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1 CHAPTER

Subject-Verb - Agreement

In English the basic structure of a sentence is as follows –

“Subject + Verb + Object”

Example:- Appear (P.V.) – Appears (S.V.)

Now; for a sentence to be grammatically correct, the verb must agree with the subject.

In the other words the verb used must be in accordance with the person and number of subject.

In order to attain grammatical accuracy, some rules must be followed which are as follows –

Rule 1

Singular subject (S.S) takes singular verb (S.V.)

Example: -

Ravi (S.S) writes (S.V.) a letter.

Plural subject (P.S) takes plural verb (P.V.).

Example:-

(i) Ram and Shyam are good friends.

(ii) They (P.S.) write (P.V.) a letter.

Rule 2

Note – Noun + s/es -> plural form

Example: -

Bags, Mangoes

Verb+ s/es -> singular form

Some short forms used in this chapter –

N (P) – Plural Noun

N(S) – Singular Noun

V (P) – Plural Verb

Pro (P) – Plural pronoun

Pro (S) – Singular Pronoun

Many a/an

Many a + good + [N(S) +V(S) +Pro(S)]

/ Great

Example:-

(i) A great many institutions are providing lab facility their students.

(ii) Many an institution is providing lab facility to its students.

Rule 7

Each, Every, Either, Neither + [N(s) + V(s) +Pro(s)]

We use singular verb with sentence starting with each/ every/ either/ neither.

Example: -

- Each stakeholder has invested more than Rs. 2, 00,000 in this project.

- Either stakeholder is interested in investing in this project.

Rule 9

Each of the

Any one of the

Some one of the → [N (P) +V(S) +Pro(S)]

One of the

No one of the

Example: -

One of the health policies is successfully implemented with its new features.

Rule 11

Some of the

[NC(S) +V(S) +Pro(S)]

[NC (P)

+V (P) +Pro (P)]

Example: -

Some of the workers have initiated this campaign.

(i) Some of the confidence has been misplaced.

Rule 12

Subject 1 + as well as, with, together with, along with, in addition to, a rather than, a besides, and not, like, except, accompanied by, headed by, led by, governed by, dominated by, run by etc. + subject 2.

Verb is used according to first subject.

Example: -

1. The minister along with his party colleagues have been invited to the party. [have (✗) → has (□)]
Sub 1 – The minister is singular so – has (□)
2. Sachin (Sub 1) as well as his friends (Sub 2) is coming to the party.

Rule 13

Neither – Nor

Either – Or [Verb used according to its nearest subject]

Not Only – But also

Example: -

- (i) Neither the boss nor his assistant appear to have gone through the report.
(Here assistant is singular subject then singular verb will be used. Appear-> appears)
- (ii) Neither the schemes nor the offer have/has attracted the customers.
(Offer is a singular noun then singular verb will be used. Has will be the right answer.)

Rule 14

When collective noun used as a single body then we use singular verb (S.V.) and pronoun (it/ its).

Example: -

- (i) The Jury were unanimous in the verdict.
Ans. Were (✗) - Was (✓) the (✗) – its (✓)

When collective noun used as an Individual members and units then we use “plural verb” and pronoun them/their.

Example: -

- (i) The Jury were divided in their opinions.

Rule 15

A bunch of keys + Singular verb.

If this type of formation used in the sentence then we use. – Singular verb.

Example: -

A team of players have played a match.
Have (✗) - Has (✓)

Rule 16 –

Few

The few

A few

} plural noun + plural verb

Example: -

A few boys have come.

Little

A little

The little

} singular uncountable noun +
singular verb

Example: -

A little money were spent. (✗)

A little money was spent. (✓)

Rule 17

The adjective + Plural verb

The poor, the rich

The good, the bad

plural verb →

Example: -

- (i) The rich hates the poor. (✗)

The rich hate the poor. (✓)

Rule 18

If Numerical Adjective + Plural Noun shows a definite distance, height, weight, unit etc. then Singular verb used.

Example: -

Two thousand rupees is a handsome amount. **But**

If shows the different entities then – Plural verb Used.

Example: -

Two thousand rupees have been spent.

Rule 19

Who/ Which/ that used as "Relative Pronoun" then use of verb according to their antecedent.

