Government of Tamilnadu

Department of Employment and Training

Course : TNPSC Group II Exam

Subject : Aptitude and Mental Ability

Topic : **Data Handling**

It is a cost-free service provided to the job seekers who are preparing for the Competitive Exams.

Commissioner,
Department of Employment and Training.

DATA HANDLING

Introduction

Everyday we come across different kinds of information in the form of numbers through newspapers and other media of communication.

This information may be about food production in our country, population of the world, import and export of different countries, dropouts of children from the schools in our state, the accidential deaths, etc.

In all these information, we use numbers. These numbers are called **data**. The data help us in making decisions. They play a vital part in almost all walks of life of every citizen. Hence, it is very important to know how to get relevant and exact information from such data.

The calculated data may not be suitable for reading, understanding and for analysing. The data should be carefully handled so that it can be presented in various forms. A common man should be able to understand and visualize and get more information on the data.

Recalling the Formation of Frequency Table

We have learnt in seventh standard, how to form a frequency table. Let us recall it.

Formation of frequency table for an ungrouped data

Example

Consider the following data:
15, 17, 17, 20, 15, 18, 16, 25, 16, 15,
16, 18, 20, 28, 30, 27, 18, 18, 20, 25,
16, 16, 20, 28, 15, 18, 20, 20, 20, 25. Form a frequency table.

Solution

The frequency table is given below:

Number (x)	Tally Mark	Frequency (f)
15	𝍸	4
16	𝍸 |	5
17	||	2
18	𝍸 |	5
20	𝍸 ||	7
25	|||	3
27	|	1
28	||	2
30	|	1
	Total	**30**

Formation of frequency table for a grouped data

Example

The marks obtained by 50 students in a Mathematics test with maximum marks of 100 are given as follows:

43, 88, 25, 93, 68, 81, 29, 41, 45, 87, 34, 50, 61, 75, 51, 96, 20, 13, 18, 35,
25, 77, 62, 98, 47, 36, 15, 40, 9, 25, 39, 60, 37, 50, 19, 86, 42, 29, 32, 61,
45, 68, 41, 87, 61, 44, 67, 30, 54, 8.

Prepare a frequency table for the above data using class interval.

Solution

Total number of values = 50

Range = Highest value -Lowest value

= 98 – 8 = 90

Let us divide the given data into 10 classes.

‡ Length of the Class interval $= \dfrac{\text{Range}}{\text{Number of class interval}}$

$= \dfrac{90}{10} = 9$

The frequency table of the marks obtained by 50 students in a mathematics test is as follows:

Class Interval (C.I)	Tally Mark	Frequency (*f*)
0-5	||	2
10-20	||||	4
20-30	𝍸 |	6
30-40	𝍸 ||	7
40-50	𝍸 ||||	9
50-60	||||	4
60-70	𝍸 |||	8
70-80	||	2
80-90	𝍸	5
90-100	|||	3
	Total	**50**

Thus the given data can be grouped and tabulated as follows:

Class Interval (C.I)	0-10	10 -20	20-30	30-40	40 -50	50 -60	60 -70	70 -80	80-90	90 -100
Frequency (*f*)	2	4	6	7	9	4	8	2	5	3

Drawing Histogram and Frequency Polygon for Grouped Data

The statistical data can be represented by means of geometrical figures or diagrams which are normally called "graphs''. The graphical representation of data makes itself interesting for reading, consuming less time and easily understandable. There are many ways of representing numerical data graphically. In this chapter, we will study the following two types of diagrams:

(i) Histogram
(ii) Frequency Polygon

Histogram

A two dimensional graphical representation of a continuous frequency distribution is called a histogram.

In histogram, the bars are placed continuously side by side with no gap between adjacent bars. That is, in histogram rectangles are erected on the class intervals of the distribution. The areas of rectangle are proportional to the frequencies.

(a) Drawing a histogram for continuous frequency distribution

Procedure:

Step 1 : Represent the data in the continuous (exclusive) form if it is in the discontinuous (inclusive) form.
Step 2 : Mark the class intervals along the X-axis on a uniform scale.
Step 3 : Mark the frequencies along the Y-axis on a uniform scale.
Step 4 : Construct rectangles with class intervals as bases and corresponding frequencies as heights.

The method of drawing a histogram is explained in the following example.

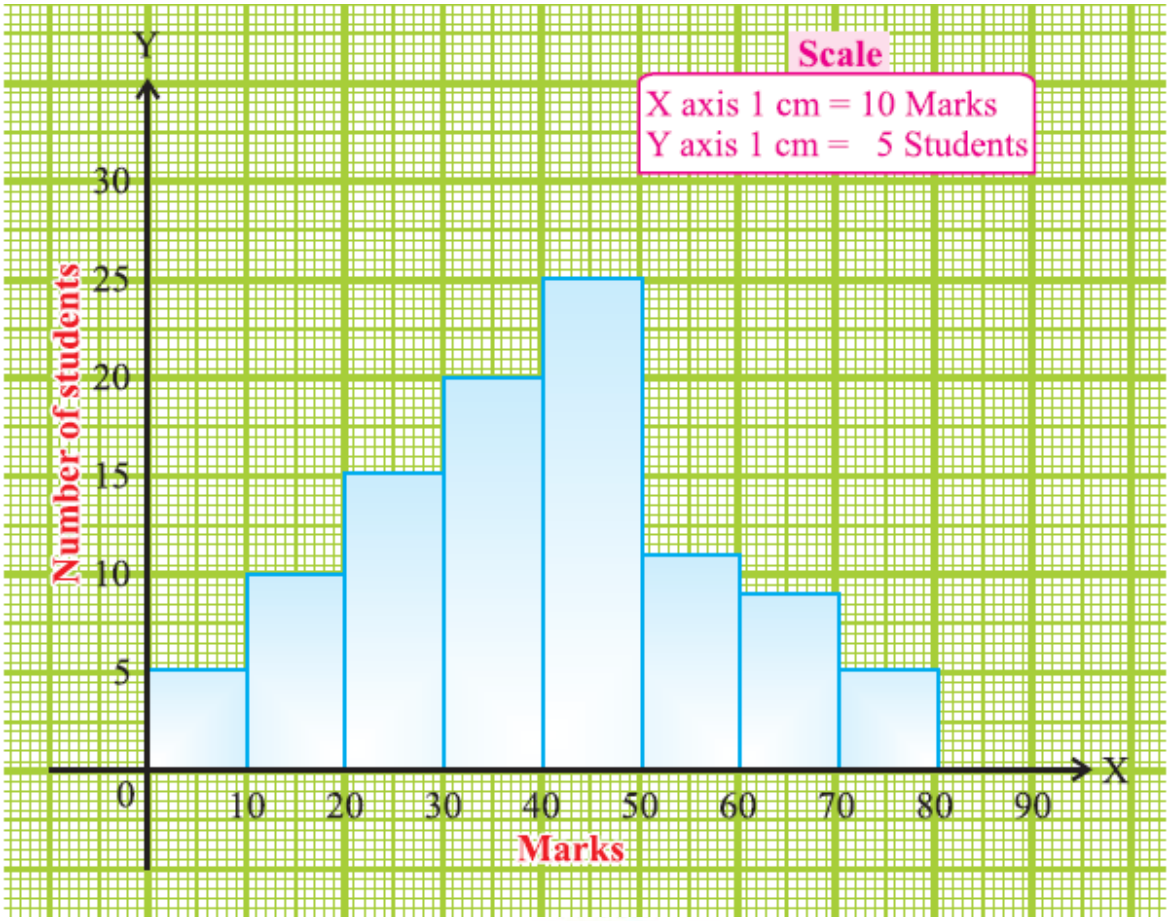
Example

Draw a histogram for the following table which represent the marks obtained by 100 students in an examination:

Marks	0-10	10 -20	20-30	30-40	40 -50	50 -60	60 -70	70 -80
Number of Students	5	10	15	20	25	12	8	5

Solution

The class intervals are all equal with length of 10 marks. Let us denote these class intervals along the X-axis. Denote the number of students along the Y-axis, with appropriate scale. The histogram is given below.



Note: In the above diagram, the bars are drawn continuously. The rectangles are of lengths (heights) proportional to the respective frequencies. Since the class intervals are equal, the areas of the bars are proportional to the respective frequencies.

(b) Drawing a histogram when class intervals are not continuous

Example

The heights of trees in a forest are given as follows. Draw a histogram to represent the data.

Heights in metre	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55
Number of trees	10	15	25	30	45	50	35	20

Solution

In this problem, the given class intervals are discontinuous (inclusive) form. If we draw a histogram as it is, we will get gaps between the class intervals. But in a histogram the bars should be continuously placed without any gap. Therefore we should make the class intervals continuous. For this we need an adjustment factor.

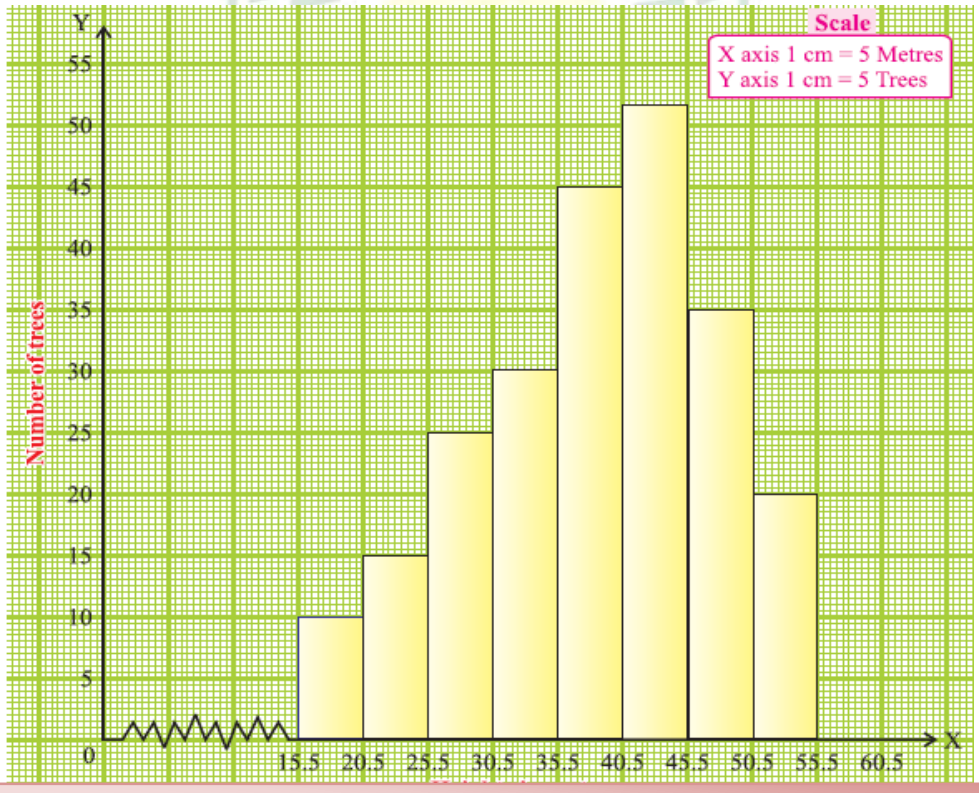
Adjustment Factor = ½ [(lower limit of a class interval) – (upper limit of the preceding class interval)]

= ½ (21-20) = 0.5

In the above class interval, we subtract 0.5 from each lower limit and add 0.5 in each upper limit. Therefore we rewrite the given table into the following table.

Heights in metre	15.5-20.5	20.5-25.5	25.5-30.5	30.5-35.5	35.5-40.5	40.5-45.5	45.5-50.5	50.5-55.5
Number of trees	10	15	25	30	45	50	35	20

Now the above table becomes continuous frequency distribution. The histogram is given below



Note: In the histogram (Fig. 3.2) along the X-axis the first value starts from 15.5, therefore a break (kink) is indicated near the origin to signify that the graph is drawn beginning at 15.5 and not at the origin.

Frequency polygon

Frequency Polygon is another method of representing frequency distribution graphically.

Draw a histogram for the given continuous data. Mark the middle points of the tops of adjacent rectangles. If we join these middle points **successively** by line segment, we get a polygon. This polygon is called the **frequency polygon**. It is customary to bring the ends of the polygon down to base level by assuming a lower class of a frequency and highest class of a frequency.

Frequency Polygon can be constructed in two ways:

(i) Using histogram

(ii) Without using histogram.

(a) To draw frequency polygon using histogram

Procedure:

Step 1 : Obtain the frequency distribution from the given data and draw a histogram.

Step 2 : Join the mid points of the tops of adjacent rectangles of the histogram by means of line segments.

Step 3 : Obtain the mid points of two assumed class intervals of zero frequency, one adjacent to the first bar on its left and another adjacent to the last bar on its right. These class intervals are known as **imagined class interval**.

Step 4 : Complete the polygon by joining the mid points of first and the last class intervals to the mid point of the imagined class intervalsadjacent to them.

Example

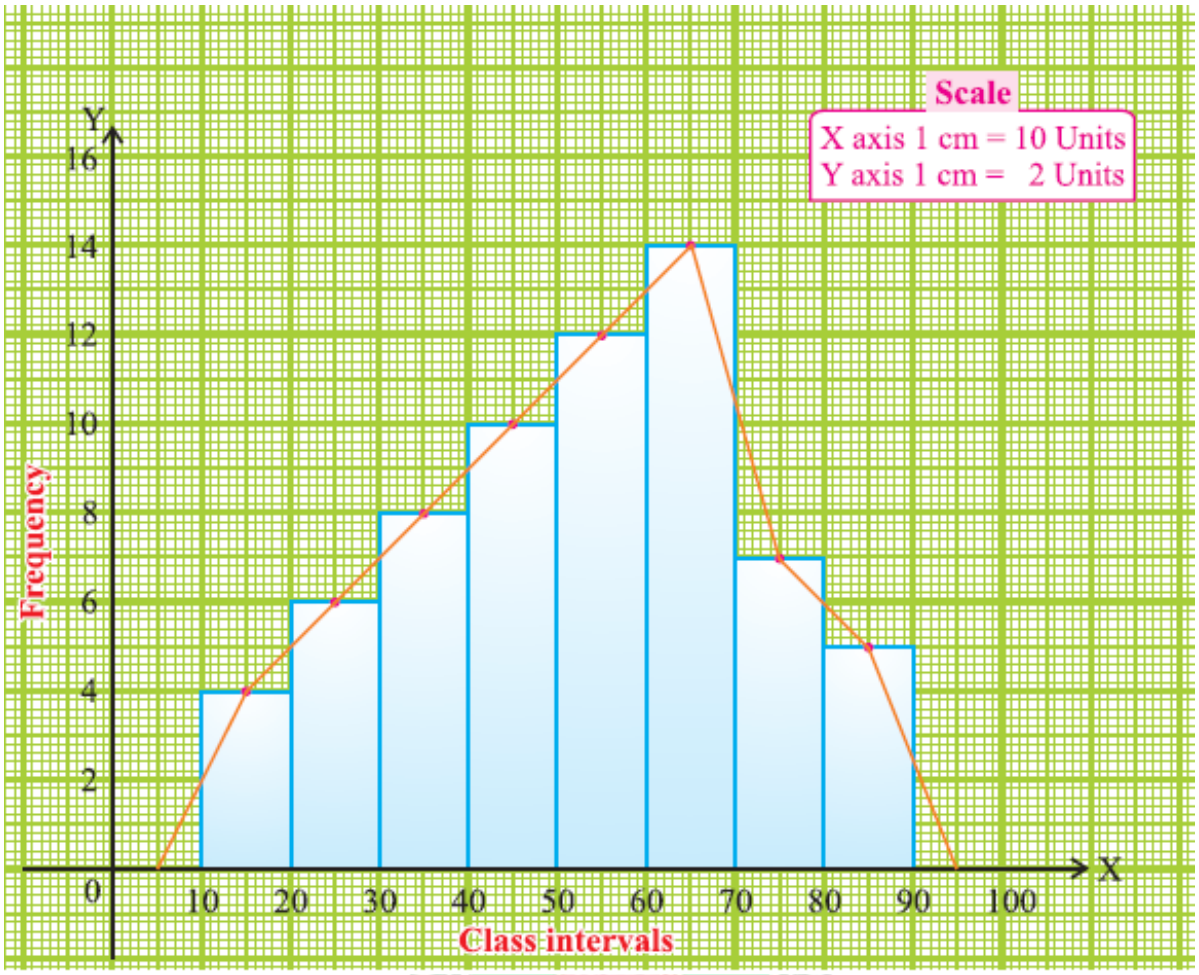
Draw a frequency polygon imposed on the histogram for the following distribution.

Class interval	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Frequency	4	6	8	10	12	14	7	5

Solution

Take the class-intervals along the X-axis and frequencies along the Y-axis wit appropriate scale as shown in the Fig.

Draw a histogram for the given data. Now mark the mid points of the upper sides of the consecutive rectangles. We also mark the midpoints of the assumed class intervals 0-10 and 90-100. The mid points are joined with the help of a ruler. The ends of the polygon are joined with the mid points of 0-10 and 90-100. Now, we get the frequency polygon. Refer Fig.



