
 - Father of my son’s father – My Father
 - My son’s sister – My daughter
 - Daughter-in-law of grandmother of my father’s only son – My Mother
 - A is the father of B but B is not the son of A – B is daughter of A
- After the answer is found, it is good practice to quickly check back the answers with

the relevant information given in the question.

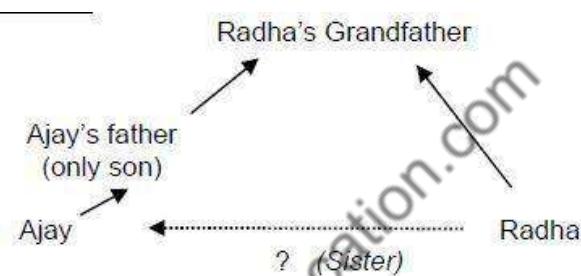
Solved Examples of Mixed-Up Relationship Descriptions

1. Pointing to Ajay, Radha said, "His father is the only son of my grandfather". How is Radha Related to Ajay?

- (1) Brother
- (2) Sister
- (3) Mother
- (4) Daughter
- (5) None of these

Solution:

Traditional Method



When Radha's Grandfather's only son is Ajay's father, then Ajay's father is also the father of Radha. So Radha is Ajay's sister. Hence, answer is (2) Sister.

Traditional Method

We know, 'Only son of my grandfather' means 'my father'. "His father is the only son of my grandfather" thus becomes "His father is my father". So Radha is Ajay's sister. Hence, answer is (2) Sister.

2. Lalita said to Tina, "You are the daughter-in-law of the grandmother of my father's only son." How is Lalita related to Tina?

- (1) Aunt
- (2) Sister
- (3) Mother
- (4) Indeterminable
- (5) None of these

Solution: 'My father's only son' is my (Lalita's) brother. Tina is daughter-in-law of grandmother of (Lalita's) brother. Tina thus can be their mother (wife of grandmother's only son). However, as it is not mentioned that the grandmother has only one son, Tina can be wife of grandmother's other son i.e. Tina could also be their aunt. Hence, answer is (4) Indeterminable.

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3. Pointing to a photograph, Amar said, "I have no brother or sister, but that man's father is my father's son." Whose photograph was it?

- (1) His son's
- (2) His father's
- (3) His nephew's
- (4) His own
- (5) None of these

Solution: Since Amar has no brother or sister so his father's son is the man himself and so the man who is talking is the father of the man in the photograph i.e. the man in the photograph is his son. Hence, answer is (1) His son's.

4. Looking at the portrait of a man, Ashok said, 'His mother is the wife of my father's son. Brothers and sisters, I have none'. At whose portrait was Ashok looking.

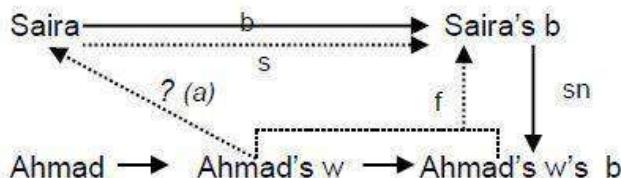
- (1) His cousin
- (2) His nephew
- (3) His uncle
- (4) His son
- (5) None of these

Solution: My (Ashok's) father's son will be Ashok himself as he has no brother or sister. Ashok's wife is mother of the person in the portrait. The portrait is thus of Ashok's own son. Hence, answer is (4) His Son.

5. Ahmad said to Saira, 'Your only brother's son is my wife's brother'. How is Saira related to the Ahmad's wife?

- (1) Mother in law
- (2) Sister in law
- (3) Sister
- (4) Aunt
- (5) None of these

Solution:



Hence, Saira is Ahmad's wife's father's sister. i.e. "Aunt". Answer is (4) Aunt.

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6. Pointing to a gentleman, Abdul said, "His only brother is the father of my daughter's father". How is the gentleman related to Abdul?"
- (1) Uncle
 - (2) Brother-in-law
 - (3) Father
 - (4) Grandfather
 - (5) None of these

Solution: 'Father of Abdul's daughter's father means- Abdul's father. Thus, the man's brother is Abdul's father, or the man is the brother of Abdul's father i.e. Uncle of Abdul. Hence, answer (1) Uncle.

7. Pointing to a photograph, Dilip said, "She is the daughter of my grandfather's only son." How is Dilip related to the girl in the photograph?
- (1) Father
 - (2) Cousin
 - (3) Brother
 - (4) Data inadequate
 - (5) None of these

Solution: Grandfather's only son i.e. father. Father's daughter i.e. sister. Dilip is, thus brother to the girl in the photograph. Hence, answer is (3) Brother.