Example: -

I who am a teacher; teach here.
(I is antecedent, so 'am' comes here)

Rule 20

- Some nouns which are in plural form but give sense of singular.
- Singular verb is used with these words.
 - a) Disease: Measles, Mumps, Rickets
 - b) Sports: Billiards, Darts, Draughts etc.
 - c) Country: The United States, the West Indies.
 - d) Books: The Arabian nights, three musketeers etc.
 - e) Subject: Physics, Economics, Civics, statistics etc.

Rule 21

Verb should be according to main subject in a sentence.

Example: -

The quality of apples is good.

Rule 22

Plural Noun/Pronoun + Each → Plural verb

Example: -

(i) We each have a duty towards our nation.

Rule 23

Optative Sentence -
Singular subject + Plural Verb

Example: -

(i) God save the king!
(ii) Long live the Queen!

Rule 24

Structure of All
If All used with Uncountable → Verb singular
If All used with Number → Verb Plural

Example: -

(i) All is well that ends (S.V.) well.
(ii) All are well (P.V.) at home.

Rule 25

Some Nouns which are plural but seems as singular.

Cattle, cavalry, infantry, poultry, peasantry, children, gentry, police, people etc.

Example: -

(i) Cattle are grazing in the field.
(ii) Police have arrested the thieves.

Rule 26

Some Nouns which are used in singular form only- Scenery, Poetry, Furniture, Advice, Information, Hair, Business, Stationary, crockery, Luggage, Baggage, Knowledge, Wastage, Money, Jewellery, work etc.

Example: -

(i) The Scenery of Kashmir is very charming.
(ii) His hair is Black.

Exercise

1. Indian politics currently/ seem to be a battle between/ a juggernaut and a footnote.
2. Electoral politics with its wide repertoire of tactics/ teach you that you can indeed make a/ silk purse out of Sow's ear.
3. It is they who has to leave this place.
4. Two miles are too much for this man to run.
5. The president of India together with his personal secretaries are invited to this function.
6. Some genuine issues/ exist with the newly/adopted system and needs/ to be examined seriously.
7. The investigation by the/ government in science/ and technology have increased/considerably in the recent past.