Example

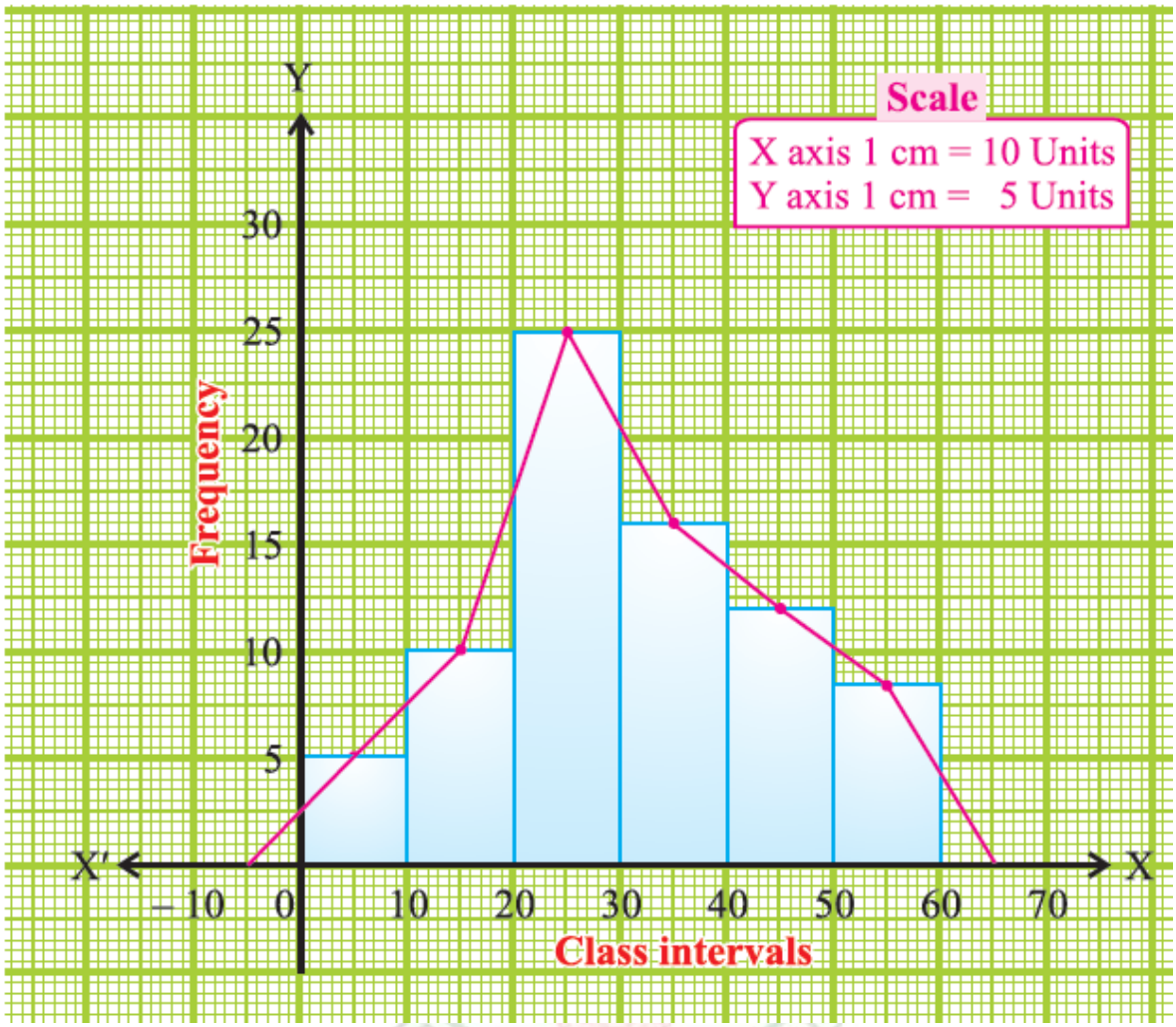
Draw a frequency polygon of the following data using histogram

Class interval	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	5	10	25	16	12	8

Solution

Mark the class intervals along the X-axis and the frequencies along the Y-axis with appropriate scale shown in Fig.

Draw a histogram for the given data. Now, mark the mid points of the upper sides of the consecutive rectangles. Also we take the imagined class interval (-10) - 0 and 60 - 70. The mid points are joined with the help of a ruler. The ends of the polygon are joined with the mid points of the imagined class intervals (-10)-0 and 60 - 70. Now we get the frequency polygon.



Note: Sometimes imagined class intervals do not exist. **For example**, in case of marks obtained by the students in a test, we cannot go below zero and beyond maximum marks on the two sides. In such cases, the extreme line segments are only partly drawn and are brought down vertically so that they meet at the mid points of the vertical left and right sides of first and last rectangles respectively.

Using this note, we will draw a frequency polygon for the following example:

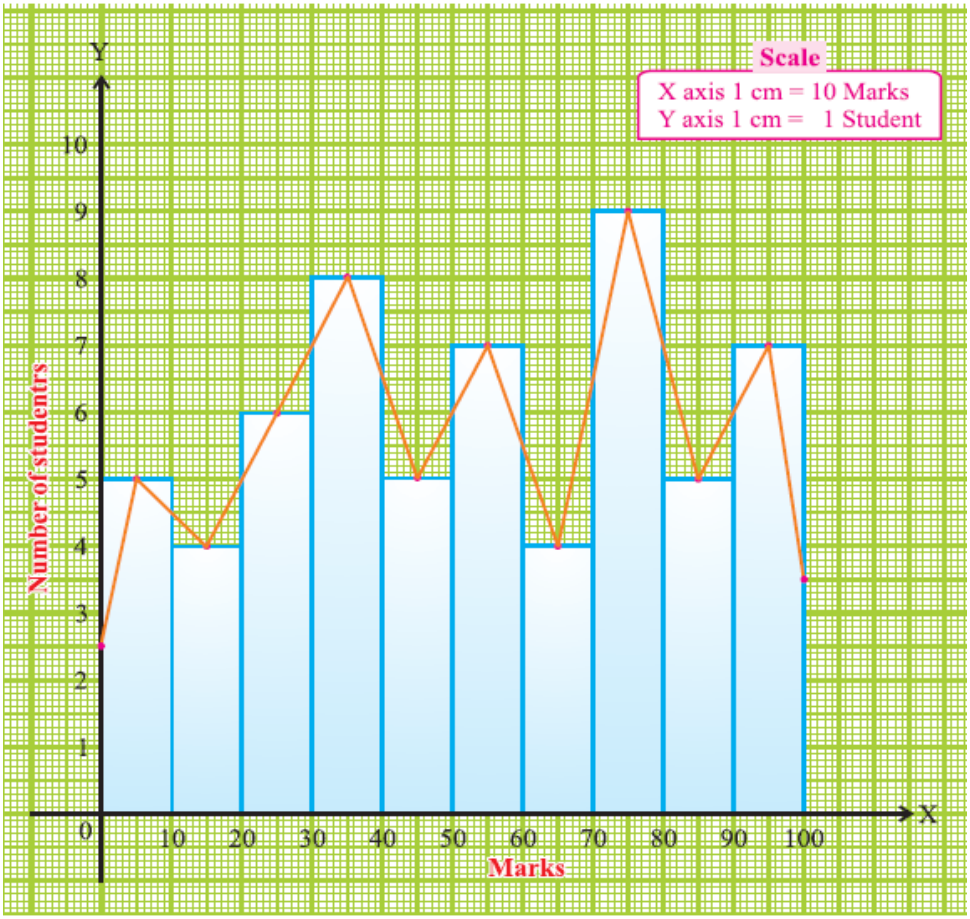
Example

Draw a frequency polygon for the following data using histogram.

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Number of Students	5	4	6	8	5	7	4	9	5	7

Solution

Mark the class intervals along the X-axis and the number of students along the Y-axis. Draw a histogram for the given data. Now mark the mid points of the upper sides of the consecutive rectangles. The mid points are joined with the help of a ruler. Note that, the first and last edges of the frequency polygon meet at the mid point of the vertical edges of the first and last rectangles.



(b) To draw a frequency polygon without using histogram.

Procedure:

Step 1 : Obtain the frequency distribution from the given data and draw a histogram.

Step 2 : Join the mid points of the tops of adjacent rectangles of the histogram by means of line segments.

Step 3 : Obtain the mid points of two assumed class intervals of zero frequency, one adjacent to the first bar on its left and another adjacent to the last bar on its right. These class intervals are known as **imagined class interval**.

Step 4 : Complete the polygon by joining the mid points of first and the last class intervals to the mid point of the imagined class intervalsadjacent to them.

Example

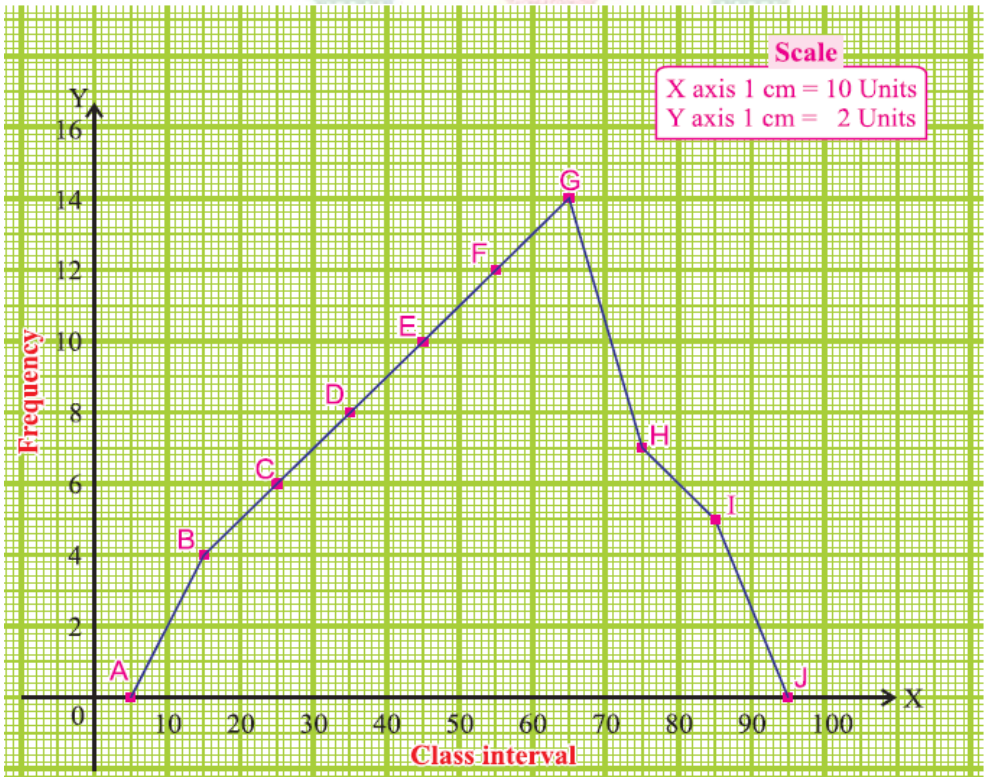
Draw a frequency polygon for the following data without using histogram.

Solution:

Mark the class intervals along the X-axis and the frequency along the Y-axis. We take the imagined classes 0-10 at the beginning and 90-100 at the end, each with frequency zero. We have tabulated the data as shown. Using the adjacent table, plot the points A (5, 0), B(15,4), C (25, 6), D (35, 8), E (45, 10), F (55, 12), G (65, 14), H (75, 7), I (85, 5) and J (95, 0).

Class interval	Midpoints	Frequency
0-10	**5**	**0**
10-20	15	4
20-30	25	6
30-40	35	8
40-50	45	10
50-60	55	12
60-70	65	14
70-80	75	7
80-90	85	5
90-100	**95**	**0**

We draw the line segments AB, BC, CD, DE, EF, FG, GH, HI, IJ to obtain the required frequency polygon ABCDEFGHIJ, which is shown in Fig.

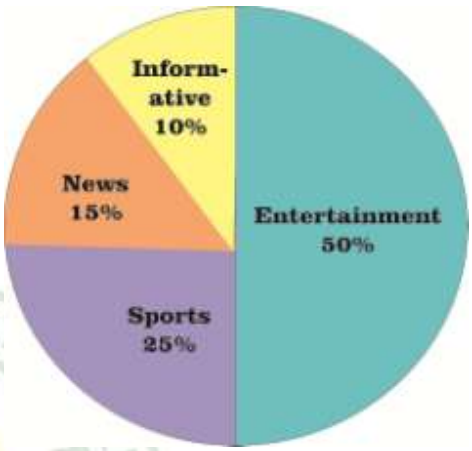


Construction of Simple Pie Chart

Have you ever come across the data represented in a circular form as shown in Figure.

The time spent by a school student during a day (24 hours).

Viewers watching different types of channels on TV.



The figures similar to the above are called circle graphs. A **circle graph** shows the relationship between a whole and its parts. Here, the whole circle is divided into sectors. The size of each sector is proportional to the activity or information it represents. Since, the sectors resemble the slices of a pie, it is called a **pie chart.**

For example, in the pie chart

The proportion of the sector for hours spent in sleeping $= \dfrac{\text{number of sleeping hours}}{\text{whole day}}$

$= \dfrac{8 \text{ hours}}{24 \text{ hours}} = \dfrac{1}{3}$

So, this sector is drawn $\dfrac{1}{3}$ rd part of the circle.

The proportion of the sector for hours spent in school $= \dfrac{\text{number of school hours}}{\text{Whole day}}$

$= \dfrac{6 \text{ hours}}{24 \text{ hours}} = \dfrac{1}{8}$

So, this sector is drawn $\dfrac{1}{8}$ th of the circle.

The proportion of the sector for hours spent in homework $= \dfrac{\text{number of home work hours}}{\text{whole day}}$

$= \dfrac{3 \text{ hours}}{24\text{hours}} = \dfrac{1}{8}$

So, this sector is drawn $\frac{1}{8}$ th of the circle

The proportion of the sector for hours spent in others $\Big\}$ $= \frac{\text{number of others hours}}{\text{whole day}}$

$= \frac{4 \text{ hours}}{24 \text{hours}} = \frac{1}{6}$

So, this sector is drawn $\frac{1}{6}$ th of the circle.

Adding the above fractions for all activities,

We get the total $= \frac{1}{3} + \frac{1}{4} + \frac{1}{8} + \frac{1}{8} + \frac{1}{6}$

$= \frac{8+6+3+3+4}{24} = \frac{24}{24} = 1$

The sum of all fractions is equal to one. Here the time spent by a school student during a day is represented using a circle and the whole area of the circle is taken as one. The different activities of the school student are represented in various sectors by calculating their proportion. This proportional part can also be calculated using the measure of angle. Since, the sum of the measures of all angles at the central point is 360°, we can represent each sector by using the measure of angle.

In the following example, we are going to illustrate how a pie chart can be constructed by using the measure of angle.

Example

The number of hours spent by a school student on various activities on a working day, is given below. Construct a pie chart using the angle measurment.

Activity	Sleep	School	Play	Homework	Others
Number of hours	8	6	3	3	4

Solution

Number of hours spent in different activities in a day of 24 hours are converted into component parts of 360°. Since the duration of sleep is 8 hours, it should be represented by $\frac{8}{24} \text{x} 360^0 = 120^0$.

Therefore, the sector of the circle representing sleep hours should have a central angle of 120°.

EXAMPLE PROBLEMS:

1.

Item	Expenditure
Food	300
Clothing	75
Education	40
House	75
Rent	110
Others	

When we represent the data on percentage diagram, the percentage of expenditure on clothing is

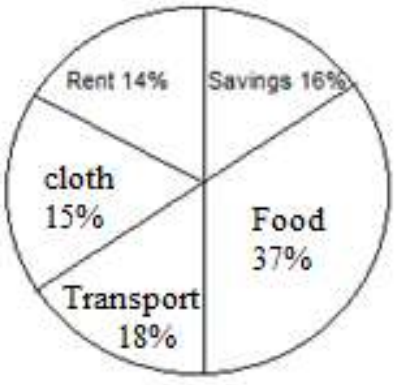
SOLUTION:

The percentage of expenditure on Clothing is,

$= \frac{75}{600} \times 100$

$= 12.5\%$

2. A man earns Rs. 24,000 as monthly Salary. His expenditure and Savings are given in the diagram. How much did he spend on rent?



SOLUTION:

Spending on rent = 14%

$\frac{14}{100} \times 24000$

$= 3360$

Ans : 3360.

3. A pie diagram is drawn to the following data, then the angle of the sector corresponding to Mathematiecs is

Course	No.of Students
Engineering	440
Medicine	220
Agriculture	160
Economics	60
Mathematies	80

SOLUTION:

440 + 220 + 160 + 60 + 80 = 960

Angle of Sector = $\frac{80}{960}$ x 360^0

(Mathematics)

= 30^0

4. From the following graph, find the percentage of increase in the profit from 2004 to 2005.

Year	2004	2005
Profit	30	50

SOLUTION:

Percentage of increase in the profit from

2004 to 2005 = $\frac{50-30}{30}$ x 100

= $\frac{20}{30}$ x 100

= $\frac{200}{30}$

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

5. From the following graph, the percentage of increase in sales from 2011 to 2013 is?

Year	2011	2012	2013
Sales	15	20	30

SOLUTION:

$$\text{Increase Percentage} = \frac{New\ value - old\ value}{old\ value} \times 100$$

$= \frac{30 - 15}{15} \times 100$ { 2011 – 15 old value}

$= \frac{15}{15} \times 100$ {2013 – 30 New value}

Ans = 100%

6. Consider the following Table?

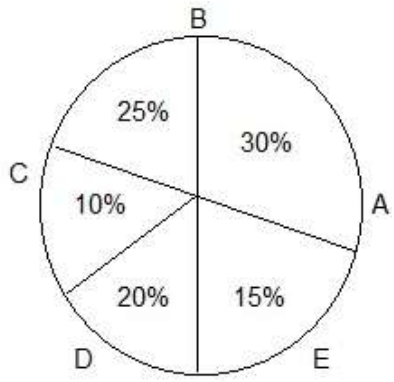
Year	1973 - 74	1987 - 88	1993 - 94	1999 - 2000
Number of poor in Indian (in million)	321	307	320	260?

Which year is least number of poor in India?

Ans : 1999 – 2000.

7. The world – wide Tea product of 15

The angle subtended by E at the centre of the circle is



SOLUTION:

$= \frac{15}{100} \times 360^0$

$= 18 \times 3 = 54^0$

Ans : 54^0

8. Yearly Profit of the Company XYZ

Change in profit from 50 to 60 of 2005 to 2006 is

SOLUTION:

Change in profit $= \frac{\text{New value} - \text{old value}}{\text{old value}} \times 100$

$= \frac{50 - 60}{60} \times 100$

$= \frac{-10}{60} \times 100$

$= \frac{-100}{6} = -16\frac{2}{3}\%$

Ans : Decreased by $16\frac{2}{3}\%$

9. The marks obtained by 10 students in a test are 15, 75, 33, 67, 76, 54, 39, 12, 78, 11, Find the arithnectic mean (or) Average.

SOLUTION:

Here, the number of observations, n = 10

$\therefore$ Arithnetic Mean = $\bar{x} = \frac{15 + 75 + 33 + 67 + 76 + 54 + 39 + 12 + 78 + 11}{10}$

$= \bar{x} = \frac{460}{10} = 16$

10. If the average of the values 9, 6, 7, 8, 5 and x is 8. Find the value of x,

SOLUTION:

Here, the given values are 7, 6, 7, 8, 5 and x, also n = 6

By formula, Arithnectic mean = $\bar{x} = \frac{9 + 6 + 7 + 8 + 5 + x}{6}$

$= \frac{35 + x}{6}$

By data $\bar{x} = 8$,

so, $\frac{35 + x}{6} = 8$

ie, $35 + x = 48$

$x = 48 - 35$

x = 13.

11. Find the median of 17, 15, 9, 13, 21, 7, 32

SOLUTION:

Arrange the values in the ascending order as 7, 9, 13, 15, 17, 21, 32.

Here n = 7, (odd number)

Therefore, Median = Middle value

$$= \left(\frac{n+1}{2}\right)^{th} \text{ value} = \left(\frac{7+1}{2}\right)^{th} \text{ value} = 4^{th} \text{ value}$$

Hence, the Median is 15.

12. A cricket player has taken the runs 13, 28, 61, 70, 4, 11, 33, 9, 71, 92, Find the Median

SOLUTION:

Arrange the runs in ascending order as 0, 4, 11, 13, 28, 33, 61, 70, 71, 92

Here, n = 10 (even number)

There are two middle values 28 and 33.