8. Pointing to a photograph Smita says, "This man's son's sister is my mother-in-law." How is the woman's husband related to the man in the photograph?
- (1) Son
 - (2) Nephew
 - (3) Grandson
 - (4) Son-in-law
 - (5) None of these

Solution: Man's son's sister i.e. man's daughter. Man's daughter is the mother of Smita's husband i.e. he is the grandson of man in the photograph. Hence, answer is (3) Grandson.

9. A man goes to the house of Malati who is the neighbour of Vaiju, who has a daughter Nita. Nita studies in First year. Ashu is the father of Aman and is married to Meena whose sister is Vaiju. What is the relation of Vaiju and Aman?
- (1) Cousin
 - (2) Niece
 - (3) Grandson
 - (4) Nephew

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- (5) None of these

Solution: Aman is son of Meena who is sister of Vaiju, so Aman is nephew of Vaiju. Hence, answer is (4) Nephew. Please note that ‘the man going to the house of Malati’ is superfluous and has no relevance to the question asked.

10. Pointing to a man in a photograph, Malati tells, “His brother’s father is the only son of my grandfather.” How is Malati related to the man in the photograph?

- (1) Sister
- (2) Aunt
- (3) Mother
- (4) Daughter
- (5) None of these

Solution: As the man’s father is the son of Malati’s grandfather, she is the man’s sister. Hence, answer is (1) Sister.

11. Rekha introduces a man as the son of the brother of her mother. How is the man related Rekha.

- (1) Nephew
- (2) Uncle
- (3) Cousin
- (4) Son
- (5) None of these

Solution: Brother of mother i.e. uncle. Uncle’s son is cousin. Hence, answer is (3) Cousin.

12. Pointing to Dharmendra, Hema said, “He is the son of my father’s only son.” How is Dharmendra’s mother related to Hema?

- (1) Sister- in- law
- (2) Sister
- (3) Aunt
- (4) Daughter
- (5) None of these

Solution: Hema’s father’s only son is Hema’s brother. So, Dharmendra is the son of Hema’s brother. Thus, Dharmendra’s mother is the wife of Hema’s brother. Hence, answer is (1) Sister- in- law.

13. Pointing towards a girl in the picture, Jaya said, “She is the mother of Amita whose father is my son.” How is Jaya related to the girl in the picture?

- (1) Aunt
- (2) Cousin

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- (3) Mother
- (4) Data inadequate
- (5) None of these

Solution: Amita is the daughter of Jaya's son and the girl is Amita's mother. So, the girl is Jaya's son's wife i.e. Jaya is the girl's mother-in-law. Hence, answer is (5) None of these.

14. If Nitesh says, "Priya's mother is the only daughter of my mother", how is Nitesh related to Priya?
- (1) Father (2) Grandfather (3) Brother (4) Uncle (5) None of these

Solutions 'Only daughter of Nitesh's' mother means Nitesh's sister. Priya's mother is the Nitesh's sister. So, Nitesh is Priya's maternal uncle. Hence, answer is (4) Uncle.

15. Mr. 'Ashok' meets Mr.'Babu'. 'Babu' is the father of a son 'Dharmendra' and a daughter 'Chandrika'. 'Shalini' is the mother of 'Ashok' 'Dharmendra' is married has one son. 'Shalini' is the daughter-in- law of 'Babu'. How is 'Ashok' related to 'Babu'.

- (1) Grandson (2) Nephew (3) Uncle (4) Son (5) None of these

Solution: 'Shalini' is daughter in law of 'Babu' and 'Ashok' is son of 'Shalini', so relation between 'Ashok' and 'Babu' is grandson. Hence, answer is (1) Grandson.

Please note that in case of question having very long description of relations it is better to focus on the sentences that contain at least one of the persons whose relationship is asked.

16. 'Kishor' goes to picnic trip and meets Sandhya who is the sister of 'Kishor's wife. How is 'Sandhya' related to 'Kishor'?

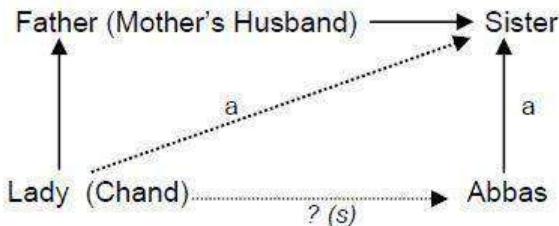
- (1) Brother (2) Sister (3) Brother-in-law (4) Sister-in-law (5) None of these

Solutions 'Sandhya' is sister in law of 'Kishor'. Hence, answer is (4) Sister-in-law.