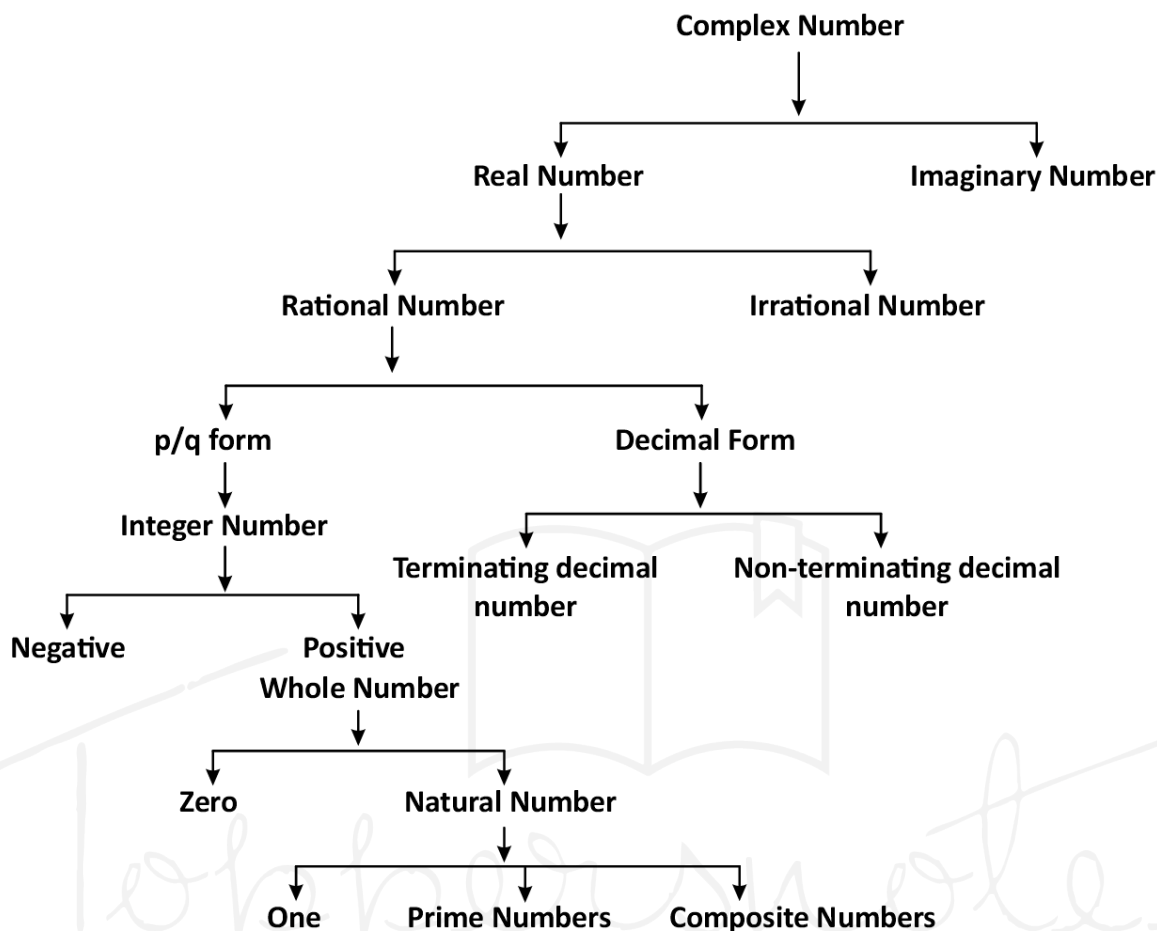
8. One of the five boys of / this group were absent / due to sickness but/ the other four ones were present.
9. Every man and women of the village/ have come out to see his strange child who claims to know everything about his prenatal existence.
10. Neither of them / are going to attend/ the party on 10th October.
11. He walked five miles/ which are really a great distance for a man like him/ who is not only old but also ill.
12. The rise and fall/ of the tide are due/ to lunar influence.
13. Many a man/ have succumbed/ to this temptation.
14. The introduction of tea, coffee/ and such other beverages/ have not been without some effect.
15. The hovels created such an impact that/ I wondered how would Yaddanapudi interprets/ certain situations I witnessed / in life. She talked about very relatable/ issues in contrast to feminist literature.
16. Each of the students in the computer class/ has to type/ their own research paper this semester.
17. Every one of the films/ you suggested/ are not worth seeing.
18. The three day trip that India's prime minister; Narendra Modi, made/ to china is seen in some quarter/ as a chance to reset the relationship/ between Asia's two giants.
19. Kashmir is one of those few/ place which provides/ a delightful escape from/ the strenuous life.
20. Knowledge of/ at least two languages/ are required to pass the examination.

Answers

1. Seems will come as Indian Politics is a singular subject.
2. Teaches will come as electoral politics is a singular subject.
3. They who has – have(✓)
4. Are (✗) – is (✓) (two miles is)
5. Are (✗) – is (✓) [together with ds igys sub (the president)]
6. Needs (✗) – need (✓) (some genuine issues)
7. Have increased (✗) – has increased (✓)
8. This group was absent. (✓)
9. Have (✗)– has (has come out) (✓)
10. Replace are by is
11. Five miles is singular. Use “is” in place of “are”
12. Replace “are” by “is” [the rise and fall is]
13. Many a is singular and will take singular noun, verb and pronoun.
14. Introduction – have (✗) – has (✓)
15. Interprets (✗) – Interpret (✓)
(As it precede by a **modal** which always takes first form of verb after it)
16. Use his in place of their.
17. Everyone is singular. So replace “are” by “is”.
18. Replace “quarter” with “quarters”
19. ‘One of’ is followed by a ‘plural noun’ hence ‘places’ should be used in place of ‘place’. Now again the verb followed by relative pronoun must agree with relative pronoun's antecedent (here, places) Hence, ‘provide’ should be used in place of ‘provides’.
(Kashmir is one of those few places (P.N.) which provide (P.V.))
20. Use “is” in place of “are” knowledge is the main subject.

16 CHAPTER

Number System



Complex Number (Z)

$Z = \text{Real numbers} + \text{Imaginary numbers}$

$$Z = a + ib$$

Where, $a = \text{Real numbers}$.
 $b = \text{Imaginary numbers}$.