∴ Median = Average of the two middle values

$$= \frac{28+33}{2} = \frac{61}{2} = 30.5$$

13. Find the mode of 22, 25, 21, 22, 29, 25, 34, 37, 30, 22, 29, 25

SOLUTION:

Here 22 occurs 3 times, and 25 also occurs 3 times.

∴ Both 22 and 25 are the modes for this data, we observe that there are two modes for the given data.

14. Find the mode of 15, 25, 35, 45, 55, 65

SOLUTION:

Each value occurs exactly one time is the series.

Hence there is no mode for this data.

15. The circle graph given shows the spending of a family on various items and its savings during a year. If the total income of the family is Rs. 75000. Then the expenditure on Education was.

SOLUTION:

Expenditure of education = 12% of 75000

$= \frac{12}{100} \times 75000$

$= 12 \times 750$

$= 9000$

Ans = Rs. 9000

16. Find the range of the following data:

25, 67, 78, 43, 21, 17, 49, 54, 76, 92, 20, 45, 86, 37, 35

SOLUTION:

To find Range, first arrange the given data in the ascending order

17, 20, 21, 25, 35, 37, 43, 45, 49, 54, 67, 76, 78, 86, 92

∴ Range = Last Term - First Term

= 92 – 17

= 75

EXERCISE PROBLEMS:

1. A histogram is used to depict a

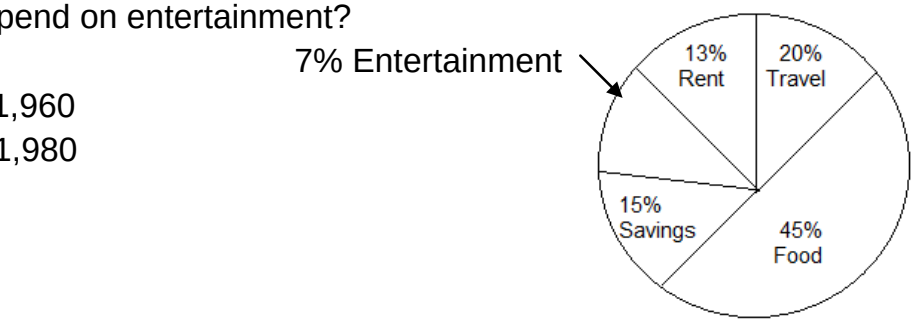
(A) sample data (B) frequency distribution

(C) geographical data (D) time series data

2. A man earns Rs. 28,000 as monthly salary. His expenditure and savings are given in the diagram. How much did he spend on entertainment?

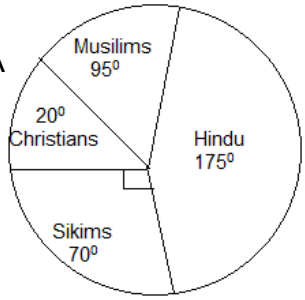
(A) Rs. 1,950 (B) Rs. 1,960

(C) Rs. 1,970 (D) Rs. 1,980

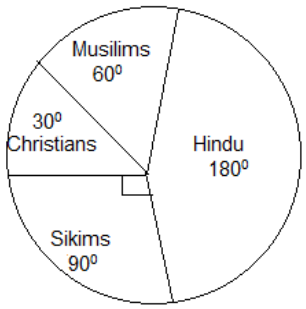


3. Christian workers in A are how many per cent of Christian workers in B?

A



B



(A) 64% (B) 65% (C) 66.66% (D) 67%

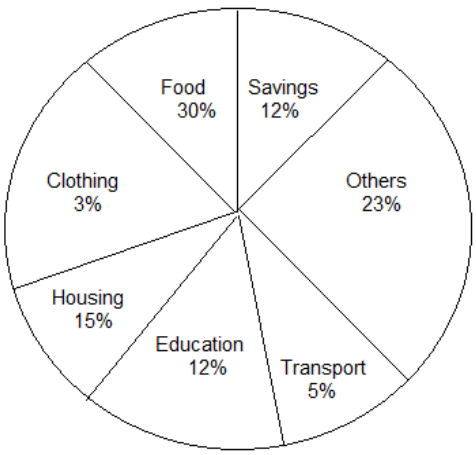
4. Consider the following table :

Year	2008	2009	2010	2011
Sales (crores)	15	25	32	54

The year in which the sales registered a sharp increase over that of the preceding year is

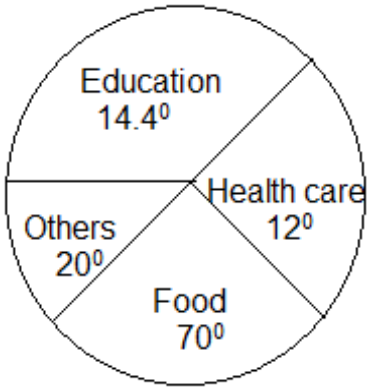
(A) 2008 (B) 2009 (C) 2010 (D) 2011

5. The circle graph given shows the spending of a family on various items and its savings during a year. If the total income of the family is Rs. 75,000. Then the expenditure on education was



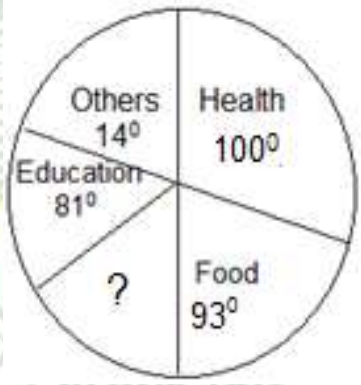
(A) Rs. 7,500 (B) Rs. 8,000 (C) Rs. 8,500 (D) Rs. 9,000

6. The pie diagram illustrates how income was spent. The percentage of income spent on health care is



(A) 40% (B) 30% (C) 20% (D) 10%

7. Pie diagram represents the government expenditure in various sectors. The missing value is:



(A) 48^0 (B) 36^0 (C) 72^0 (D) 108^0

8.

Age in years	No of persons
10 - 20	8
20 - 30	24
30 - 40	40
40 - 50	22
50 - 60	6

The relative frequency of persons belonging to the class interval 30-40 is
(A) 0.60 (B) 0.40 (C) 40 (D) 60

9.

Sector	Agriculture	Manu facturing	Services
Revenue collection	22%	40%	38%

When represented in a pie diagram, the angle that represents manufacturing is
(A) 72^0 (B) 96^0 (C) 144^0 (D) 216^0

10.

Item	Expenditure
Food	1200
Clothing	320
Rent	480
Light & Fuel	160
MBC	240

When represented through a pie diagram, the angle that corresponds to rent is:
(A) 32^0 (B) 48^0 (C) 72^0 (D) 96^0

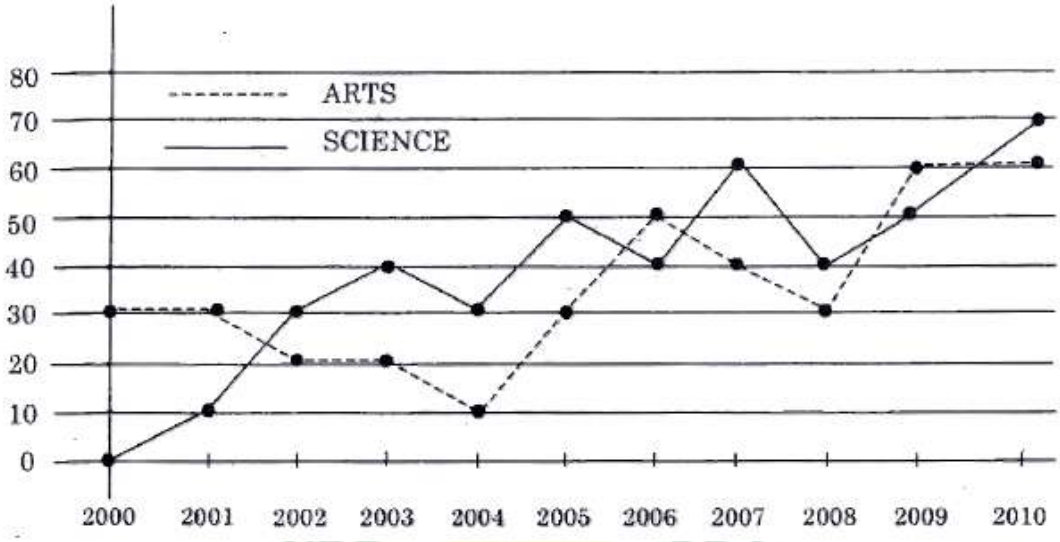
11.

Class	Frequency
0 - 10	5
10 - 20	8
20 - 30	15
30 - 40	6
40 - 50	4

For the class 20 - 30 cumulative frequency is:

(A) 20 (B) 13 (C) 15 (D) 28

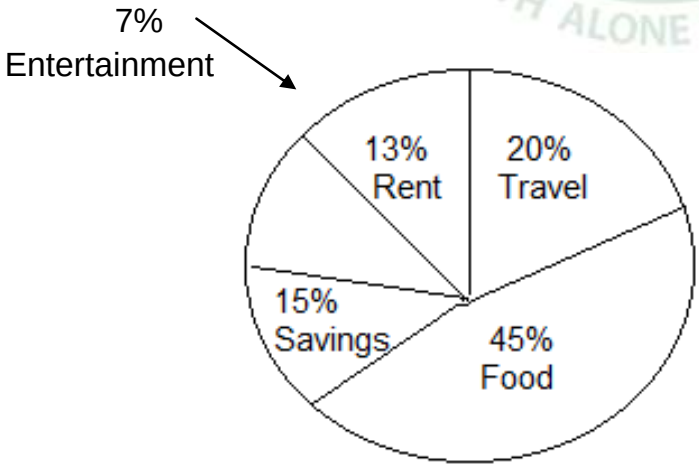
12. SALES BY TWO CATEGORY FOR ABC PRESS, 2000 - 2010 (in thousands of books).



In how many years did the sales of science books exceed the sales of arts books from 2000 to 2009?

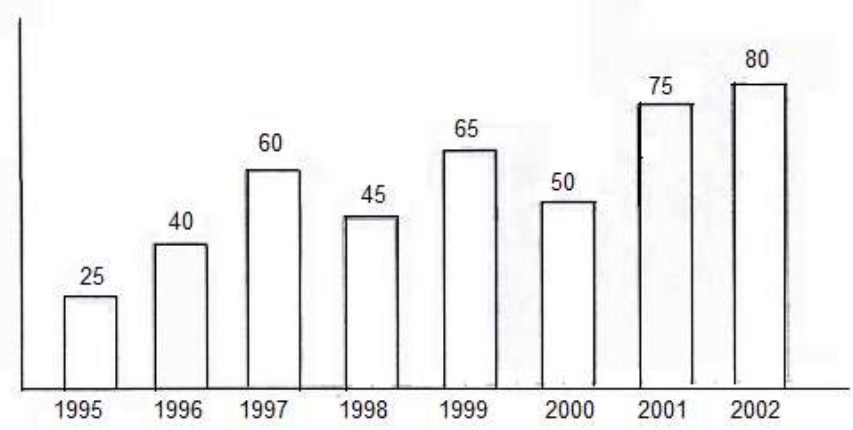
(A) 4 years (B) 5 years (C) 6 years (D) 7 years

13. A man earns Rs. 28,000 as monthly salary. His expenditure and savings are given in the diagram. The percentage of savings compared to food



(A) 33.1% (B) 33.7% (C) 33.2% (D) 33.3%

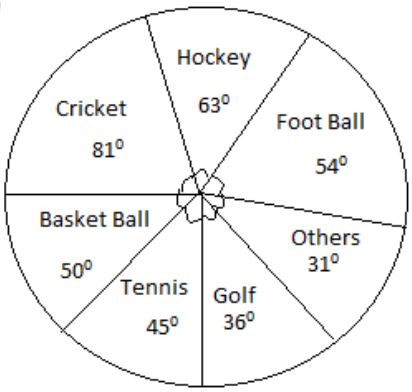
14. Study the following bar-graph and answer the question given below. A company in certain period of fertilizer production (10000 tonnes)



The average production of 1996 and 1997 was exactly equal to the average production of which of the following pairs of years?

(A) 2000 and 2001 (B) 1999 and 2000
(C) 1995 and 1999 (D) 1995 and 2001

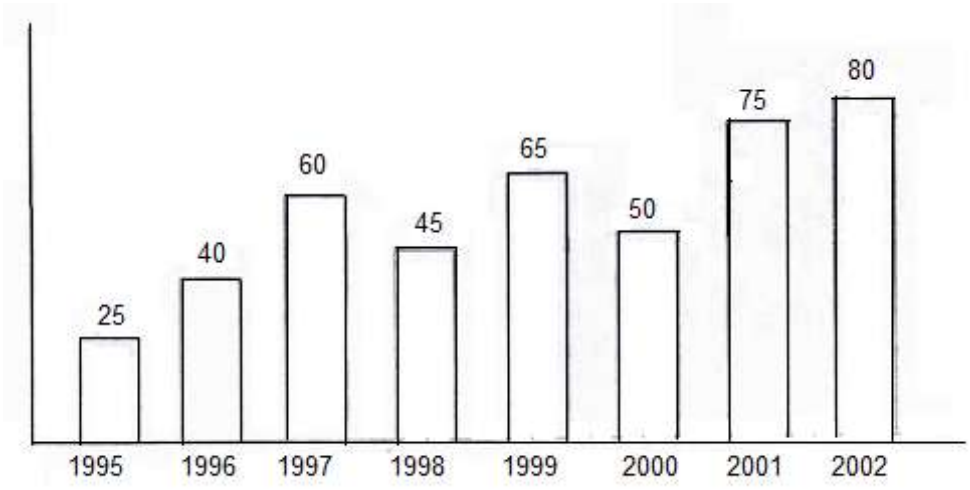
15. The circle graph given here shows the spending of a country on various sports during a particular year. Study the graph and answer the question.



If the total amount spent on sports during the year be Rs. 1,80,00,000, the amount spent on Basket Ball exceeds that on Tennis by

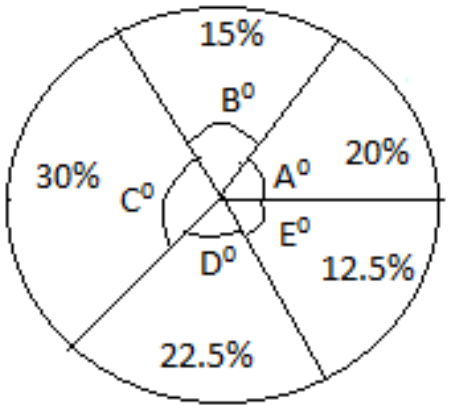
(A) Rs. 2,50,000 (B) Rs. 3,60,000
(C) Rs. 3,75,000 (D) Rs. 4,10,000

16. Study the following graph and answer the question given below.
Production of fertilizers by a company (in 10000 tonnes) over the years.



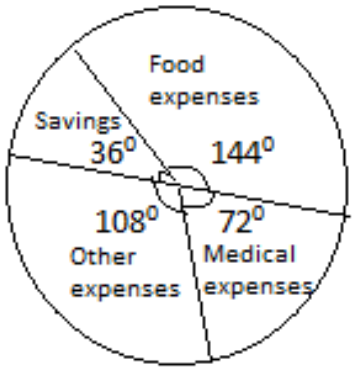
What was the percentage decline in production of fertilizers from 1997 to 1998?
(A) 25% (B) 20% (C) 30% (D) 50%

17. From the Pie Diagram given below find the central angle E^0.



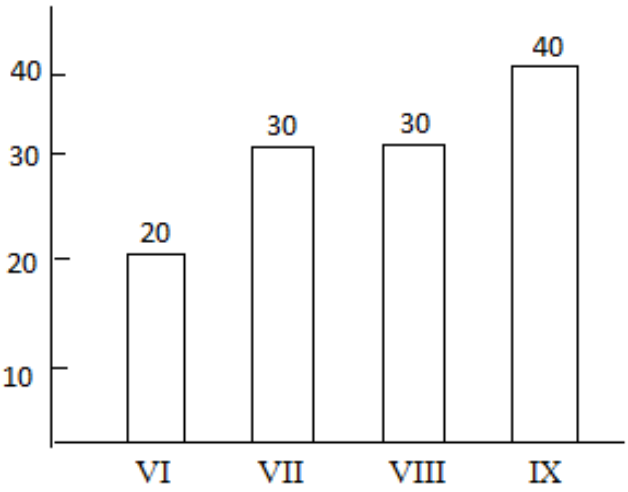
(A) 25^0 (B) 45^0 (C) 50^0 (D) 60^0

18. Monthly expenditure of a person whose monthly salary is 9000 is as shown in the diagram. The percentage of money spent for medical expenses is



(A) 10% (B) 20% (C) 30% (D) 40%

19. The ratio of the number of students in the class VII to class IX is:



(A) 2 : 3 (B) 1 : 1 (C) 3 : 4 (D) 1 : 2

20. From the following table, find the number of students who have scored marks between 20 and 50.

Marks	**No. of Students**
10-19	10
20-30	7
31-40	13
41-50	18
51-60	12
61-100	24

(A) 20 (B) 31 (C) 30 (D) 38

21. Find the mean of 2, 4, 6, 8, 10, 12, 15, 16

(A) 9 (B) 8 (C) 7 (D) 4

ANSWER KEYS:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
B	B	C	D	D	B	D	B	C	C	D	C	D	D	A	A	B	B	C	D

21
A

Government of Tamilnadu

Department of Employment and Training

Course : TNPSC Group II Exam

Subject : Aptitude and Mental Ability

Topic : **Simplification**

It is a cost-free service provided to the job seekers who are preparing for the Competitive Exams.

Commissioner,
Department of Employment and Training.