17. Abbas said to Chand, "Your mother's husband's sister is my aunt." How is the lady related to Abbas?

- (1) Brother (2) Daughter (3) Sister (4) Aunt (5) None of these

MATHEMATICAL REASONING



Solution: Lady (Chand) mother's husband means her father. Lady's father's sister is Lady's aunt. But this sister is also Abbas's aunt. Therefore, Lady (Chand) is Abbas's sister. Hence, answer is (3) Sister.

18. Pointing towards a person, Salman said to Shehnaz, "His mother is the only daughter of your father." How is the woman related to that person?

(1) Mother (2) Aunt (3) Wife (4) Sister (5) None of these

Solutions: The only daughter of Shehnaz father is she herself. So, the person is Shehnaz's Son, i.e. Shehnaz is Salman's mother. Hence, answer is (1) Mother

19. R is the brother of P's father's wife. What is the relation of P with R?

(1) Brother (2) Nephew (3) Uncle (4) Cousin (5) None of these

Solutions: R is brother of P's mother. R is maternal uncle of P. P is thus nephew of R. So answer is (2) Nephew.

20. Introducing Nitin, Rohit said, "He is the only son of my father's only son. How is Rohit related to Nitin?"

(1) Son (2) Father (3) Uncle (4) Cousin (5) Data inadequate

Solution: Rohit father's only son means Rohit himself. So, Nitin is Rohit's son i.e. Rohit is Nitin's father. Hence, answer is (2) Father.

21. 'Anil' and 'Meena' are married couple. 'Arjun' and 'Laksh' are brothers. 'Arjun' is the brother of 'Anil'. How is 'Laksh' related to 'Meena'?

(1) Brother-in-law (2) Brother (3) Cousin (4) Data inadequate (5) None of these

Solution: 'Anil' and 'Meena' are husband and wife. Since Arjun' and 'Laksh are brothers and 'Arjun' is the brother of 'Anil', 'Laksh' is also the brother of 'Anil'. Thus, 'Laksh' is the brother-in-law of 'Meena'. Hence, answer is (1) Brother-in-law.

Mathematical Aptitude

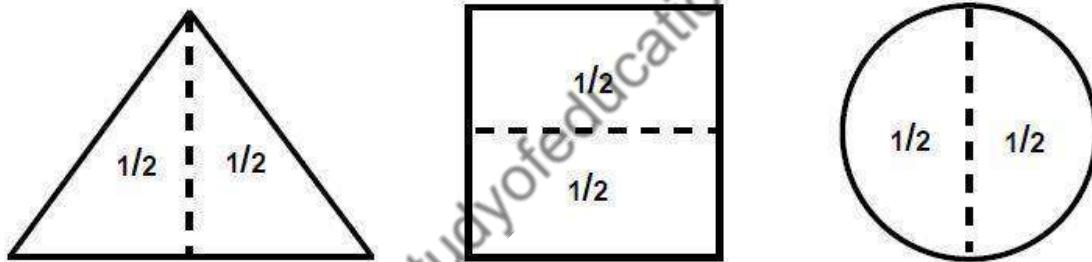
Mathematical Aptitude is a way to identify the basic mathematical skill of the candidates. We all aware of the fact that after clearing the UGC NET exam, we will go for either teaching at colleges/universities level or enrol for Ph.D. In both cases, we need basic mathematical skills for calculation, analysis, grading, percentage, etc.

In UGC NET Syllabus of Paper 1, the following topics of mathematical Aptitude are mentioned:

Fraction

A fraction is a part of a whole unit or quantity. For example, if a square, triangle, or circle is divided into two equal parts, one of these parts is a fraction of the whole square, triangle, or circle.

Description of Common Fractional Forms



Points:

- A fraction represents one or more equal parts of a whole.
- The number above the line in a fraction is called the numerator and the number below the line is called denominator of the fraction.
- When the numerator and denominator of a fraction are equal then, the fraction equals 1.
- There are as many ways to write 1 as a fraction as there are numbers.
- Fractions that have the same denominator are said to have a Common Denominator.
- Example: $5/10$, 5 is the numerator, and 10 is the denominator.

Ratio

- A ratio is comparison of two quantities
- A ratio is simplified the same way that a fraction is simplified.

- A ratio can be inverted and still be true.

Proportion and Percentage

A proportion is simply a statement that two ratios are equal. It can be written in two ways: as two equal fractions, $a/b = c/d$; or using a colon, $a:b = c:d$. The following proportion is read as "twenty is to twenty-five as four is to five." $20/25 = 4/5$

In problems involving proportions, we can use cross products to test whether two ratios are equal and form a proportion. To find the cross products of a proportion, we multiply the outer terms, called the extremes, and the middle terms, called the **means**.