Real Numbers

Rational and irrational numbers together are called real numbers. These can be represented on the number line.

Imaginary Numbers

Numbers that can not be represented on the number line.

Integer Numbers

A set of numbers which includes whole numbers as well as negative numbers, is called integer numbers, it is denoted by I .

$$I = \{-4, -3, -2, -1, 0, 1, 2, 3, 4, \dots\}$$

Natural Numbers

The numbers which are used to count things are called natural numbers.

$$N = \{1, 2, 3, 4, 5, \dots\}$$

Whole Numbers

When 0 is also included in the family of natural numbers, then they are called whole numbers.

$$W = \{0, 1, 2, 3, 4, 5, \dots\}$$

The product of four consecutive natural numbers is always exactly divisible by 24.

Even Numbers

Numbers which are completely divisible by 2 are called even numbers.

$$n^{\text{th}} \text{ term} = 2n$$

$$\text{Sum of first } n \text{ even natural numbers} = n(n+1)$$

Sum of square of first n even natural

$$\text{numbers} = \frac{2n(n+1)(2n+1)}{3}$$

$$\left\{ n = \frac{\text{Last term}}{2} \right\}$$

Odd Numbers

The numbers which are not divisible by 2 are odd numbers.

$$\text{Sum of first } n \text{ odd numbers} = n^2$$

$$\left\{ n = \frac{\text{Last term} + 1}{2} \right\}$$

Natural Numbers

$$\text{Sum of first } n \text{ natural numbers} = \frac{n(n+1)}{2}$$

$$\begin{aligned} \text{Sum of square of first } n \text{ natural numbers} \\ = \frac{n(n+1)(2n+1)}{6} \end{aligned}$$

$$\text{Sum of cube of first } n \text{ natural numbers} =$$

$$\left[\frac{n(n+1)}{2} \right]^2$$

The difference of the squares of two consecutive natural numbers is equal to their sum.

$$\text{Example - } 11^2 = 121$$

$$12^2 = 144$$

$$11 + 12 \rightarrow 23$$

$$\text{Difference } 144 - 121 = 23$$

Prime Numbers – Which have only two forms - $1 \times$ numbers

$$\text{E.g. - } \{2, 3, 5, 7, 11, 13, 17, 19, \dots\}$$

Where, 1 isn't a Prime Number.

- The digit 2 is only even prime number.
- 3, 5, 7 is the only pair of consecutive odd prime numbers.
- Total prime numbers between 1 to 25 = 9
- Total prime numbers between 25 to 50 = 6
- There are total of 15 prime numbers between 1-50.
- There are total of 10 prime numbers between 51 – 100.
So there are total 25 prime numbers from 1-100.
- Total prime numbers from 1 to 200 = 46
- Total prime numbers from 1 to 300 = 62
- Total prime numbers from 1 to 400 = 78
- Total prime numbers from 1 to 500 = 95

Co-prime Numbers

Numbers whose HCF is only 1.

$$\text{E.g. - } (4,9), (15, 22), (39, 40)$$

$$\text{HCF} = 1$$

Perfect Number

A number whose sum of its factors is equal to that number (except the number itself in the factors)

$$\text{E.g. - } 6 \rightarrow 1, 2, 3 \rightarrow \text{Here } 1 + 2 + 3 \rightarrow 6$$

$$28 \rightarrow 1, 2, 4, 7, 14 \rightarrow 1 + 2 + 4 + 7 + 14 \rightarrow 28$$

Rational Numbers

Numbers that can be written in the form of P/Q , but where Q must not be zero and P and Q must be integers.

$$\text{E.g. - } 2/3, 4/5, \frac{10}{-11}, \frac{7}{8}$$

Irrational Numbers

These cannot be displayed in P/Q form.

$$\text{E.g. - } \sqrt{2}, \sqrt{3}, \sqrt{11}, \sqrt{19}, \sqrt{26} \dots$$

Perfect square numbers



Unit Digit which can be of square

0
1
4
5 or 25
6
9

Which can't be square

2 —
3 —
7 —
8 —

- The last two digits of the square of any number will be the same as the last two digits of the square of numbers 1-24.

Note: Therefore, everyone must remember the squares of 1-25.