SIMPLIFICATION

FORMULA

- $(a + b)^2 = a^2 + b^2 + 2ab$
- $a^m \div a^n = a^{m-n}$
- $(a - b)^2 = a^2 + b^2 - 2ab$
- $a^m \times a^n = a^{m+n}$
- $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$
- $(a + b)^3 = a^3 + b^3 + 3ab(a + b)$
- $(a - b)^3 = a^3 - b^3 - 3ab(a - b)$
- $a^3 + b^3 = (a + b)(a^2 + b^2 - ab)$
- $a^3 - b^3 = (a - b)(a^2 + b^2 + ab)$
- $a^2 - b^2 = (a + b)(a - b)$
- $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$

  If $a + b + c = 0$, then the above identify reduces to $a^3 + b^3 + c^3 = 3abc$
- Sum of natural numbers = $\frac{n(n+1)}{2}$
- Sum of square of natural numbers = $\frac{n(n+1)(2n+1)}{6}$
- Sum of cubes of 'n' natural numbers = $\left[\frac{n(n+1)}{2}\right]^2$
- $\sqrt{y} = y$, Then the required number = y^2
- $\sqrt{a^3 \times b^3} = a^{3/2}\ b^{3/2}$
- $\sqrt{a^3 \times b^3} = ab\sqrt{ab}$
- $\sqrt{a^4 \times b^4 \times c^4} = a^2 \times b^2 \times c^2$
- $\sqrt{a^n \times b^m} = a^{n/2} \times b^{m/2}$
- $\left(\frac{a}{b}\right)^{-m/n} = \left(\frac{b}{a}\right)^{+m/n}$
- $\left(-\frac{a}{b}\right)^{-m/n} = \left(-\frac{b}{a}\right)^{+m/n}$
- $N = \left[\frac{N+1}{2}\right]^2 - \left[\frac{N-1}{2}\right]^2$

1. Properties of a Perfect Square Number:

A number whose exact square root (which must be a whole number can be obtained, is called a perfect square:

a) A number ending with 2, 3, 7 or 8 cannot be a perfect square.

b) The last digit of a perfect square must be 0, 1, 4, 5, 6 or 9.

c) A number ending with odd number of zeroes cannot be a perfect square, e.g. 9000, 25000, 16000, etc. are not perfect squares.

d) A perfect square number is either exactly divisible by 3 or leaves a remainder of 1, when divided by 3.
e.g. 64 if divided by 3, will leave a remainder of 1
36 is exactly divisible by 3.

e) A perfect square number is either exactly divisible by 4 or leaves a remainder of 1, when divided by 4
e.g. 81 if divided by 4, will leave a remainder of 1
100 is exactly divisible by 4.

2. Square Root of Vulgar Fraction

$\sqrt{\frac{3}{7}}$ = ?

Step 1: Multiply the numerator and the denominator by the donominator.

Step 2: Find the square root of the new numerator and divide it by the new denominator.

$\therefore \sqrt{\frac{3}{7}} = \sqrt{\frac{3}{7} \times \frac{7}{7}} = \frac{\sqrt{21}}{7} = \frac{4.582}{7} = 0.652$

EXAMPLE PROBLEM:

1. $(1 - \frac{1}{3})(1 - \frac{1}{4})(1 - \frac{1}{5})\ldots\ldots(1 - \frac{1}{q}) =$

$(3 - \frac{1}{3})(4 - \frac{1}{4})(5 - \frac{1}{5})\ldots\ldots(q - \frac{1}{q})$

$(\frac{2}{3})(\frac{3}{4})(\frac{4}{5})(\frac{5}{6})\ldots\ldots(q - \frac{1}{q})$

Ans = $\frac{2}{q}$

2. $\frac{16.12 \times 16.12 \times 16.12 + 13.88 \times 13.88 \times 13.88}{16.12 \times 16.12 - 16.12 \times 13.88 + 13.88 \times 13.88}$

Solution:

Let, a = 16.12 b = 13.88

$a^3 + b^3 / a^2 - ab + b^2$

$= (a + b)(a^2 - ab + b^2) / (a^2 - ab + b^2)$

= (a + b)
= 16.12 + 13.88
Ans = 30

3. If 1 + 2 + 3 + …. + n = K, then
$1^3 + 2^3 + 3^3 + …. + n^3 =$_____

Solution:
1 + 2 + 3 + …. + n (n + 1) / 2
n (n + 1) / 2 = K [1 + 2 + 3 + ….. + n = K]
$1^3 + 2^3 + 3^3 + ….. + n^3 = [n (n + 1) / 2]^2$
Ans : K^2

4. If a clock strikes once at 1'o' clock, twice at 2'o' clock and so on, how many times will it strike in a day?

Solution:
1 + 2 + 3 + ……. + 12
No of time in a day = 2[1 + 2 + 3 + ……. + 12]
= (n = 12)
= 2 x n (n + 1)/2
= 2 x 12 (13)/2
= 2 x 6(13)
= 2 x 78 = 156
Ans = 156

5. If $8^m = 32$, then m is

Solution:
$8^m = 32$
$(2^3)^m = 2^5$
$2^{3m} = 2^5$
3m = 5
Ans = $\frac{5}{3}$

6. Simplify $\sqrt[4]{\sqrt[3]{x^2}}$
$[(x^2)^{1/3}]^{1/4}$
Ans : $x^{1/6}$

7. If $\frac{2}{3} = 89$, $\frac{3}{4} = 2716$, $\frac{4}{3} = 649$ then $\frac{1}{2} = ?$

Solution:

$\frac{2}{3} = 2^3\,3^2 = 89$

$\frac{3}{4} = 3^3\,4^2 = 2716$

$\frac{4}{3} = 4^3\,3^2 = 649$

$\frac{1}{2} = 1^3\,2^2 = 14$

8. Simplify $\frac{(4.2 \text{ x } 4.2 - 1.9 \text{ x } 1.9)}{(2.3 \text{ x } 6.1)} = ?$

Solution:

$$= \frac{4.2 \text{ x } 4.2 - 1.9 \text{ x } 1.9}{2.3 - 6.1}$$

$$= \frac{(a^2 - b^2)}{(a-b)(a+b)}$$

Ans $= \frac{(a+b)(a-b)}{(a-b)(a+b)} = 1$

9. $\sqrt{56 + \sqrt{8\sqrt{64}}} =$

Solution:

$= \sqrt{56 + 8}\sqrt{8^2}$

$= \sqrt{56 + 8\,x\,8}$

$= \sqrt{56 + \sqrt{8}^2} = \sqrt{56 + 8}$

$= \sqrt{64} = 8$

Ans: 8

10. If n, n + 2, n + 4 are prime numbers, then the least value of n is

If n = 1 - > 1, 3, 5 -> 1 is not prime numbers

If n = 2 -> 2, 4, 6 -> Is not prime numbers

If n = 3 -> 3, 3 + 2, 3 + 4…..

3, 5, 7 -> is prime numbers

∴ The Least value of n is 3.

11. The value of $\frac{\sqrt{0.25}}{1.44} \text{ x } \frac{\sqrt{3.6 \text{ x } 4.9}}{6.25} =$

Solution:

$= \frac{\sqrt{0.25}}{1.44} \text{ x } \frac{\sqrt{3.6 \text{ x } 4.9}}{6.25}$

$= \frac{\sqrt{25}}{144} \text{ x } \frac{\sqrt{36x49}}{625}$

[Multiply by 100]

$= \frac{\sqrt{25}}{\sqrt{144}} \text{ x } \frac{\sqrt{36}\sqrt{49}}{\sqrt{625}}$

$= \frac{5}{12} \text{ x } \frac{6 \text{ x } 7}{25}$

= 7/2 x 5 = 7/10

Ans: 0.7

12. If the mean of $x, x + 3, x + 6, x + 9, x + 12$ is 60, then the value of x is

Solution:

$\frac{x + x + 3 + x + 6 + x + 9 + x + 12}{5} = 60$

$x + x + 3 + x + 6 + x + 9 + x + 12 = 60 \text{ x } 5$

$5x + 30 = 60 \text{ x } 5$

$5x = 300 - 30$

$5x = 270$

$x = \frac{270}{5}$

Ans: $x = 54$

13. Find the value of $\sqrt{58 + \sqrt{31 + \sqrt{21 + \sqrt{11 + \sqrt{25}}}}}$

Solution:

$= \sqrt{58 + \sqrt{31} + \sqrt{21} + \sqrt{11 + 5}}$

$= \sqrt{58 + \sqrt{31} + \sqrt{21} + \sqrt{16}}$

$= \sqrt{58 + \sqrt{31} + \sqrt{21} + \sqrt{4}}$

$= \sqrt{58 + \sqrt{31} + \sqrt{25}}$

$= \sqrt{58 + \sqrt{31 + 5}}$

$=\sqrt{58+\sqrt{36}}$

$=\sqrt{58+6}$

$=\sqrt{64}$ **= 8**

14. (0.673) x (0.673) – (0.327) x (0.327) / 1 – 0.654

Solution:

$= (0.673)^2 – (0.327)^2 / 1 – 0.654$

= (0.673 + 0.327) (0.673 – 0.327) / 1 – 0.654

= (1.000) x (0.346) / 1 – 0.654

= 0.346 / 0.346

= 1.000 = **Ans: 1**

15. Simplify the following $x^2 + 1 / x^4 – 1$

Solutions:

$= x^2 + 1 / x^4 – 1 = x^2 + 1 / (x^2)^2 – 1^2$

$= x^2 + 1 / (x^2 + 1)(x^2 – 1)$

$= 1 / x^2 – 1$

Ans = $1 / x^2 – 1$

EXERCISE PROBLEMS:

1. For a set of 500 observations variance is found to be 125. If 25 is added to each observation and 55 is subtracted then the new variance under simplification?

(a) 95 (b) 150 (c) 180 (d) 125

2. What is x in

260	2
x	6

?

(a) 30 (b) 36 (c) 38 (d) 230

3. Find x in

5	9	6	84
7	3	7	70
8	6	7	56
5	x	3	36

(a) 4 (b) 7 (c) 9 (d) 3

4. Find the value of $\sqrt{58+\sqrt{31+\sqrt{21+\sqrt{11+\sqrt{25}}}}}$

(a) 7 (b) 8 (c) 9 (d) 6

5. Simplify the following $\frac{x^2+1}{x^4-1}$

(a) $\frac{1}{x^2}$ (b) $\frac{1}{x^2-1}$ (c) x^2 (d) $\frac{1}{x^2-1}$

6. 5% income of X is equal to 15% income of Y and 10% income of Y is equal to 20% income of Z. If income of Z is Rs. 3,000 then total income of X, Y and Z in Rupees is

(a) 18,000 (b) 12,000 (c) 27,000 (d) 16,000

7. $\frac{(0.673)\text{ x }(0.673)-(0.327)\text{ x }(0.327)}{1-0.654}$

(a) 0.276 (b) 0.354 (c) 0.412 (d) 1.000

8. x is equal to

3	5	7
11	13	17
19	$\boldsymbol{x}$	29

(a) 25 (b) 21 (c) 22 (d) 23

9. $\sqrt{56+\sqrt{8\sqrt{64}}}=$

(a) 8 (b) 7 (c) 5 (d) 6

10. If 2% of x is 40, then 2% of (x + 50) =

(a) 50 (b) 401 (c) 410 (d) 41

11. The value of $\sqrt{\frac{0.25}{1.44}\ x\ \frac{3.6\ x\ 4.9}{6.25}}$ =

(a) 0.7 (b) 0.9 (c) 0.6 (d) 0.8

12. Simplify $\sqrt[4]{\sqrt[3]{x^2}}$

(a) $x^{1/6}$ (b) $x^{1/12}$ (c) $x^{1/3}$ (d) $x^{1/4}$

13. Find the value of $\left(\frac{\mathbf{456\ x\ 456 - 123\ x\ 123}}{\mathbf{579}}\right)$

(a) 333 (b) 579 (c) 456 (d) 123

14. If $x : y = 2 : 1$ then $(x^2 - y^2) : (x^2 + y^2)$ is

(a) 3 : 5 (b) 5 : 3 (c) 1 : 3 (d) 3 : 1

15. If $: y = 5 : 7$, then $7x - 3y / 14x + 5y$ =?

(a) 1/15 (b) 1/7 (c) 7/3 (d) 5/7

16. The sum of n terms of $\left(1 - \frac{1}{n}\right) + \left(2 - \frac{4}{n}\right) + \left(3 - \frac{9}{n}\right) + n$ ....

(a) $\frac{n^2 - 1}{6}$ (b) $\frac{n^2 + 1}{6}$ (c) $\frac{n + 1}{6}$ (d) $\frac{n - 1}{6}$

17. If $a^b = 169$ then $(a - 1)^{b + 1}$

(a) 1278 (b) 1728 (c) 1827 (d) 2781

18. The value of $\frac{225\ x\ 225\ x\ 225\ x + 275\ x\ 275\ x\ 275}{225\ x\ 225 - 225\ x\ 275 + 275\ x\ 275}$

(a) 500 (b) 600 (c) 650 (d) 50

19. $48^2 + 2 \times 48 \times 52 + 52^2$ is

(a) 4^2 (b) 100^2 (c) 99^2 (d) 1000

ANSWER KEYS:

1	2	3	4	5	6	7	8	9	10
D	A	B	B	B	C	D	D	A	D
11	12	13	14	15	16	17	18	19	
A	A	A	A	A	A	B	A	B	

Government of Tamilnadu

Department of Employment and Training

Course : TNPSC Group II Exam

Subject : Aptitude and Mental Ability

Topic : **Percentage**

Commissioner,
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PERCENTAGE

- ❖ Percentage represents parts of or fraction of the whole. Percentage implies 'for every hundred' and is denoted by the symbol '%'.
- ❖ Percentage concept is the most needed concept to solve data interpretation and most important chapter in TNPSC.

1. Conversion of fraction to percentage and vice-versa.
2. Percentage Increase and decrease.
3. Successive percentage change.

Through analysis of TNPSC question papers reveals that it is the foremost basic concept to be learned. Since D.I. is also included inthe syllabus, it is necessary to have a strong basic related to percentage.

Most of TNPSC questions are simple and can be solved within 30 seconds. In this chapter, we will solve using formulas and also through shortcuts.

Remember:

1) '%' means 'divided by 100' or 'out of 100' E.g. 36% → 36 out of 100 → 36/100
2) The word 'of' defines multiplication (x)
   E.g. 10% of 200 → 10/100 x 200
3) These values given below are to be learnt so that any percentage problem can be solved:

½	=	50%
1/3	=	$33\frac{1}{3}$%
¼	=	25%
1/5	=	20%
1/6	=	$16\frac{2}{3}$%
1/7	=	$14\frac{2}{7}$%
1/8	=	12.5%
1/9	=	$11\frac{1}{9}$%
1/10	=	10%
1/11	=	$9\frac{1}{11}$%
1/12	=	$8\frac{1}{3}$ %

$$\text{Percentage Change} = \frac{\text{Final Quantity} - \text{Initial Qty.}}{\text{Initial Qty.}}$$

EXAMPLE PROBLEMS:

EXAMPLE: If the cost of an article changes from 6 to 8, the percentage change is given by

$\frac{8-6}{6}$ x 100 = 33.33%

If a quantity increases by a %, then its value gets multiplied by (100 + a) /100.

EXAMPLE: If there is a 25% increase on an article worth Rs.464,

its new price = 464 x $\frac{(100+25)}{100}$

464 x 125 / 100 → 464 x 1.25 = Rs.580

Similarly, if a quantity decreases by a%, then its value gets multiplied by $\frac{(100-a)}{100}$

EXAMPLE: If there is a 25% decrease on an article worth Rs.464,

its new price = 464 x 0.75 = Rs.348

Basics : Question on percentage can be asked in 3 different ways. Let's find the value of X in the following cases :

Case 1 : x is 15% of 70

$x = \frac{15}{100}$ x 70

$x = \frac{105}{10} = 10.5$

Case 2 : x = 484 x $\frac{100}{40}$ = 1210

Case 3 : x % of 85 is 15

15 = $\frac{x}{100}$ x 85

$x = \frac{15\,x\,100}{85}$ = 17.467

1. Original Number and its Rate Percent:

Rate percent of a number is the product of the rate percent and the number which gives a result.

⇒ p% of number = result

$\Rightarrow \frac{p}{100}$ x number = result

(Original) number = $\frac{result}{p}$ x 100

$$\text{Original number} = \frac{result}{p} \text{ x } 100$$

2. Two Different Rate percents of a Number:

Subtracting,

(p_1 - p_2)% of number = x_1 - x_2

EXAMPLE: If 40% of the number exceeds the 25% of it by 54, find the number

3. Expressing a Given Quantity as a Percentage of Another Given Quantity:

$$\text{the required percentage} = \frac{x}{y} \text{ x } 100\%$$

EXAMPLE: To find '30 is what per cent of 150' or 'what percentage of 150 is 30?

Using the earlier concept, we find here that 150 is the basis of comparison and hence 150 will be in the denominator.

The required percentage = $\frac{30}{150}$ x 100%

= 20%.

4. Two step change of Percentage for a number

$$\text{Net \% change} = x + y + \frac{xy}{100} \ (+ \text{ or } -)$$

If x or y indicates decrease in percentage, then put a (-)ve sign before x or y, otherwise positive sign remains.

EXAMPLE: If a number is increased by 12% and then decreased by 18%, then find the net percentage change in the number.

Using the formula (2)

net % change = $x + y + \frac{xy}{100}$

where $x = 12$ $y = -18$

$\Rightarrow$ net % change = $12 - 18 + \frac{(12)x\,(-18)}{100}$

$= -6 - 2.16$

$= -8.16$

Example: If the length of rectangle increases by 30% and the breadth decreases by 12%, then find the % change in the area of the rectangle.

net % change = $x + y + \frac{xy}{100}$

where $x = 30$ $y = -12$

$\Rightarrow$ net % change $= 30 - 12 + \frac{30\,x\,-12}{100}$

$= 18 - 3.6$

$= +14.4$

It implies that there is 14.4% increase int he area of the rectangle.

$$\%\ \text{Change in consumption} = \frac{\%\ \text{change in rate}}{100 + \%\ \text{change in rate}}\ \text{x}\ 100$$

If rate falls then % change in rate is (−)ve.

5. Rate change and change in quantity available for same Expenditure

$$\text{Original rate} = \frac{\text{pE}}{(100 + \text{p})\text{q}}$$

Where E = fixed expenditure q = change in quantity available because of change of rate.

EXAMPLE: A reduction of 25% in the price of sugar enables the person to get 10 kg more on a purchase for Rs. 600 Find the reduced rate of sugar.

Let the original rate be Rs. A/kg then using

$$A = \frac{\text{pE}}{(100 + \text{p})\text{q}}$$

here, p = – 25, E = 600, q = 10

$$A = \frac{25\ \text{x}\ 600}{75\ \text{x}\ 10} = 20 \text{ (original rate)}$$

Reduced rate = (100 – 25)% of 20 = Rs.15 (new rate/kg)

6. % Excess or % Shortness

When a number A exceeds the another number B by x%, then

$$\% \text{ shortness of B} = \frac{x}{100+x} \text{ x } 100$$

It implies that B is less than A by $= \frac{x}{100+x}$ x 100%

Similarly, if a number A is short of (or less than) B by x %, then

$$\% \text{ excess of B} = \frac{x}{100-x} \text{ x } 100$$

i.e. B is more than A by = $\frac{x}{100-x}$ x 100%

EXAMPLE: If the price of coffee is increased by 10%, then by how much percentage must a house wife reduce here consumption, to have no extra expenditure?