Percentage

The use of percentages is a commonplace in many aspects of commercial life. Interest rates, discounts, pay rises, and so on are all expressed using percentages. Any fraction which has a denominator of 100 can be written in a special way known as a **percentage**. The symbol for percentage is %.

For **example**, the fraction $20/100$ is written as 20%, and this is read as 'twenty percent'.

Proportion and percentage are very important for calculation in Data Interpretation. The question of Data Interpretation is generally related to percentages like finding growth, increment, loss, etc.

Averages

The average is defined as the sum total of all volumes of items divided by the total number of items.

- Arithmetic average is used for all averages like: average income, average profit, average age, average marks etc
- In individual series. Average = sum of observation / Number of observation
- or $x(x^1+x^2+x^3+\dots+x^n)/n$
- To calculate the sum of observations, they should be in the same unit

Example: Ram, Shyam, David, and Abbas are students, and they have Rs. 200, Rs. 300, Rs. 500, and Rs. 600 respectively. What is the average amount they have?

Solutions. Total amount = $200+300+500+600 = \text{Rs. } 1600$ Total Number of Students = 4. Then, Average money they have = $1600/4 = \text{Rs. } 400$

Example: A man purchased 5 toys at the rate of Rs 200 each, and 9 toys at the rate of Rs 300 each. Calculate the average cost of one toy.

Solutions: Price of 5 toys = $200 \times 5 = 1000$

Price of 6 toys = $250 \times 6 = 1500$

Price of 9 toys = $300 \times 9 = 2700$

Average cost of one toy = $(1000+1500+2700)/20 = 5200/20 = \text{Rs. } 260/-$

Time & Distance

Time and distance is a very important topic of Mathematical Aptitude for general competitive exams, like Banking, Railways, SSC etc. But, this is not an important topic in Mathematical Aptitude of UGC NET Exam.

This type of question ask to test the general mathematical ability.

Points to solve the question

- The speed (rate) at which an object moves is the distance that the object covers in a unit of time.
- The formula for the relationship between the speed, the distance the object covers, and the amount of time it requires to cover that distance is:

$$v = \frac{s}{t} \quad \text{where} \quad v = \text{speed (rate)} \\ s = \text{distance} \\ t = \text{time}$$

All possible relationships between distance, speed and time can be derived from this formula: $t = s/v$ and $s = v \cdot t$

All possible relationships between distance, speed and time can be derived from this formula: $t = s/v$ and $s = v \cdot t$

Example: A train traveled 240 kilometers (km) at a speed of 80 kilometers per hour (kph). How long did the journey take?

- a) 7 hours b) 5 hours c) 3 hours d) 2 hours

Ans. : c) 3 hours

We are given v (80 kph) and s (240 km), and we have to calculate t. Since the speed is given in kilometers per hour, the traveling time must be calculated in hours.

Substituting the given information into the formula $t = s/v$, we get $t = 240/80 = 3$

Thus, the journey took 3 hours

Profit & Loss

The calculation of profit and loss involves various terms like cost price, selling price, marked price etc. Basically, it is a difference between cost price and selling price.

- Cost price is the price paid to purchase an article or a product or we can say it is a cost incurred in manufacturing an article.
- Selling price is the price at which a product is sold. Various profit and loss formulas used in profit and loss:
 1. Profit or gain = Selling price(S.P) - Cost price (C.P)
 2. Loss = Cost price – Selling price
 3. Gain percentage (%) = $(\text{Gain}/ \text{C.P.}) \times 100$
 4. Loss percentage (%) = $(\text{Loss}/ \text{C.P.}) \times 100$
 5. There is a direct relationship between selling price and costprice:

$$\text{S.P.} = \frac{100 + \text{Gain percentage}}{100} \times \text{C.P.} \text{ (In case of gain)}$$

$$\text{S.P.} = \frac{100 - \text{Loss percentage}}{100} \times \text{C.P.} \text{ (In case of loss)}$$

6. If a person sells two commodities at same prices. On one he gains $x\%$ and loses $x\%$ on another, then as a whole he will be in loss and the loss percentage will be equal to:

$$\frac{(\text{Common gain or loss percentage})^2}{100} = \frac{x^2}{10}$$

Example: A man buys a cycle for Rs.1400 and sells it at a loss of 15%. What is the selling price of the cycle?

- a) Rs.1090 b) Rs.1160 c) Rs.1190 d) Rs1202

Ans. c)

Selling Price = Rs. 1400 - 15 % loss
= Rs. $(1400 \times 85\%)$ = Rs. $1400 \times 85/100$
= Rs. 1190

Interest & Discounting

This topic is also based on percentages and simple calculations like profit and loss.

The questions related to interest and discounting never asked in previous exams since June 2012.