Convert to Binary and Decimal –

1. Convert Decimal Number to Binary Number

To find the binary number equivalent to a decimal number, we continuously divide the given decimal number by 2 until we get 1 as the final quotient.

E.g.

2	89	$2 \times 44 = 88 ; 89 - 88 = 1$
2	44	$2 \times 22 = 44 ; 44 - 44 = 0$
2	22	$2 \times 11 = 22 ; 22 - 22 = 0$
2	11	$2 \times 5 = 10 ; 11 - 10 = 1$
2	5	$2 \times 2 = 4 ; 5 - 4 = 1$
2	2	$2 \times 1 = 2 ; 2 - 2 = 0$
	1	Final quotient

Hence, binary number equivalent to 89 = $(1011001)_2$

2. Convert Binary to Decimal Number

In binary system the value of 1 when it moves one place to its left every time it doubles itself and wherever 0 comes its value is 0.

E.g.

1	0	1	1	0	0	1
2^6	2^5	2^4	2^3	2^2	2^1	2^0

Now

$$\begin{aligned} (1011001)_2 &= 1 \times 2^6 + 0 \times 2^5 + 1 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 \\ &= 64 + 0 + 16 + 8 + 8 + 0 + 1 \quad \{2^0 = 1\} \\ &= 89 \end{aligned}$$

Finding the Number of Divisors or Number of Factors

First we will do the prime factorization of the number and write it as Power and multiply by adding

One to each power, then the number of divisors will be obtained.

Ex: By how many total numbers can 2280 be completely divided?

Sol. $2280 = 2^3 \times 3^1 \times 5^1 \times 19^1$

$$\begin{aligned} \text{Number of divisors} &= (3 + 1) (1 + 1) (1 + 1) (1 + 1) \\ &= 4 \times 2 \times 2 \times 2 = 32 \end{aligned}$$

Find the unit's digit

1. When the number is in the form of power –

When the unit digit of Base is 0, 1, 5 or 6, the unit digit of the result remains the same for any natural power. When the unit digit of base is 2, 3, 4, 7, 8, or 9, divide the power by 4 and put the same power on the unit digit of the base as the remainder. When the power is rounded off to 4, then the 4th power will be placed on the unit digit of the base.

2. In the form of simplification –

Write the unit digit of each number and simplify it according to the symbol, the result that will come will be its unit digit answer.

Divide by Power of Numbers (Finding the Divisor)

1. If $a^n + b^n$ is given –

If n is odd, then $(a+b)$ will be its divisor.

2. If $a^n - b^n$ is given –

Divisor (when n is odd) $\rightarrow (a-b)$

Divisor (when n is even) $\rightarrow (a - b)$ or $(a + b)$ or both.

1. If $a^n \div (a - 1)$ then the remainder always be 1.

2. $a^n \div (a + 1)$ $\left\{ \begin{array}{l} \text{If } n \text{ is an even then the remainder always be 1.} \\ \text{If } n \text{ is an odd then the remainder always be } a. \end{array} \right.$

3. If $(a^n + a) \div (a - 1)$ then the remainder always be 2 .

4. $(a^n + a) \div (a + 1)$ $\left\{ \begin{array}{l} \text{If } n \text{ is an even then the remainder always be zero (0).} \\ \text{If } n \text{ is an odd then the remainder always be } (a - 1) \end{array} \right.$

Terminating Decimal

Those numbers which end after a few digits after the decimal like - 0.25, 0.15, 0.375 can be written in a fraction number.

Non-Terminating Decimal

Those numbers which continue after the decimal and can be of two types.

0.3333, 0.7777, 0.183183183.....

Repeating

Numbers that never end after the decimal, but repeat, till infinity. It can be written in fractions.

Non Repeating Decimal

Numbers that never end after the decimal point, but they do not repeat their numbers.

Recurring Decimal Fraction

That decimal fraction is the repetition of one or more digits after the decimal point, then one or more digits are repeated after the dot.

Eg. $\frac{1}{3} = 0.333\dots$, $\frac{22}{7} = 3.14285714\dots$ To represent such fractions, a line is drawn over the repeating digit.

$$0.\overline{3524} = \frac{3524 - 35}{9900} = \frac{3489}{9900} = \frac{1163}{3300}$$

$$\frac{22}{7} = 3.14285714\dots = 3.\overline{142857}$$

It is called bar.