The % reduction in consumption = $\frac{10}{100+10}$ x 100%

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

EXERCISE PROBLEMS:

1. If the radius of a circle is increased by 25% then its area is increased by

(A) 50% (B) 25% (C) 56.25% (D) 46.25%

2. If *A*'s height is 25% less than that of *B,* then how much percent is *B*'s is height more than that of *A*?

(A) 50% (B) 45% (C) $22\frac{1}{3}$% (D) $33\frac{1}{3}$%

3. Rate of a bike is Rs. 17,000 the company save Rs. 1700 discount to the bike. Then what is the percentage of the discount?

(A) 15% (B) 25% (C) 5% (D) 10%

4. In a basket, 15% of the mangoes are rotten. The number of rotten mangoes is 30. Then the number of good mangoes is:

(A) 200 (B) 170 (C) 150 (D) 30

5. In a survey conducted among 2000 Junior Assistants in an office, it was found that 48% preferred coffee, 54% liked tea and 64% used to smoke. If 28% used coffee and tea, 32% used tea and smoke and 30% used coffee and smoke, then the percentage of clerks who use only coffee, given that 6% did none of these.

(A) 15% (B) 12% (C) 8% (D) 10%

6. The mean age of a combined group of men and women is 30 years. If the mean age of the group of men is 32 and that of the group of women is 27, find out the percentage of men in the group.

(A) 0.4 (B) 0.6 (C) 0.5 (D) 0.7

7. In an examination 30% of total students failed in English, 40% of students failed in Hindi and 20% in both. Find the percentage of students who passed in both the subjects.

(A) 50% (B) 20% (C) 10% (D) 60%

8. Amala invests Rs. 6,000 in a bond which gives interest at 4% per annum during the first year, 5% during the second year, 10% during the third year. How much does she get at the end of the third year?

(A) Rs. 7,300 (B) Rs. 7,007.2 (C) Rs. 7,200 (D) Rs. 7,207.2

9. The boys and girls are in the ratio 3:2. If 10% of the boys and 25% of the girls are brilliant, the percentage of students NOT brilliant is:

(A) 80% (B) 84% (C) 72% (D) 60%

10. Ramkumar spends 70% of his income. His income is increased by 15% and he increased his expenditure by 10%. Find the percentage increase in his savings.

(A) 76.67% (B) 36.6% (C) 26.67% (D) 15%

11. In an examination 80% of the total candidates passed in English and 70% in Mathematics, while 20% failed in both. If total no. of candidates failed is 450, find the total number of candidates.

(A) 1800 (B) 1500 (C) 1000 (D) 1200

12. In an half yearly examination 60% of the candidate failed in Physics and 40% failed in Mathematics. If 15% of the candidates failed in both subjects and 7,500 students passed in both then the total number of candidates are

(A) 50,000 (B) 45,000 (C) 75,000 (D) 60,000

13. A's salary is half that of B. If A got a 50% rise in his salary and B got a 25% rise in his salary, then the percentage increase in combined salaries of both is :

(A) 33 ½% (B) 72% (C) 36% (D) 33%

14. A road transport officer accepts 72% of the auto meters in working condition. How many will he examine to accept 270 auto meters?

(A) 375 (B) 470 (C) 475 (D) 720

15. In 2013, the population of a town is 1,25,000. If it is increased by 7% in the next year. Find the population in 2014

(A) 8750 (B) 1,33,750 (C) 1,16,250 (D) 1,25,000

16. Which is largest in 28%, 2.8%, $\frac{2}{9}$ and 0.25?

(A) 28% (B) 2.8% (C) $\frac{2}{9}$ (D) 0.25

17. 30 percent of a number is 15 less than 3/5th of that number. What is the number?

(A) 48 (B) 52 (C) 50 (D) 70

18. If A's salary is 20% less than B's salary, by how much percent is B's salary more than A's?

(A) 24% (B) 25% (C) 20% (D) 22%

19. If 18% of the total number of oranges in a basket is 36. Then the total number of oranges is

(A) 100 (B) 150 (C) 200 (D) 300

ANSWER KEYS:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
C	D	D	B	B	B	A	D	B	C	B	A	A	A	B	A	C	B	C

Government of Tamilnadu

Department of Employment and Training

Course : TNPSC Group II Exam

Subject : Aptitude and Mental Ability

Topic : **LCM & HCF**

Commissioner,
Department of Employment and Training.

LCM AND HCF

Least Common Multiple (LCM) and Highest Common Factor (HCF) :

HCF divides the numbers and numbers divides the LCM

- L.C.M x H.C.F = product of the two numbers.
- L.C.M is always multiple of H.C.F.
- LCM of fractions $= \frac{\text{LCM of numerators}}{\text{HCF of denominators}}$
- HCF of fractions $= \frac{\text{HCF of numerators}}{\text{LCM of denominators}}$

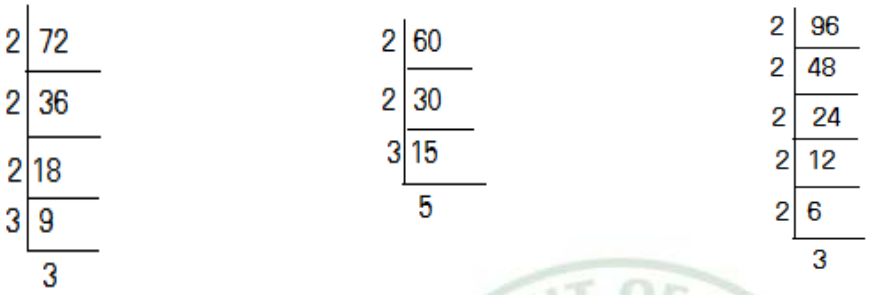
S.no	***Question***	***Approach***
I	Find the least number, which is exactly divisible by *x, y, z.*	LCM (*x, y, z*)
II	Find the least number, which when divided by *x, y, z* leaves a remainder '*r*' in each case.	LCM (*x, y, z*) + r
III	Find the least number, which when divided by *x, y, z* leaves remainders a, b, c respectively.	Observe, if *(x - a) – (y – b) – (z – c) =k* (say). Then LCM *(x, y, z) - k* Else, go with the options.
IV	Find the greatest number, that will exactly divide *x, y, z*	HCF *(x, y, z)*
V	Find the greatest number, that will divide *x, y, z* leaving remainders a, b, c respectively.	HCF *(x - a, y - b, z - c)*
VI	Find the greatest number, that will divide *x, y, z* leaving the same remainder in each case.	HCF *(x - y, y - z, z - x)*

1. Highest Common Factor (HCF):

If two or more numbers are broken into their prime factors, then the product of the maximum common prime factors in the given numbers is the H.C.F. of the numbers.

In other words, the HCF of two or more numbers is the greatest number (divisor) that divides all the given numbers exactly. So, HCF is also called the Greatest Common Divisor (GCD).

Example: Find the HCF of 72, 60, 96.
Here, we first find the prime factors of each given number.



Here 72 = 2 x 2 x 2 x 3 x 3
60 = 2 x 2 x 3 x 5
96 = 2 x 2 x 2 x 2 x 2 x 3

and so HCF = product of maximum common prime factors = 2 x 2 x 3 = 12
Note: The common factors in the given numbers have been encircled.

2. Product of Two numbers:

HCF of numbers x LCM of numbers = Product of numbers

i.e., if the numbers are A and B, then

HCF of A and B x LCM of A and B = A x B

3. Difference Between HCF and LCM:

HCF of x, y and z	**LCM of x, y and z**
is the Highest Divisor which can exactly divide x, y and z	is the Least Dividend which is exactly divisible by x, y and z.

TABLE: RAPID INFORMATION LIST		
Ref	**Type of Problem**	**Approach to Problem**
1.	Find the GREATEST NUMBER that will exactly divide x, y and z.	Required number HCF of x, y and z (greatest divisor)

2.	Find the GREATEST NUMBER that will divide, x, y and z leaving remainders a, b and c respectively	Required number (greatest divisor) = HCF of $(x - a)$, $(y - b)$ and $(z - c)$
3.	Find the LEAST NUMBER which is exactly divisible by x, y and z	Required number = LCM of x, y and z (least dividend)
4.	Find the LEAST NUMBER which when divided by x, y and z leaves remainders a, b and c respectively	Then, it is always observed that $(x - a) = (y - b) = (z - c) = K$ (say). Required number = (LCM of x, y and z) + (K)
5.	Find the LEAST NUMBER when divided by x, y and z leaves the same remainder 'r' each case	Required number = (LCM of x, y and z) + r
6.	Find the GREATEST NUMBER that will divide x, y and z leaving the same remainder in each case.	Required number = (HCF of $(x - y)$, $(y - z)$ and $(z - x)$
7.	Find the n-digit GREATEST NUMBER that will exactly divide x, y and z (a) leaves on remainder (i.e., exactly divisible) (b) leaves remainder K in each case.	LCM of x, y and $z = L$ (Step 1) $L \frac{(n-digit\ greatest\ number)}{remainder=R}$ (Step 2) By Rule I (Chapter I), (a) Required number = n-digit greatest number – R (b) Required number = [n-digit greatest number – R] + K
8.	Find the n-digit SMALLEST NUMBER which when divided by x, y and z. (a) leaves no remainder (i.e., exactly divisible) (b) leaves remainder K in each case.	LCM of x, y and $z = L$ (Step 1) L $\frac{(n-digit\ greatest\ number)}{remainder=R}$ (Step 2) By Rule II (Chapter I), (a) Required number =

		n-digit smallest number + $(L - R)$ (b) Required number = [n-digit smallest number + $(L - R) + K$
8.	Find the HCF of $\frac{x}{y}, \frac{a}{b}$ and $\frac{m}{n}$	HCF of fractions = $\frac{HCF\ of\ numerators}{LCM\ of\ denominators}$
9.	Find the LCM of $\frac{x}{y}, \frac{a}{b}$ and $\frac{m}{n}$	LCM of fractions = $\frac{LCM\ of\ numerators}{HCF\ of\ denominators}$
10.	Find the HCF of decimal numbers	**Step 1:** Find the HCF of the given numbers without decimal. **Step 2:** Put the decimal point (in the HCF of Step 1) from right to left according to the MAXIMUM decimal places among the given numbers.
11.	Find the LCM of decimal numbers	**Step 1:** Find the LCM of the given numbers without decimal. **Step 2:** Put the decimal point (in the LCM of Step 1) from right to left at the place equal to the MINIMUM decimal places among the given numbers.

2. LCM (Lowest Common Multiple):

The LCM of two or more than two numbers is the product of the highest powers of all the prime factors that occur in these numbers.

Example: Find the LCM of 36, 48, 64 and 72

2	36,	48,	64,	72
2	18,	24,	32,	36
2	9,	12,	16,	18
2	9,	6,	8,	9
3	9,	3,	4,	9
3	3,	1,	4,	3
	1,	1,	4,	1

LCM = 2 x 2 x 2 x 2 x 3 x 3 x 4 = 576

EXAMPLE PROBLEMS:

1. Find the greatest number that will exactly divide 200 and 320.

Solution:

Using the approach 1.

Required number = HCF of 200 and 320 = **40.**

2. Find the greatest number that will divide 148, 246 and 623 leaving remainders 4, 6 and 11 respectively.

Solution:

Using the approach 2.

Required number = HCF of (148 – 4), (246 – 6) and (623 – 11) i.e. HCF of 144, 240, 612 is **12.**

3. Find the greatest possible length of a scale that can be used to measure exactly the following lengths of cloth; 3 m, 5m, 10 cm and 12 m, 90 cm.

Solution:

The lengths of cloth to be measured are, 300 cm, 510 cm and 1290 cm.

∴ the required length of the scale is HCF is 300, 510 and 1290 i.e. 30

∴ the greatest possible length of the scale to be used = **30 cm.**

4. Find

(a) the greatest number of 4 digits and

(b) the smallest number of 4 digits

Such that they are exactly divisible by 12, 15, 20 and 35.

Solution:

(a) Using the approach 7(a),

Step I LCM of 12, 15, 20 and 35 = 420.

Step 2 420) 9999 (39

9660

339

∴ Required number

= 999 – 339 = **9660.**

(b) Using the approach 9(a),

Step I LCM of 12, 15, 20 and 35 = 420.

Step 2 420) 1000 (2

840

160

∴ Required number

= 1000 + (420 – 160) = **1260.**

5. Four bells first begin to toll together and then at intervals of 6, 7, 8 and 9 seconds respectively. Find, what interval they toll together?

Solution:

LCM of 6, 7, 8 and 9 = 504.

∴ All the bells toll together after each interval of 504 seconds

∴ in two hours, no. Of times they toll together = $\frac{2 \times 60 \times 60}{504}$ = **14 times.**

6. There are two electrical wires, one is a 9 m 60 cm long aluminimum wire and the other is a 5 m 12 cm long copper wire. Find the

a) maximum length that can be equally cut from each wire in such a way that the total length of each wire is exactly divisible by it.
b) How many such largest possible pieces are available in each kind of wire?

Solution:

9 metre 60 cm = 960 cm and 5 metre 12 cm = 512 cm.

a) The required largest piece = HCF of 960 and 512 cm, i.e. **64 cm.**
b) ∴ Number of such aluminium wire pieces = $\frac{960}{64}$ **nos.**

and number of such copper wire pieces = $\frac{512}{64}$ **nos.**

7. HCF and LCM of two numbers are 16 and 240 respectively. If one of the numbers is 48, find the other number.

Solution:

We know that, HCF x LCM = Product of two numbers

Second number = $\frac{16 \times 240}{48}$ i.e. 80

8. Among how many students, 175 bananas and 105 oranges can be equally divided?

Solution:

HCF of 175 and 105 = 35

∴ The required number of students is 35, or factors of 35, namely 5 or 7.

9. Find out the HCF of 3^5, 3^9 and 3^{14}.

Solution:

Here the base of each number is same (= 3) but indices are different.

So, the required HCF = number with the minimum index, i.e. **3^5.**

10. Find out the LCM of 4^5, 4^{-81}, 4^{12} and 4^7.

Solution:

Here the base of each number is the same (= 4) but indices (or powers) are different.

So, the required LCM = number with the maximum index, i.e. 4^{12}

11. The ratio of two numbers is 15 : 11. If their HCF is 13, then the numbers are:

Solution:

Hint: Since HCF is 13, so, the numbers will be 13 x 15 and 13 x 11 terms of ratio

EXERCISE PROBLEMS:

1. The LCM of 2 numbers is 2079 and their HCF is 27. If the 1st number is 189, find the 2nd number.

(a) 298 (b) 295 (c) 297 (d) 287

2. Fine the LCM of 8, 15, 24 and 72

(a) 350 (b) 360 (c) 720 (d) 735

3. Find the HCF of 132, 204 and 228

(a) 12 (b) 18 (c) 6 (d) 21

4. Find the LCM of $\frac{1}{3}, \frac{2}{9}, \frac{5}{6}, \frac{4}{27}$.

(a) $\frac{1}{54}$ (b) $\frac{10}{27}$ (c) $\frac{20}{3}$ (d) $\frac{3}{20}$

5. Find the HCF of $\frac{4}{5}$ and $\frac{7}{15}$

(a) $\frac{1}{13}$ (b) $\frac{1}{5}$ (c) $\frac{1}{15}$ (d) $\frac{1}{25}$

6. Find the LCM of 36, 56, 105, and 108.

(a) 7650 (b) 7560 (c) 6750 (d) 4580

7. HCF of two numbers is 6 and also their difference is 6. The numbers are _____
(a) 22, 28 (b) 14, 20 (c) 24, 30 (d) 94,100

8. Three rods of lengths 15 m, 42 m and 39 m are to be cut into pieces of equal lengths. Find the greatest possible length of each piece.
(a) 5m (b) 6m (c) 3m (d) 4m

9. Four drums containing water have capacities 135 liters, 205 Liters, 165 liters and 240 Liters. Find the greatest capacity measure which can be used to measure the capacities of the drums.
(a) 5lts (b) 6lts (c) 3lts (d) 4lts

10. Two numbers are in the ratio 3:4 and the product of their LCM and HCF is 10,800. Find the sum of the numbers.
(a) 210 (b) 220 (c) 219 (d) 250

11. The ratio of two numbers is 3:4 and their HCF is 4. What will be their LCM?
(a) 12 (b) 16 (c) 24 (d) 48

12. If HCF and LCM of two numbers is are 4 and 496. If one of the numbers is 124, find another number.
(a) 12 (b) 16 (c) 24 (d) 48

13. The LCM of two numbers is 495 and their HCF is 5. If sum of the numbers is 100, find the difference of the numbers.
(a) 10 (b) 46 (c) 70 (d) 90

14. The sum of HCF and LCM of two numbers is 403 and their LCM is 12 times their HCF. If one number is 93, find another number.
(a) 115 (b) 122 (c) 124 (d) 138

15. LCM of two numbers is 120 and their HCF is 10. Which of the following can be the sum of those numbers?
(a) 140 (b) 80 (c) 60 (d) 70

16. If the product of two numbers is 800 and their LCM is 200, then the HCF is ……..
(a) 100 (b) 4 (c) 5 (d) 10

17. LCM of two numbers is 150 and their HCF is 4. If one number is 50, then the other number is
(a) 15 (b) 25 (c) 10 (d) 12

18. Ratio of two numbers is 6 : 7 and their LCM is 420, then the smaller number is …….

(a) 10 (b) 60 (c) 70 (d) 30

19. Two numbers are in the ratio 3 : 4. Their LCM is 132. The greatest number is …….

(a) 41 (b) 33 (c) 44 (d) 38

20. The HCF of $x^2 - 6x + 9$, $x^3 - 27$ is

(a) $x + 3$ (b) $x - 3$ (c) $x^2 - 9$ (d) $x - 9$

21. If HCF and LCM of two numbers are 12 and 144 respectively. If one number is 36, the other number is

(a) 96 (b) 48 (c) 72 (d) 24

22. Find the highest common factor 34, 102

(a) 17 (b) 34 (c) 2 (d) 3

23. Find the greatest number which will divide 3322 and 3832 leaving the remainder?

(a) 75 (b) 255 (c) 80 (d) 81

24. The product of two co prime numbers is 117. Their LCM should be

(a) 1 (b) 117 (c) $\frac{1}{117}$ (d) none of these

25. The LCM of twonumbers is 14 times their HCF. The sum of the LCM and the HCF is 600. If one number is 280, then the other number is:

(a) 80 (b) 60 (c) 40 (d) 100

26. The sum of two numbers is 187 and their HCF is 17. What is the number of such pairs of numbers satisfying the above condition?