- Convert pure recurring decimal fraction to simple fraction as follows –

$$0.\overline{p} = \frac{p}{9} \quad 0.\overline{pq} = \frac{pq}{99} \quad 0.\overline{pqr} = \frac{pqr}{999}$$

- Convert a mixed recurring decimal fraction to an ordinary fraction as follows –

$$0.p\overline{q} = \frac{pq - p}{90} \quad 0.pq\overline{r} = \frac{pqr - pq}{900}$$

$$0.\overline{pqr} = \frac{pqr - p}{990} \quad 0.pq\overline{rs} = \frac{pqrs - pq}{9900}$$

Example -

$$(i) 0.\overline{39} = \frac{39}{99} = \frac{13}{33}$$

$$(ii) 0.\overline{625} = \frac{625 - 6}{990} = \frac{619}{990}$$

$$(iii) 0.\overline{3524} = \frac{3524 - 35}{9900} = \frac{3489}{9900} = \frac{1163}{3300}$$

Symbol of the Roman Method

1	→	I
2	→	II
3	→	III
4	→	IV
5	→	V
6	→	VI
7	→	VII
8	→	VIII
9	→	IX
10	→	X
20	→	XX
30	→	XXX
40	→	XL
50	→	L
100	→	C
500	→	D
1000	→	M

Rule of Divisibility

Rule of 2	The last digit is an even number or zero (0) as - 236, 150, 1000004
Rule of 3	If the sum of the digits of a number is divisible by 3, then the whole number will be divisible by 3. E.g. 729, 12342, 5631
Rule of 4	Last two digits are zero or divisible by 4. E.g. 1024, 58764, 567800
Rule of 5	The last digit is zero or 5. E.g. 3125, 625, 1250
Rule of 6	If a number is divisible by both 2 and 3 then it is also divisible by 6. E.g. 3060, 42462, 10242
Rule of 7	After multiplying the last digit of a number by 2 and

	subtracting it from the remaining number, if the number is a multiple of 0 or 7 or if any digit is repeated in a multiple of 6, then the number will be divisible by 7. E.g. 222222, 444444444444, 7854
Rule of 8	If the last three digits of a number are divisible by 8 or the last three digits are '000' (zero). E.g. 9872, 347000
Rule of 9	If the sum of the digits of a number is divisible by 9, then the whole number will be divisible by 9.
Rule of 10	The last digit should be zero (0).
Rule of 11	If the difference between the sum of digits at odd places and sum of digits at even places is zero (0) or 11 or a multiple of 11. E.g. 1331, 5643, 8172659
Rule of 12	Composite form of divisible by 3 and 4.
Rule of 13	Repeating the digit 6 times, or multiplying the last digit by 4 and adding it to the remaining number, if the number is divisible by 13, then the whole number will be divisible by 13. E.g. 222222, 17784

Practice Questions

- Q.1** If $\frac{3}{4}$ of a number is 7 more than $\frac{1}{6}$ of that number, then what will be $\frac{5}{3}$ of that number?
 (a) 12 (b) 18
 (c) 15 (d) 20
- Q.2** If the sum of two numbers is a and their product is b then their reciprocals will be –
 (a) $\frac{1}{a} + \frac{1}{b}$ (b) $\frac{b}{a}$
 (c) $\frac{a}{b}$ (d) $\frac{a}{ab}$
- Q.3** The sum of two numbers is 75 and their difference is 25, then what will be the product of those two numbers?
 (a) 1350 (b) 1250
 (c) 1000 (d) 125
- Q.4** Divide 150 into two parts such that the sum of their reciprocal is $\frac{3}{112}$. Calculate both parts.
 (a) 50, 90 (b) 70, 80
 (c) 60, 90 (d) 50, 100
- Q.5** If the sum of any three consecutive odd natural numbers is 147, then the middle number will be –
 (a) 47 (b) 48
 (c) 49 (d) 51

- Q.6** If the product of first three and last three of 4 consecutive prime numbers is 385 and 1001, then find the greatest prime number.
- Q.7** What will be the sum of the even numbers between 50 and 100?
- Q.8** What will be the sum of odd numbers between 50 and 100?
- Q.9** In a division method, the divisor is 12 times the quotient and 5 times the remainder. Accordingly, if the remainder is 36, then what will be the dividend?
 (a) 2706 (b) 2796
 (c) 2736 (d) 2826
- Q.10** What is the unit digits of $(3694)^{1739} \times (615)^{317} \times (841)^{491}$
 (a) 0 (b) 2
 (c) 3 (d) 5
- Q.11** What will be written in the form of $\frac{p}{q}$ of 18.484848....?
 (a) $\frac{462}{25}$ (b) $\frac{610}{33}$
 (c) $\frac{200}{11}$ (d) $\frac{609}{33}$
- Q.12** Put $\frac{0.936 - 0.568}{0.45 + 2.67}$ in the form of rational number.
- Q.13** What will be the common factor of $\{(127)^{127} + (97)^{127}\}$ and $\{(127)^{97} + (97)^{97}\}$?
 (a) 127 (b) 97
 (c) 30 (d) 224

Answer Key

- | | | | |
|----------------|----------------|-----------------|---|
| Q.1 (d) | Q.2 (c) | Q.3 (b) | Q.4 (b) |
| Q.5 (c) | Q.6 13 | Q.7 1800 | Q.8 1875 |
| Q.9 (c) | Q.10(a) | Q.11(b) | Q.12 $\frac{2024}{17205}$ |
| Q.13(d) | | | |

17

CHAPTER

Percentage

- Percentage means 'Per hundred'.
- The fraction whose denominator is 100, is called percentage and the numerator of that fraction is called percentage rate.
- 5 out of 100 = $\frac{5}{100} = 5\%$

- 10 out of 100 = $\frac{10}{100} = 10\%$
- That is, when an amount is compared with 100, it is called percentage. The basis with which the comparison is made. In the fraction, the base will be called the denominator.

Conversion From Percentage to Fraction

$$100\% = 1$$

$$50\% = \frac{1}{2}$$

$$33\frac{1}{3}\% = \frac{1}{3}$$

$$25\% = \frac{1}{4}$$

$$20\% = \frac{1}{5}$$

$$16\frac{2}{3}\% = \frac{1}{6}$$

$$14\frac{2}{7}\% = \frac{1}{7}$$

$$12\frac{1}{2}\% = \frac{1}{8}$$

$$11\frac{1}{9}\% = \frac{1}{9}$$

$$80\% = \frac{4}{5}$$

$$10\% = \frac{1}{10}$$

$$9\frac{1}{11}\% = \frac{1}{11}$$

$$8\frac{1}{3}\% = \frac{1}{12}$$

$$7\frac{9}{13}\% = \frac{1}{13}$$

$$7\frac{1}{7}\% = \frac{1}{14}$$

$$6\frac{2}{3}\% = \frac{1}{15}$$

$$6\frac{1}{4}\% = \frac{1}{16}$$

$$5\frac{15}{17}\% = \frac{1}{17}$$

$$5\frac{5}{9}\% = \frac{1}{18}$$

$$75\% = \frac{3}{4}$$

$$5\frac{5}{19}\% = \frac{1}{19}$$

$$5\% = \frac{1}{20}$$

$$4\frac{1}{6}\% = \frac{1}{24}$$

$$4\% = \frac{1}{25}$$

$$2\frac{1}{2}\% = \frac{1}{40}$$

$$37\frac{1}{2}\% = \frac{3}{8}$$

$$62\frac{1}{2}\% = \frac{5}{8}$$

$$57\frac{1}{7}\% = \frac{4}{7}$$

$$66\frac{2}{3}\% = \frac{2}{3}$$

Note -

- To convert a fraction or a decimal fraction or an integer into a percentage, multiply it by 100.
- To convert a percentage to a fraction, divide it by 100.

- One number is what percent of another number –

$$\% \text{ Quantity} = \frac{\text{Given number}}{\text{Basic (another number)}} \times 100$$

Ex.1 What percent of 48 is 6 ?

Sol. Let x % of 48 = 6

$$\text{Now, } 48 \times \frac{x}{100} = 6$$

$$\frac{12x}{25} = 6$$

$$x = \frac{6 \times 25}{12} = 12\frac{1}{2}$$

The percent $12\frac{1}{2}\%$ of 48 is 6.