(a) One (b) Four (c) Five (d) Seven

27. Find the remainder when 2^{30} is divided by 5

(a) 2 (b) 3 (c) 1 (d) 4

28. In a division sum the divisor is 12 times the quotient and 5 times the remainder. If the remainder is 24, then the dividend is

(a) 1224 (b) 1242 (c) 1222 (d) 120

29. The difference between two numbers is 642. If the larger number when divided by the smaller one given 8 as quotient and a remainder of 19. What will be that number?
(a) 715 (b) 723 (c) 731 (d) 740

30. The smallest number when decreased by 11, is exactly divisible by 20, 28, 35, 105 is
(a) 341 (b) 431 (c) 541 (d) 531

ANSWER KEYS:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
C	B	A	C	C	B	C	C	A	A	D	B	A	C	D	B	D	B	C	B
21	22	23	24	25	26	27	28	29	30										
B	A	B	B	A	C	D	A	C	B										

Government of Tamilnadu

Department of Employment and Training

Course : TNPSC Group II Exam

Subject : Aptitude and Mental Ability

Topic : **Ratio, Proportions & Age**

It is a cost-free service provided to the job seekers who are preparing for the Competitive Exams.

Commissioner,
Department of Employment and Training.

RATIO, PROPORTIONS & AGE

a) **Ratio** A ratio is a comparison of two numbers (quantities) by division. The ratio of a to b is written as,

$$a : b = \frac{a}{b}$$

In the ratio a : b, a and b are called the terms of the ratio; 'a' is the antecedent 'b' is the consequent.

b) **Proportion** A: Proportion is an expression which states that two ratios are equal.

Example: $\frac{3}{12} = \frac{1}{4}$ is a proportion.
It can also be expressed as 3 : 12 = 1 : 4

(Thus, if a : b = x : y, then bx = ay)
2nd term x 3rd term = 1st term x 4th term

Example: In 4 : 8 = 12 : 24,
we have 8 x 12 = 4 x 24

1. Dividing a given number in the given Ratio

Let 'A' be the given number. The given ratio is $a_1 : a_2$
Here 'A' is to be divided in the ratio
$a_1 : a_2$.
It implies that A is divided in two parts such that,
value of first part : value of second part = $a_1 : a_2$.
Therefore,

$$\text{first part} = \frac{a_1}{a_{1+}\,a_2} \text{ x A} = \text{first term of ratio x} \left(\frac{\text{Sum of parts}}{\text{Sum of terms of ratio}}\right)$$

$$\text{second part} = \frac{a_2}{a_{1+}\,a_2} \text{ x A} = \text{Second term of ratio x} \left(\frac{\text{Sum of parts}}{\text{Sum of terms of ratio}}\right)$$

Since, A has been divided into two parts, so, first part + second part = A.

EXAMPLE PROBLEMS:

EXAMPLE: Two numbers are in the ratio 8 : 9. If the sum of the numbers is 119, find the numbers.

Since the sum of two numbers is 119, so, the problem implies that 119 is divided in two parts in the ratio 8 : 9.

first part = $\frac{8}{8+9}$ x 119 = 56

second part = $\frac{9}{8+9}$ x 119 = 63 or (119-56=63)

Note: These relations are also true for dividing a given number into more than two ratios (i.e. more than two parts)

When any number A is divided in more than one ratio such as a : b : c : d :... then,

$$\text{value of any part} = \frac{its\ related\ ratio\ term}{a+b+c+\cdots}$$

$$\boxed{\text{third part} = \frac{c}{a+b+c+\cdots} \text{ x A}}$$

EXAMPLE: Dividing Rs. 3,200 among P, Q, R in the ratio 5 : 2 : 9, find the amount received by Q.

$$\boxed{\text{Amount received by Q} = \frac{\text{its related ratio term}}{\text{sum of ratio terms}} \text{ x Total amount}}$$

= $\frac{2}{5+2+9}$ x 3200

= Rs. 400.

2. Useful Results on Proportion

1. $\frac{b}{a} = \frac{d}{c}$ 2. $\frac{a}{c} = \frac{b}{d}$ 3. $\frac{c}{a} = \frac{d}{b}$

2. $\frac{a+b}{b} = \frac{c+d}{d}$ $\left(\text{By componendo: } \frac{a}{b} + = \frac{c}{d} +\right)$

3. $\frac{a-b}{b} = \frac{c-d}{d}$ $\left(\text{By componendo: } \frac{a}{b} - = \frac{c}{d} -\right)$

4. $\frac{a+b}{a-b} = \frac{c+d}{c-d}$ (By componendo and dividend)

5. $\frac{a}{a-b} = \frac{c}{c-d}$

If a : b = c : d

1st proportion, 2nd proportion, 3rd proportion, 4th proportion

EXAMPLE: Find the mean proportional between 9 and 16.

Required mean proportional $= \sqrt{9 \text{ x } 16}$

$= 12$

EXAMPLE: If 3, x, 27 are in continued proportion, then find the value of x.

Since 3, x, 27 are in continued proportion, therefore, (middle number)^2

= First number x last number

$\Rightarrow x^2 = 3 \text{ x } 27$

$\Rightarrow x^2 = \sqrt{81}$

$\Rightarrow x = 9$

3. Relation among the quantities more than two

(i) Number of quantities are **three**

Given $a : b = x : y$ (say) and

$b : c = p : q$ (say),

Then the given quantities a, b and c can be related as,

$a : b = x : y$

$b : c = p : q$

[Follow the arrow and multiply to get the each term in the final ratio]

$a : b : c = xp : py : yq$

$a : c = xp : yq$

EXAMPLE: If incomes of Ram and Shyam are in the ratio of 3 : 5 and that of Shyam and Mohan are in the ratio of 7 : 4, then find the ratio of incomes of Ram, Shyam and Mohan.

Ram : Shyam = 3 : 5
R S M
Shyam : Mohan = 7 : 4

[Follow the arrow & multiply]
Shyam : Mohan
Ram : Shyam : Mohan = 3 x 7 : 5 x 7: 5 x 4 = 21 : 35 : 20

(ii) Number of quantities are four
Given $a : b = x : y$ (say) = $b : c = p : q$ (say),

Then the given quantities a, b, c and d can be related as,

$a : b = x : y$
b
$b : c = p : q$ d
c
$c : d = m : n$

[Follow the arrow and multiply to get the each term in the final ratio]

EXAMPLE: Find B's share in Rs 6,300 if
A : B = 2 : 3, B : C = 4 : 5, and C : D = 3 : 7

A : B = 2 : 3
B
B : C = A 4 : 5 D
C
C : D = 3 : 7

A : B : C : D = 2 x 4 x 3 : 3 x 4 x 3 : 3 x 5 x 3 : 3 x 5 x 7 = 24 : 36 : 45 : 105

B's share in Rs 6,300 $= \frac{\text{B's related ratio term}}{\text{sum of all ratio terms}}$ x Total amount

$= \frac{36}{24+36+45+105}$ x 6,300

$= \frac{36}{210}$ x 6,300

= Rs. 1,080

EXERCISE PROBLEMS:

1. If A : B = 5 : 7 and B : C = 6 : 11 then A : B : C is
a) 55 : 77 : 66 b) 30 : 42 : 77 c) 35 : 49 : 423 d) None of these

2. If A : B : C = 2 : 3 : 4 then A/ B : B/C : C/A = is equal to
a) 4 : 9 : 16 b) 8 : 9 : 12 c) 8 : 9 : 16 d) 8 : 9 : 24

3. If A : B = $\frac{1}{2} : \frac{3}{8}$ and B: C = $\frac{1}{3} : \frac{5}{9}$ and C : D = $\frac{5}{6} : \frac{3}{4}$ then the ratio A : B : C : D is
a) 4 : 6 : 8 : 10 b) 6 : 4 : 8 : 10 c) 6 : 8 : 9 : 10 d) 8 : 6 : 10 : 9

4. If 2A = 3B = 4C then A : B : C is
a) 2 : 3 : 4 b) 4 : 3 : 2 c) 6 : 4 : 3 d) 20 : 15 : 2

5. If 2A = 3B and 4B = 5C then A : C is
a) 4 : 3 b) 8 : 15 c)15 : 8 d) 3 : 4

6. The ratio of $4^{3.5} : 2^5$ is same as
a) 2 : 1 b) 4 : 1 c)7 : 5 d) 7 : 10

7. If 0.75 : x : : 5 : 8 then x is equal to
a) 1:12 b) 1.20 c)1.25 d) 1.30

8. If $\frac{a}{3} = \frac{b}{4} = \frac{c}{7}$ then $\frac{a+b+C}{2}$ is equal to :
a) 7 b) 2 c) $\frac{1}{2}$ d) $\frac{1}{7}$

9. Two numbers are in the ratio 3:5 if 9 is subtracted from each the new numbers in the ration 12 : 23 the smaller number is
a) 27 b) 33 c) 49 d) 55

10. Two numbers are in the ration 1:2 if 7 is added to both their ration changes to 3:5 the greatest number is

a) 24 b) 26 c) 28 d) 32

11. The ratio of three numbers is 3:4:5 and the sum of their squares is 1250 the sum of the number is

a) 30 b) 50 c) 60 d) 90

12. A fraction which bears the same ratio to $\frac{1}{27}$ that $\frac{3}{11}$ does to $\frac{5}{9}$ is equal to

a) $\frac{1}{55}$ b) $\frac{1}{11}$ c) $\frac{3}{11}$ d) 55

13. A sum of Rs.1300 is divided amongst P, Q, R and S such that $\frac{P's\ share}{Q's\ share} = \frac{Q's\ share}{R's\ share} = \frac{R's\ share}{S's\ share} = \frac{2}{3}$ then P's share is P's share is

a) $\text{Rs.}\,140$ b) $\text{Rs.}\,160$ c) $\text{Rs.}\,240$ d) Rs. 320

14. If 40% of a number is equal to two third of another number what is the ratio of first numbers to the second number?

a) $2:5$ b) $3:7$ c) $5:3$ d) 7:3

15. In a mixture of 60 litres the ratio of milk and water is 2 : 1 if this ratio is to be 1 : 2 then the quantity of water to be further added is

a) 20 litres b) 30 litres c) 40 litres d) 60 litres

16. The fourth proportional to 5,8,15 is

a) 18 b) 24 c)19 d) 20

17. The third proportional to $(x^2 - y^2)$ and $(x - y)$ is

a) $(x + y)$ b) $(x - y)$ c) $\frac{x+y}{x-y}$ d) $\frac{x-y}{x+y}$

18. The ratio between two numbers is 3:4 and their L.C.M. is 180 the first number is

a) 60 b) 45 c) 20 d)15

19. 15 litres of mixture contains 20% alcohol and the rest water. If 3 litres of water be mixed with it the percentage of alcohol in the new mixture would be

a) 15% b) 16 2/3 % c) 17% d) 18 ½ %

20. 85kg of a mixture contains milk and water in the ratio 27:7 how much more water is to be added to get a new mixture containing milk and water in the ratio 3:1?

a) 5kg b) 6.5kg c) 7.2 kg d) 8kg

21. The sides of a triangle are in the ratio $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$ and its perimeter is 104 cm the length of the longest side is

a) 52cm b) 48cm c)32cm d) 26cm

22. Which of the following ratio is greatest?

a) 7 : 15 b) 15 : 23 c)17 : 25 d) 21 : 29

23. Divide 581 into three parts such that 4 times the first may be equal to 5 times the second and 7 times the third.

a) 145 : 181 : 254 b) 100 : 181 : 200

c) 160 : 170 : 180 d) 145 : 181 : 160

24. The ratio of the incomes of A and B is 5 : 4 and their expenditure is 3 : 2. If at the end of the year, each saves Rs. 1600, then the income of A is

a) Rs. 3400 b) Rs.3600 c) Rs.4000 d) Rs.4400

25. A hemisphere and cone have equal bases and equal height. Then their volumes be in the ratio

a) 2 : 1 b) 1 : 2 c) 3 : 2 d) 2 : 3

26. In a mixture of 28 litres, the ratio of milk and water is 5 : 2. If 2 litres of water is added to the mixture, find the ratio of milk and water in the new mixture.

a) 2 : 1 b) 1 : 2 c) 2 : 3 d) 1 : 3

27. The difference between the present ages of *P* and *Q* is 8 yrs and the ratio of their present ages is 2 : 3 respectively. What is *P*'s present age?

a) 16 yrs b) 24 yrs c) 12 yrs d) 30 yrs

28. Mani's and Vijay's salary is 4 : 5 and Vijay's and Kumar's salary is 2 : 3 If Mani's salary has Rs. 800 the Kumar's salary is?

a) Rs. 1000 b) Rs. 1200 c) Rs. 1500 d) Rs. 2000

29. If A is 1/3 of B and B is ½ of C then A : B : C is
a) 1 : 3 : 6 b) 2 : 3 : 6 c) 3 : 2 : 6 d) 3 : 1 : 2

30. The radius of sphere *B* is one fourth of radius of sphere *A*. Then the ratio of volume between *A* and *B* is
a) 1 :16 b) 16 : 1 c) 1 : 64 d) 64 : 1

31. Three numbers are in the ratio 2 : 3 : 5 and the sum of their squares is 608, then the numbers are respectively
a) 6, 16, 10 b) 8, 12, 20 c) 12, 8, 20 d) 20, 8, 12

32. Anand earns Rs. 80 in 7 hrs. Ram earns Rs. 90 in 12 hrs. The ratio of their earnings is
a) 23 : 12 b) 8 : 9 c) 32 : 21 d) 7 : 12

33. The sum of two numbers is 40. Their difference is 4, then the ratio of the numbers is
a) 11 : 8 b) 11 : 9 c) 10 : 7 d) 10 : 9

34. If a : b = 2 : 3, b : c = 5 : 7 then a : b : c is
a) 10 : 21 : 15 b) 15 : 10 : 21 c) 10 : 15 : 21 d) 21 : 10 : 15

35. Two numbers are in the ratio 3:4. If 6 is to be added to each term of the ratio, then the new ratio will be 4 : 5. Find the numbers.
a) 28 and 24 b) 18 and 24 c) 28 and 14 d) 18 and 14

36. A mixture contains alcohol and water in the ratio 4 : 3. If 5 litres of water is added to the mixture, the ratio becomes 4 : 5. find the quantity of alcohol in the given mixture.
a) 8 litres b) 10 litres c) 12 litres d) None of these

37. In a factory, the ratio of male workers to female workers was 5 : 3. If the number of female workers is less by 40, what was the total number of workers in the factory?
a) 100 b) 320 c) 160 d) 180

38. The sides of a triangles are in the ratio ½ : 1/3 : ¼ and its perimeter is 100 cm. Then the length of the longest sides is :
a) 46.15 cm b) 46.35 cm c) 46.83 cm d) 46 cm

39. The Cube root (Sub Triplicate) ratio of 8 : 27 is
a) 27 : 8 b) 24 : 81 c) 2 :3 d) None of these

40. A mixture contains alcohol and water in the ratio 4 : 3 if 7 litres of water is added to the mixture the ratio of alcohol and water becomes 3 : 4 then the quantity of alcohol in the mixture is

a) 15 b) 13 c) 14 d) 12

41. The square ratio of 3 : 4 is

a) $\sqrt{3}$: 2 b) 4 : 3 c) 9 : 16 d) None of these

42. If the ratio of the ages of son and father in 2014 and 2022 are 1 : 4 and 3 : 8 respectively, then the sum of the ages of son and father in 2010 is

a) 42 b) 43 c) 50 d) 45

43. The ratio of number of boys and girls in a college is 6 : 5. If the % of increase in the number of boys and girls be 25% and 10% respectively, what will be the new ratio?

a) 15 : 11 b) 10 : 15 c) 15 : 13 d) 11 : 7

44. Salaries of Ravish and Sumita are in the ratio 2 : 3. If the salary of each is increased by Rs. 4, 000, the new ratio becomes 40:57. What is Sumita's present salary?

a) Rs. 32,000 b) Rs. 34,000 c) Rs. 38,0000 d) Rs. 40,000

45. Three numbers are in the ratio 3 : 4 : 5 and their LCM is 240. Then the HCF of these number is

a) 4 b) 8 c) 12 d) 20

46. The ratio of the prices of two cows was 23 : 16. Two years later the price of the first cow rises by Rs. 477 and that of the second by 10% and the ratio of their prices became 20:11. Find the original prices.

a) Rs. 1,219, Rs. 848 b) Rs. 1,218, Rs. 848
c) Rs. 1,210, Rs. 850 d) Rs. 1,219, Rs. 840

47. Divide Rs. 2600 among A, B, C in the ratio ½ : 1/3 : ¼.

a) Rs. 1200, Rs. 600, Rs. 800 b) Rs. 800, Rs. 1200, Rs. 600
c) Rs. 600, Rs. 800, Rs. 1200 d) Rs. 1200, Rs. 800, Rs. 600

48. A horse and two cows together cost Rs. 680. If a horse cost Rs. 80 more than a cow then the ratio of cost of horse and cow is

a) 7 : 5 b) 5 : 7 c) 8 : 9 d) 9 : 8

ANSWER KEYS:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
B	D	D	C	C	B	B	A	B	C	C	A	B	A	C	B	D	B	B	A
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
B	D	A	C	A	A	A	C	A	D	B	C	B	C	B	B	C	A	C	D
41	42	43	44	45	46	47	48												
C	A	A	C	A	A	D	A												

AGE PROBLEMS:

1. The sum of the ages of a father and a son is 50 years. Six years ago, the product of their ages was twice the father's age at that time. The present age of father and son respectively are.

(A) 40 years, 10 years (B) 41 years, 9 years

(C) 38 Years, 12 years (D) 42 years, 8 years

2. The difference between the present ages of P and Q is 8 yrs and the ratio of their present ages is 2 : 3 respectively. What is *P*'s present age?

(A) 16 yrs (B) 24 yrs (C) 12 yrs (D) 30 yrs

3. 15 years hence A will be twice as old as his son. Their present ages are.

(A) 20, 40 (B) 15, 45 (C) 30, 60 (D) 25, 50

4. In 2014, Arjun'a fater age was two times of Arjun's age. In 2002, the father's age was three times as old as Arjun's age. In1999, product of their ages is

(A) 297 (B) 192 (C) 324 (D) 412

5. Ramani was born on March 21st, 2004. Ravi was born 7 days before Ramani. The Republic day of that your falls on Monday. Which day was Ravi born on?

(A) Sunday (B) Monday (C) Saturday (D) Tuesday

6. If the ratio of the ages of son and father in 2014 and 2022 are 1 : 4 and 3 : 8 respectively, then the sum of the ages of son and father in 2010 is

(A) 42 (B) 43 (C) 50 (D) 45

7. A father is 45 and his son is 15. In how many years will the father be twice as old as his son?

(A) 10 (B) 25 (C) 15 (D) 35

8. In a class of 30 students the average age is 14 years. By the inclusion of the teacher's age, the average age is increased by 1 year. What is the age of the teacher?

(A) 45 (B) 50 (C) 40 (D) 55

ANSWER KEYS:

1	2	3	4	5	6	7	8
D	A	B	A	A	A	C	A

Government of Tamilnadu

Department of Employment and Training

Course : TNPSC Group II Exam

Subject : Aptitude and Mental Ability

Topic : **Simple Interest & Compound Interest**

It is a cost-free service provided to the job seekers who are preparing for the Competitive Exams.