Ex.2 Convert $\frac{9}{16}$ into percentage.

Sol. $\frac{9}{16} = \left(\frac{9}{16} \times 100\right)\% = \frac{225}{4}\% = 56\frac{1}{4}\%$

Ex.3 When 60 is subtracted from 60% of a number, the result is 60. The number is-

- (a) 120 (b) 150
(c) 180 (d) 200

Sol. (b)

Let the number be x, then –

$$X \times 60\% - 60 = 60$$

$$\Rightarrow 0.60x - 60 = 60$$

$$\Rightarrow 0.60x = 120$$

$$\Rightarrow x = \frac{120}{0.60}$$

$$X = 200$$

\therefore The number is 200.

If there is a percentage change

Case I – If there is increase of $x_1\%$ & $x_2\%$ then –

$$\text{Percentage increase} = x_1 + x_2 + \frac{x_1 \cdot x_2}{100}$$

Case II – If there is decrease of $x_1\%$ & $x_2\%$ then –

$$\text{Percent decrease} = x_1 + x_2 - \frac{x_1 \cdot x_2}{100}$$

Case III – If there is increase of $x_1\%$ and decrease of $x_2\%$ then –

$$\text{Percentage change} = x_1 - x_2 - \frac{x_1 \cdot x_2}{100} \left[\begin{array}{l} x_1 = \text{Always percentage increase} \\ x_2 = \text{Always percentage decrease.} \end{array} \right]$$

Note- If you want to calculate the percentage change in expenses, sales income, revenue, area, etc., then the same rule will be used.

Ex.1 Two successive price increases of 10% and 10% of an article are equal to which one single price increase?

- (a) 19% (b) 20%
(c) 21% (d) 22%

Sol. (c)

Let the initial price of any item = 100

New price = 110 % of 100 of 110%.

$$\left(100 \times \frac{110}{100} \times \frac{110}{100}\right) = 121 = 21\%$$

Hence, the single price increase is equal to 21 percent.

Ex.2 The price of laptop is increased by 25%. Now by what percent is the price increased for the second time so that the total increase becomes 35%?

- (a) 7.5 (b) 9
(c) 8 (d) 10

Sol. (c)

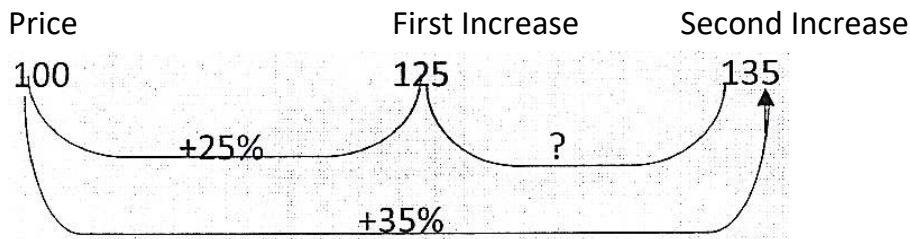
Given that –

Price increased by 25% = x
 The overall increase was 35%.
 Formula:
 Total Increment = $x + y + \frac{xy}{100}$
 Calculation:
 $\Rightarrow 35 = 25 + y + (25 \times y/100)$
 $\Rightarrow 35 = 25 + y + y/4$

$\Rightarrow 140 = 100 + 4y + y$
 $\Rightarrow 140 - 100 = 5y$
 $\Rightarrow 40 = 5y$
 $\Rightarrow y = 8$
 Hence, the second time increase is 8%.

Method II

Let the price of laptop = 100



$$\text{Percent increase} = \frac{135 - 125}{125} \times 100$$

$$= \frac{10}{125} \times 100 = 8\%$$

Ex.3 The value of a tool decreases by 20% every year. What will be the cost of that tool after 3 years?

- (a) 48.8% (b) 51.2% (c) 54% (d) 60%

Sol. (a)

20% = 1/5

Initial	Final
5	4
5	4
5	4
125	64

Required Percentage = $\frac{61}{125} \times 100 = 48.8\%$

Method II

Let the price of tool = x

According to question,

$$\text{Price after 8 years} = x \times \frac{80}{100} \times \frac{80}{100} \times \frac{80}{100}$$

$$= \frac{64}{125} x$$