Commissioner,
Department of Employment and Training.

SIMPLE INTEREST & COMPOUND INTEREST

SIMPLE INTEREST

If the interest on a certain sum borrowed for a certain period is reckoned uniformly, then it is called Simple Interest and denoted as S.I.

$\therefore$ Simple Interest (S.I.) = P x $\frac{R}{100}$ x T,

Now, simple interest + principal = amount

1. Effect of change of P, R and T on Simple Interest

Say P_1 changes to P_2 then

$$SI_1 - SI_2 = \frac{(P_1 - P_2)\,RT}{100}$$

And so on for other parameters R & T.

2. AMOUNT

→ PRINCIPAL (SUM)
actually borrowed money

+

→ SIMPLE INTEREST
Interest accrued on the sum borrowed

=

→ AMOUNT
Money to be returned by the borrower

1. A = Amount = Principal + simple Interest = P + SI
2. $A = P\left(1 + \frac{RT}{100}\right) = SI\left(1 + \frac{100}{RT}\right)$

Amount becomes N times the principal

PRINCIPAL	RATE OF INTEREST
If → P	R% p.a.

TIME	AMOUNT BECOMES
T and	N x P

then,

following relation is useful,
$R \times T = 100 (N - 1)$

If, P1, P2 .... and A1, A2 ..... then,

$$\frac{A_1 - P_1}{A_2 - P_2} = \frac{P_1 \times R_1 \times T_1}{P_2 \times R_2 \times T_2}$$

COMPOUND INTEREST:

1. Compound Interest = $P\left(1 + \frac{R}{100}\right)^n - P$
2. Amount (A) = $P\left(1 + \frac{R}{100}\right)^n$
3. Here n = Number of Years,
   R = Rate of Interest
   P = Principal
4. If a Certain Sum becomes m times in 'n' years. The rate of Compound Interest is $r = 100[(m)^{1/n} - 1]$.
5. Simple Interest, if P1, P2 and A1, A2 is given then, use the formula
   $\frac{A_1 - P_1}{A_2 - P_2} = \frac{P_1 \times R_1 \times T_2}{P_2 \times R_2 \times T_2}$

EXERCISE PROBLEMS:

1. A retail Saree shop purchases each saree for Rs. 125. It adds 10% to the original price for each saree. Later it gives 10% discount for each saree. What is the gain/loss for each saree?
(A) Gain Rs. 1.25 (B) Loss Rs. 1.25
(C) Gain Rs. 12.5 (D) Loss Rs. 12.5

2. The sum of money invested in compound interest amounts to Rs. 800 in 3 years and to Rs. 840 in 4 years. The rate of interest per annum is
(A) 2½% (B) 4% (C) 5% (D) $6\frac{2}{4}$ %

3. The compound interest on Rs. 2000/. For 3 years is Rs. 315.25. The ratio of interest is
(A) 3% (B) 4% (C) 5% (D) 6%

4. A sum amount to 690 at 3 years. S.I. and 720 at 4 years S.I. Then the sum is
(A) 600 (B) 630 (C) 650 (D) 640

5. What amount should be repaid to clear a loan of Rs. 6,000 borrowed at $6\frac{2}{6}$% simple interest per annum for a period of 1 year and 6 months?
(A) 6,800 (B) 6,600 (C) 6,200 (D) 6,400

6. A sum Rs. 800 amount to Rs. 915.92 in two years. Then the compound interest rate is
(A) 6% (B) 4% (C) 7% (D) 8%

7. The difference between the C.I. and S.I. on Rs. 4,000 for 2 years at 10% is
(A) Rs. 40 (B) Rs. 400 (C) Rs. 50 (D) Rs. 500

8. At what rate of S.I. Rs. 4,000 will amount to Rs. 5,000 in 4 years?
(A) $6\frac{1}{4}$% (B) 6% (C) $5\frac{1}{2}$% (D) $6\frac{3}{4}$%

9. If a sum of money at simple interest amounts to Rs. 767 is 3 years and Rs. 806 in 4 years. Then the sum is:
(A) Rs. 600 (B) Rs. 650 (C) Rs. 675 (D) Rs. 700

10. Rs. 800 becomes Rs. 956 in 3 years at certain simple rate of interest. If the rate of interest is increased by 4%, what amount will Rs. 800 become in 3 years?
(A) Rs. 1,020.80 (B) Rs. 1,025 (C) Rs. 1,052 (D) Rs. 1,080.20

11. At what rate percent compound interest does a sum of money become nine fold in 2 years?
(A) 100% (B) 200% (C) 300% (D) 150%

12. The difference between simple and compound interest compounded annually on a certain sum of money in 2 years at 4% per annum is Rs. 1. The sum (in Rs.) is
(A) Rs. 625 (B) Rs. 630 (C) Rs. 640 (D) Rs. 650

13. A man borrows Rs. 800 at 4% interest per annum and Rs. 700 at 5% interest per annum for the same period. If he pays a sum of Rs. 268 as total interest then the time for which he borrowed the sum is
(A) 2 years (B) 3 years (C) 4 years (D) 5 years

14. A sum was put at simple interest at certain rate for 2 years. Had it been put at 3% higher rate it would have fetched Rs. 72 more. The sum is:
(A) Rs. 1200 (B) Rs. 1500 (C) Rs. 1600 (D) Rs. 1800

15. A sum of money amounts to Rs. 8,400 in 5 years and to Rs. 9,360 in 7 years at simple interest. Find the sum and rate of interest.
(A) 5000, 7% (B) 8000, 8% (C) 6000, 9% (D) 6000, 8%

16. In how many years Rs. 5000 amounts to Rs. 6600at 8% simple interest?
(A) 2 (B) 3 (C) 4 (D) 5

17. The difference between simple Interest and compound Interest for 2 years at 5% is $225. Find the sum.
(A) $45,000 (B) $90,000 (C) $95,000 (D) $80,000

18. Find the amount of Rs. 1,400 invested at SI 14% during the period from 5th Feb.1994 to 19th April 1994.
(A) Rs. 1,539 (B) Rs. 1,437 (C) Rs. 1,439.20 (D) Rs. 1,469.20

D

ANSWER KEYS:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
B	C	C	A	B	C	A	A	B	C	B	A	C	A	D	C	B	C

Government of Tamilnadu

Department of Employment and Training

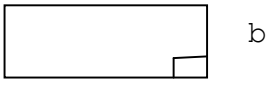
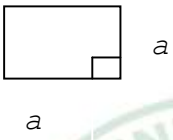
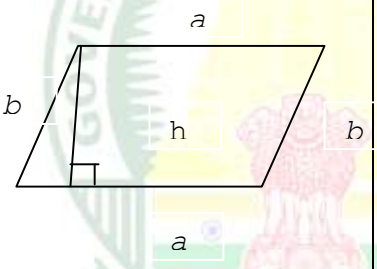
Course : TNPSC Group II Exam

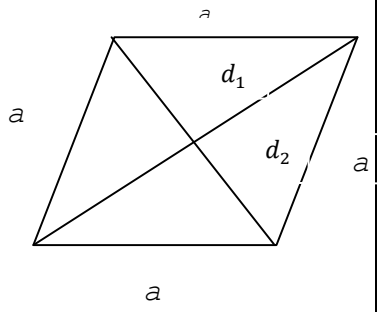
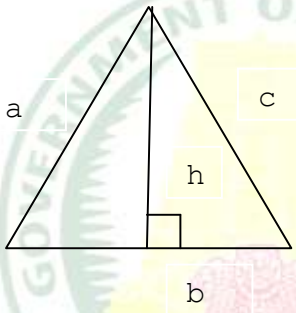
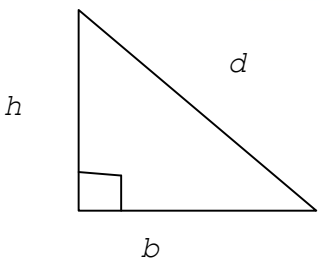
Subject : Aptitude and Mental Ability

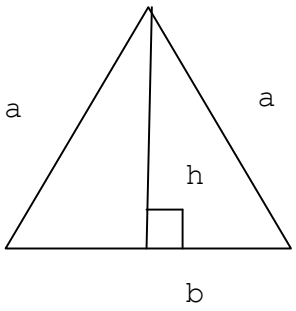
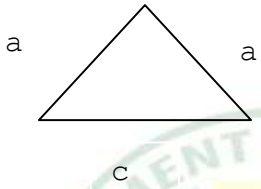
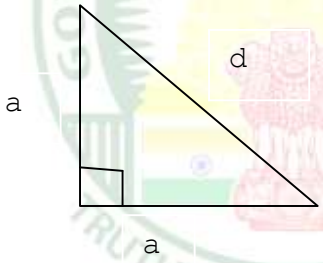
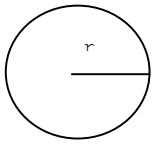
Topic : **Area and Volume**

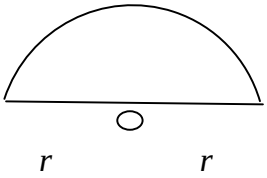
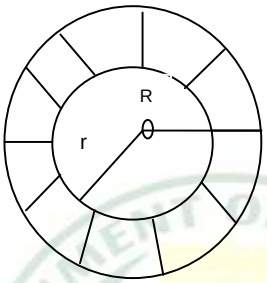
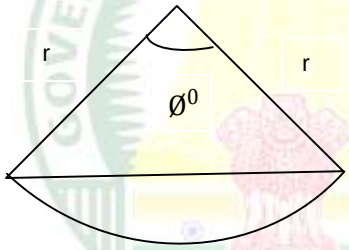
Commissioner,
Department of Employment and Training.

AREA AND VOLUME

S.No	Name	Figure	Perimeter in units of length	Area in square units
1	Rectangle	 a=length, b=breath.	2(a + b)	ab
2	Square	 a = side	*4a*	a^2 $\frac{1}{2}(\text{diagonal})^2$
3	Parallelogram	 *a*=side, *b*=sideadjacent, h = distance between the opp.parallel sides	2(a + b)	ah

4	Rhombus	 A= side of rhombus; d_1, d_2 Are the two diagonals.	4a	$\frac{1}{2}\, d_1 d_2$
5	Triangle	 *b* is the base and h is the altitude. *a,b,c* are three sides of △	*a + b + c = 2s* Where s is the semi perimeter	$\frac{1}{2}$ bh or $\sqrt{s(s-a)(s-b)(s-c)}$
6	Right triangle	 d(hypotenuse)=$\sqrt{b^2}$+$\sqrt{h^2}$	*b + h + d*	$\frac{1}{2}$ *bh*

7	Equilateral Triangle		3a	i) $\frac{1}{2}$ ah ii)$\frac{\sqrt{3}}{4}$ a^2
8	Isosceles triangle	 c = unequal side a = equal side	2a +c	$c\ \frac{\sqrt{4a^2 - c^2}}{4}$
9	Isosceles right triangle	 d(hypotenuse) =a$\sqrt{2}$ a= Each of equal sides. The angles are 90^0 , 45^0 , 45^0	2a + d	$\frac{1}{2}a^2$
10	Circle	 r = radius of the circle π = $\frac{22}{7}$ or 3.1416	*2πr*	πr^2

11	SemiCircle	 r = radius of the circle	πr +2 r	$\frac{1}{2}$ πr^2
12	Ring(Shaded region)			π(R^2 $-$ r^2)
13	Sector of a circle	 $Ø^0$ = central angle of the sector R = radius of the sector l = length of the Arc	l + 2r where l = $\frac{Ø}{360}$ x 2πr	$\frac{Ø}{360}$ x πr^2

Some theory questions related to geometry were also asked in TNPSC.

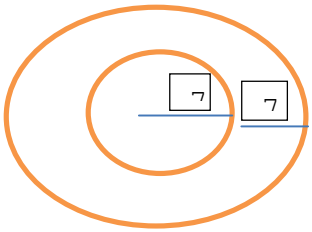
1. The angles opposite to two equal sides of a triangle are **EQUAL.**

2. If the angles of a triangle are in the ratio1 : 2: 2, then the triangle is **ISOSCELES.**

3. The polygon whose sum of interior angles equals 360^o is **QUADRILATERAL.**

EXAMPLE PROBLEMS:

1. A circular ground of radius 7 has a path of width 7 m around it on its outside. The area of the path is approximately equal to _____ ($\pi = 22/7$)



SOLUTION:

Area of inner circle = πr^2

= $\frac{22}{7}$ x 7 x 7 (r = 7)

=154

Area of outer circle = πr^2

= $\frac{22}{7}$ x 14 x 14 (r = 7 + 7 = 14)

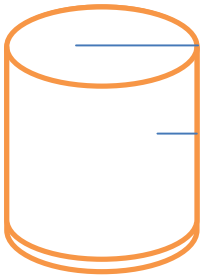
= 616

Area of Path = 616 – 154

= 462

Ans = 462 sq.m

2. A cylindrical tank of diameter 28 cms is full of water. If 11 litres of water is drawn off, the water level in the tank will drop by



SOLUTION:

Diameter = 28 cms Radius = 14 cms

Volume of Cylinder = $\pi r^2 h$

11 litres of water = 11000 cms.

$\frac{22}{7}$ x 14 x 14 x h = 1100

$\pi r^2 h$ = 11000

$\frac{22}{7}$ x 14 x 14 x h = 11000

h = 11000 x $\frac{7}{22}$ x $\frac{1}{14}$ x $\frac{1}{7}$

= $\frac{125}{7}$

Ans: = 17 $\frac{6}{7}$ cm

3. The length, breadth and height of a room are respectively 12 metres, 9 metres and 6 metres. How many cubic boxes are needed to fill the room if the side of each box is 1.5 metres?

SOLUTION:

L=12m, B=9m, H=6m

Volume of Cuboid = $l \; x \; b \; x \; h$ Cubic units

= 12 x 9 x 6

= 648 m^3

Volume of cube = a^3

Here a = 1.5

Volume = $(1.5)^3$ = 3.375

No. of cubic boxes = $\frac{\text{Volume of cuboid}}{\text{Volume of cube}}$

= $\frac{648}{3.375}$

No. of cubic boxes = 192

4. If the radius of a circle is increased by 25% then its area is increased by

SOLUTION:

Let R = 100 R Increased by 25%

Area = πr^2 $\frac{25}{100}$ x 100 = 25

= π x 100 x 100 R1 =100 + 25 = 125

= $10000\,\pi$ Area= $\pi R1^2$

= π x 125 x 125

Area = $15625\,\pi$

Increased % area = $\frac{15625\,\pi - 10000\,\pi}{10000}$ x 100

= $\frac{5625}{100}\pi$

= $56.25\%\; of\; \pi$

Increased % = 56.25 %

5. If the area of an equilateral triangle is $4\sqrt{3}$ m^2, then its perimeter is

SOLUTION:

Area of Equilateral triangle $= \frac{\sqrt{3}}{4} a^2 = 4\sqrt{3}$

$\frac{\sqrt{3}}{4} a^2 = 4\sqrt{3}$

$a^2 = \frac{4\sqrt{3} \times 4}{\sqrt{3}}$

$a^2 = 4 \times 4 = 4^2$

$a = 4$

Perimeter of equilateral triangle $= 3a$

$= 3 \times 4$

= 12 m

6. The radius of sphere B is one fourth of radius of sphere A. Then the ratio of volume between A and B is.

SOLUTION:

Radius A = r Radius B = $1/4^r$

Volume of Sphere = $4/3\ \pi r^3$

Volume A : Volume B

$\frac{4}{3} \pi r^3 : \frac{4}{3} \pi \left(\frac{1}{4} r\right)^3$

$r^3 : \frac{1}{64} r^{3*}$

$1 : \frac{1}{64}$

64 : 1 = Ratio

7. If the volume and surface area of a sphere are numerically the same, then its radius is

SOLUTION:

Volume of sphere $= \frac{4}{3} \pi r^3$

Surface area of sphere $= 4 \pi r^2$

Volume = Surface area

$\frac{4}{3}\pi r^3 = 4\pi r^2$

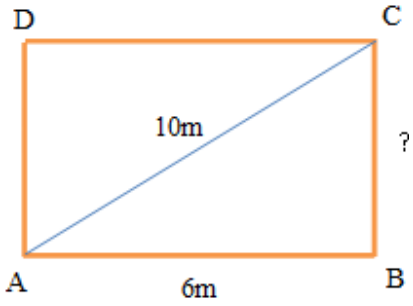
$\frac{1}{3} r^3 = r^2$

$\frac{r^3}{r^2} = 3$

$r = 3$ **units**

8. Area of a rectangle one of whose sides is 6 m and diagonal 10 m is

SOLUTION:



$AC^2 = AB^2 + BC^2$

$10^2 = 6^2 + BC^2$

$100 = 36 + BC^2$

$100 - 36 = BC^2$

$64 = BC^2$

BC = 8

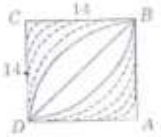
Area of rectangle = AB x BC

= 6 x 8

= 48 m

EXERCISE PROBLEM:

1. In the adjoining figure of the arcs have *A* and *C* as centres. Find the area of shaded portions.



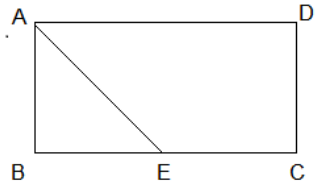
(A) 82 (B) 72 (C) 42 (D) 84

2. If the radius of a circle is increased by 25% then its area is increased by

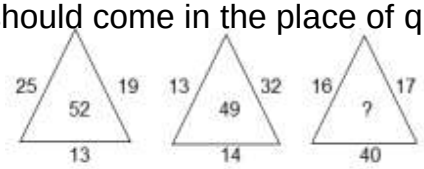
(A) 50% (B) 25% (C) 56.25% (D) 46.25%

3. In the adjoining figure ABCD is a rectangle and area of AABE is 15 cm^2. If EC = 2BE, then area of rectangle is :

(A) 24 cm^2 (B) 48 cm^2 (C) 90 cm^2 (D) 120 cm^2



4. What should come in the place of question mark (?)



(A) 63 (B) 73 (C) 53 (D) 83

5. When represented through a pie diagram, the angle that corresponds to rent is :

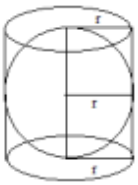
(A) 32^0 (B) 48^0 (C) 72^0 (D) 96^0

6. If the radius of a circle is decreased by 50%, find the % decrease in its area.

(A) 74% (B) 75% (C) 76% (D) 95%

7. A sphere is placed inside a right circular hollow cylinder so as to touch the top, base and the lateral surface of the cylinder as shown in figure. If the radius of the sphere is *r*, the volume of the cylinder is

(A) $4\pi r^3$ (B) $\frac{8\pi}{3}r^3$ (C) $2\pi r^3$ (D) $8\pi r^3$

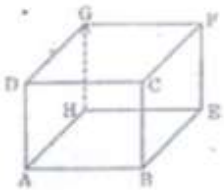


8. 12 spheres of the same size are made from melting a solid cylinder of 16 cm diameter and 2 cm height then the diameter of each sphere is

(A) $\sqrt{3}$ cm (B) 2 cm (C) 3 cm (D) 4 cm

9. If the volume of the cube ABCDEFGH is 64 cu.cm. What is the shortest distance from D to E?

(A) $4\sqrt{2}$ (B) $4\sqrt{3}$ (C) $4\sqrt{6}$ (D) $8\sqrt{2}$



10. The sum of the interior angles of a Hexagon is

(A) 360^0 (B) 240^0 (C) 720^0 (D) 180^0

11. Find the volume of a solid cylinder whose radius is 14 cm and height 30 cm

(A) 18380 cm^3 (B) 18480 cm^3 (C) 18580 cm^3 (D) 18680 cm^3

12. If

□ → Mathmatics

○ → Tamil

△ → English

Then the number of students studied Maths and Tamil alone.

(A) 5 (B) 7 (C) 8 (D) 12

13. A rectangular carpet has an area of 60 sq.m. Its diagonal and longer side together equal 5 times the shorter side. The length of the carpet is

(A) 5 m (B) 12 m (C) 13 m (D) 14.5m

14. The number of small cubes with edge 10 cm that can be accommodated in a cubical box of edge 1 m is

(A) 10 (B) 100 (C) 1000 (D) 10000

15. A uniform circular path of width 4 m is laid out around a circular park of radius 48m. Find the area of the circular path.

(A) 1256 m^2 (B) 1255 m^2 (C) 400 m^2 (D) 1254 m^2

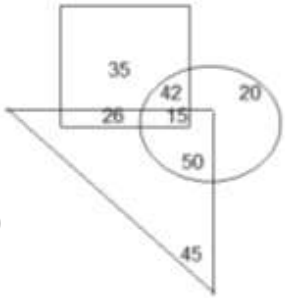
16. A flower garden is in the shape of a rhombus. The length of the diagonals are 18 m and 25 m. Find the area of the flower garden.

(A) 450 m^2 (B) 225 m^2 (C) 324 m^2 (D) 18 m^2

17. If a square and a rhombus stand on the same base, then the ratio of the area of the square and the rhombus is

(A) greater than 1 (B) equal to 1

(C) equal to ½ (D) equal to ¼



18. The sum of numbers common to two diagrams is

(A) 118 (B) 110 (C) 108 (D) 130

ANSWER KEYS:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
D	C	C	A	C	B	C	D	B	C	B	D	B	C	A	B	B	A

Government of Tamilnadu

Department of Employment and Training

Course : TNPSC Group II Exam

Subject : Aptitude and Mental Ability

Topic : **Time & Work, Distance**

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TIME & WORK, DISTANCE

- When time is the same, more men are needed to do more work i.e. number of men and work are directly propotional to each other $m \propto w$

- When work is constant, man and time are inversely proportional to each other. $m \propto \frac{1}{D}$
  Where M is the number of men and D is the number of days.
  - $\frac{M1,D1,H1}{w1} = \frac{M2,D2,H2}{w2}$ where M, D, H, W represents men, days, hours and work done respectively

- If a worker takes x days to finish a piece of work (working alone) and the second one takes y days to finish the same piece of work (working alone) together they will take $\frac{xy}{x+y}$days to finish the same job.

- If pipe A takes x hours to fill a tank and pipe B takes y hours to empty the same tank (working alone) then together they will take $\frac{xy}{x-y}$ hours to fill the tank ($y>x$)

- If A,B and C are three person who can finish the work W alone in a,b and c days respectively together they can finish the work in $\frac{abc}{ab+bc+ca}$ days

- If A and B can do same work alone in x and y days. The ratio of their wages when they work together will be $\frac{1}{x} : \frac{1}{y}$

- If A and B together can do a piece of work in X days, B and C can finish the same piece of work in Y days while C and A can finish it in Z days. Then

1) A, B and C working together can finish in = $\frac{2xyz}{xy + yz + zx}$ days
2) A alone will finish the job in = $\frac{2xyz}{xy+yz-zx}$ days
3) B alone will finish the job in = $\frac{2xyz}{xy + yz - yx}$ days
4) C alone will finish the job in = $\frac{2xyz}{xy + xz - zy}$ days

❖ a) If A can finish a piece of work in x days, and B is k times more efficient than A then the time taken by both A and B working together to complete the piece of works is $\frac{x}{1+k}$

(b)If A and B working together can finish a piece of work in X days and B is k times more efficient than A then time taken by

1) A working alone to complete the piece of work is $(\mathrm{k}+1)\,x$
2) B working alone to complete the piece of work is $\mathrm{B} = \frac{x\,(1+\mathrm{k})}{\mathrm{k}}$

❖ If a men and b women can do a piece of work in n days c men and d women can do the same piece of work in $(\frac{nab}{bc+ad})$ day

1.

Average Speed

$$Speed\ V = \frac{\text{Total distance travelled (d)}}{\text{Total time taken (t)}}$$

(or) Total distance travelled = speed x total time $\mathrm{d} = \mathrm{V} \times \mathrm{t}$

	Average speed for whole journey
If known values are $\begin{vmatrix} d_1 & d_2 & \dots & d_n \\ t_1 & t_2 & \dots & t_n \end{vmatrix}$ then	$V_a = \frac{d_1 + d_2 + \cdots + d_n}{t_1 + t_2 + \cdots + t_n}$
If known values are $\begin{vmatrix} & & & \\ V_1, t_1 & V_2, t_2 & \cdots & V_n, t_n \end{vmatrix}$ then	$V_a = \frac{V_1, t_1 + V_2, t_2 + \cdots + V_n, t_n}{t_1 + t_2 + \cdots + t_n}$
If known values are $\begin{vmatrix} d_1 & d_2 & \dots & d_n \\ V_1 & V_2 & \dots & V_n \end{vmatrix}$ then	$V_a = \frac{d_1 + d_2 + \cdots + d_n}{\frac{d_1}{V_1} + \frac{d_2}{V_2} + \cdots + \frac{d_n}{V_n}}$ Since $\mathrm{t} = \frac{d}{V}$

Example: A car travels 600 km in 11 hours and another 800 km in 17 hours. Find the average speed of the car during the entire journey.

Solution:

Here, distance and time are known.

∴ average speed = $\frac{d_1+d_2+\cdots+d_n}{t_1+t_2+\cdots+t_n}$

= $\frac{600+800}{11+17}$ = 50 km/hour

∴ the average speed is 50 km per hour.

Example: A bus moves 300 km at a speed of 45 km per hour and then it increases its speed to 60 km per hour to travel another 500 km. Find the average speed of the bus.

Solution:

Here, distance and speed are known. Time is not known.

∴ we use the relation,

average speed = $\frac{d_1+d_2+\cdots+d_n}{\frac{d_1}{V_1}+\frac{d_2}{V_2}+\cdots+\frac{d_n}{V_n}}$

⇒ average speed = $\frac{300+500}{\frac{300}{45}+\frac{500}{60}} = \frac{800}{\frac{20}{3}+\frac{25}{3}}$

= $\frac{800 \text{ x } 3}{45}$

= 53 $\frac{1}{3}$ km per hour.

1. Distance Covered is same

$\frac{d}{V_1} - \frac{d}{V_2} = t_1 - t_2$ OR

$\frac{d}{t_1} - \frac{d}{t_2} = V_1 - V_2$

Example: An increase in the speed of a car by 10 km per hour saves 30 minutes in a journey of 100 km. Find the initial speed of the car.

Solution:

Here, distance, difference in time and change (difference) in speed are known, but speed* is to be found out.

Let the initial speed of the car = V km/h

The new speed of the car

= (V + 10) km/hr

using $\frac{d}{V_1} - \frac{d}{V_2} = t_1 - t_2$

$\Rightarrow 100\left[\frac{1}{V}-\frac{1}{V+10}\right]=\frac{30}{60}$

$\Rightarrow \frac{100}{V(V+10)}-\frac{1}{2}$

$\Rightarrow$ V (V + 10) = 40 x 50

Without further solving, it appears that V = 40 km/h.

$\therefore$ the intial speed of the car is 40 km per hour.

2. Time taken with Two difference modes of transport

(Time taken by any one transport both ways – time taken by mixed transport) = time gained or lost

Example: A man takes 4 hours 30 minutes in walking to a certain place and riding back. He would have gained 1 hour 45 minutes by riding both ways. How long would he take to walk both ways?

Solution:

Time for walking bothways – time by mixed (i.e. walking + riding) = time gained

$\Rightarrow$ time for walking both ways $-4\frac{1}{2}=+1\frac{3}{4}$

$\Rightarrow$ time for walking both ways

$= -4\frac{1}{2}=+1\frac{3}{4}$ or 4 hrs 30 minutes + 1 hrs 45 minutes

$= 6\frac{1}{4}$ hours or 6 hrs 15 minutes

$\therefore$ The man will take $\mathbf{6\frac{1}{4}}$ hours to cover the same distance

3. Time and distance between two moving bodies

Let there be two persons, A and B.

Speed of A = V_1 km/hr

Speed of B = V_2 km/hr

If they walk in same direction,

A and B will be ($V_1 - V_2$) km apart in 1 hour

A and B will be 1 km apart in $\frac{1}{V_1-V_2}$ hour
A and B will be x km apart in $\frac{x}{V_1-V_2}$ hour

Similarly, if they walk in opposite directins, then A and B will be (V_1+V_2) km apart in 1 hour

A and B will be 1 km apart in $\frac{1}{V_1+V_2}$ hour

A and B will be x km apart in $\frac{x}{V_1+V_2}$ hour

Example: Two men, P and Q, start walking from a hotel at 2 km and $2\frac{1}{2}$ km an hour respectively. By how many km will they be apart at the end of $3\frac{1}{2}$ hours, if

(i) they walk in opposite directions.
(ii) they walk in same direction.

Solution:

(i) When they walk in opposite direction, then P and Q will be $\left(2+2\frac{1}{2}\right)$ km or $4\frac{1}{2}$ km apart in 1 hour.

∴ at the end of $3\frac{1}{2}$ hours, they will be $3\frac{1}{2}$ x $4\frac{1}{2}$ $\Rightarrow \frac{7}{2}$ x $\frac{9}{2} = \frac{63}{4}$

$\frac{63}{4}$ km = $15\frac{3}{4}$ km, apart.

(ii) When they walk in same direction, then P and Q will be $\left(2\frac{1}{2}-2\right)$ km or $\frac{1}{2}$ km apart in 1 hour.

∴ at the end of $3\frac{1}{2}$ hours, they will be $\frac{1}{2}$ x $3\frac{1}{2}$

km = $1\frac{3}{4}$ km, apart.

EXERCISE PROBLEM:

1. A and B can do a work in 8 days, B and C in 12 days, C and A in 24 days. If A, B and C work together, then the number of days, they will complete the work is
(A) 6 (B) 7 (C) 8 (D) 4

2. Two pipes can fill a water tank seperately by 12 minutes and 20 minutes a waste pipe can drain off in 30 gallons/min. If all the three pipes are open the tank fills in 30 minutes, then the capacity of water tank is
(A) 300 gallons (B) 400 gallons
(C) 500 gallons (D) 600 gallons

3. 8 children and 12 men complete a certain piece of work in 9 days. Each child takes twice the time taken by a man to finish the work. In how many days will 12 men finish the same work?
(A) 12 days (B) 18 days (C) 15 days (D) 36 days

4. Eight men and 12 women can complete a work in 10 days while 6 men and 8 women in 14 days. Number of days taken by a man alone to complete the work is :
(A) 210 (B) 70 (C) 280 (D) 140

5. Two pipes A and B can fill a tank in 10 hours and 15 hours respectively. Find the time taken to fill the tank when both the pipes are turned on simultaneously.
(A) 6 hrs. (B) 5 hrs. (C) 30 hrs. (D) 12 hrs.

6. A can complete $\frac{2}{3}$ part of a work in 10 days. A can complete $\frac{1}{3}$ part of the same work in
(A) 3 days (B) 4 days (C) 5 days (D) 6 days

7. 7 workers can complete a work in 12 days. They started the work and after 5 days 3 workers left. In how many days will the work be completed by the remaining
(A) $12\frac{1}{4}$ days (B) 12 days (C) $11\frac{2}{3}$ days (D) $12\frac{1}{3}$ days

8. A can do a piece of work in 40 days. He works for 8 days and then B completed it in 16 days. How long will they together take to complete the work?
(A) $13\frac{1}{3}$ days (B) 12 days (C) 16 days (D) $11\frac{2}{3}$ days

9. A can do a work in 12 days; B in 6 days and C in 3 days. A and B start working together and after a day, C joins them. The total number of days required to complete the work is
(A) $2\frac{2}{7}$ days (B) $1\frac{2}{7}$ days (C) $2\frac{1}{7}$ days (D) $1\frac{1}{7}$ days

10. Seven men can complete a work in 12 days. They started the work and after 5 days, two men left. In how many days will the work be completed by the remaining men?
(A) 5.8 days (B) 6.8 days (C) 9.8 days (D) 8 days

11. A can do a piece of work in 15 days and B can do it in 20 days. They work together for 6 days and then A goes away. In how many days B will finish the remaining work?
(A) 4 days (B) 5 days (C) 6 days (D) 7 days

12. A and B together can do a work in 8 days. Where A alone can do the work in 12 days B alone can do the work in-

(A) 12 (B) 24 (C) 8 (D) 20

13. If 3 men or 4 women can build a wall in 43 days, then the number of days taken by 7 men and 5 women to build the same wall is-

(A) 12 days (B) 36 days (C) 24 days (D) 18 days

14. A and B can together do a piece of work in 30 days. B alone can do it in 40 days. A alone can do it in

(A) 100 days (B) 140 days (C) 120 days (D) 180 days

15. A man can do a piece of work in 5 days, but with his son he can do it in 3 days. In what time can the son do it alone?

(A) $6^{1}/_{2}$days (B) 7 days (C) $7^{1}/_{2}$days (D) 8 days

16. A and B together can do a work in 6 days. B can do the same work in 15 days. In how many days can A do the same work?

(A) 10 days (B) 9 days (C) 7 days (D) 20 days

17. A and B can together do a piece of work in 15 days. B alone can do it in 20 days. A alone can do it in :

(A) 30 days (B) 40 days (C) 45 days (D) 60 days

18. A and B can together finish a work in 40 days. They worked it for 20 days and then B left. The remaining work was done by A alone in 30 days. A alone can finish the work in :

(A) 54 days (B) 60 days (C) 48 days (D) 80 days

19. A and B can do a piece of work in 10 days; B and C in 15 days; C and A in 18 days. In how many days can B alone do it?

(A) 30 days (B) 20 days (C) 12 days (D) 18 days

20. A, B and C together can finish a piece of work in 4 days. A alone can do in 12 days and B alone in 18 days. How many days will be taken by C to do it alone?

(A) 10 days (B) 12 days (C) 9 days (D) 18 days

21. A car is running at a speed of 108 kmph. What distance will it cover in1 5 seconds?
(A) 45 m (B) 55 m (C) 450m (D) None of these

22. In covering a distance of 30 km, Raman takes 2 hours more than Rekha. If Rama doubles her speed then she would take 1 hour less than Rekha. Then Rama's speed is :
(A) 5 km/h (C) 6 km/h (C) 6.25 km/h (D) 7.5 km/h

23. An electric train is moving at a speed of 68 km per hour. What is the distance covered by it in meters in 180 seconds
(A) 4700 (B) 5100 (C) 5000 (D) 6000

24. An electric train 270 metre long is running at a speed 60 km per hour. The time taken by the train to cross a platform of 230 meters in seconds is :
(A) 40 (B) 50 (C) 60 (D) 30

25. Ravi travels a distance of 5 km from a place A towards the North, turns left and walks 3 km, again turns right and walks 2 km, finally turns right and walks 3 km to reach the place B. What is the distance between A and B?
(A) 3 km (B) 7 km (C) 10 km (D) 13 km

26. Divide Rs. 680 among *A, B, C* so that *A* gets 3 times more to *B* and *B* gets 4 times to *C*.
(A) Rs. 160, Rs. 40, Rs. 480 (B) Rs. 480, Rs. 160, Rs. 40
(C) Rs. 480, Rs. 40, Rs. 160 (D) Rs. 160, Rs. 480, Rs. 40

ANSWER KEYS:

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

Government of Tamilnadu

Department of Employment and Training

Course : TNPSC Group II Exam

Subject : Aptitude and Mental Ability

Topic : **Logical Reasoning**

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LOGICAL REASONING

PUZZLES

Study the following information carefully to answer the question.

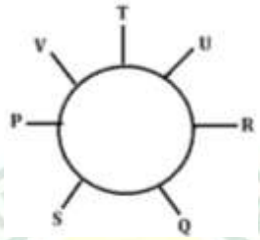
i) P, Q, R, S, T, U and V sitting around a circular table facing the centre P

ii) P is between V and S

iii) R who is second to right of S. R is between Q and U

iv) Q is not neighbour of T

Solution Diagram:



1. Which of the following is correct?

(a) V is between P and S (b) S who is second to left of V

(c) R who is third to right of P (d) P sits to left of S

Ans: (d)

2. What is the position of T?

(a) T is between R and V (b) immediate left of V

(c) second to the left of R (d) second to the right of P

Ans: (b)

3. Who is between R and V?

(a) none of these (b) S (c) V (d) Q

Ans: (a)

4. Which one of the following wrong?

(a) R who is immediate left of U (b) Q who is immediate left of R

(c) T who is third to right of Q (d) U who is second to left of T

Ans: (d)

5. Which of the following has the pair with the second person sitting to immediate right of the first person?

(a) QS (b) PV (c) RU (d) UT

Ans: (c)

Study the following information carefully to answer the question.

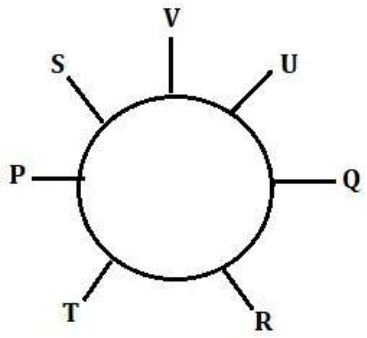
i) P, Q, R, S, T, U and V sitting around a circular table facing the centre

ii) P is between T and S

iii) U is between Q and V

iv) Q who is second to Right of T

Solution Diagram:



6. Which of the following is wrong?

(a) S who is immediate neighbour of V

(b) R who is immediate neighbour of T

(c) Q who is immediate neighbour of Q

(d) T who is immediate neighbour of S

Ans: (d)

7. Which of the following has pair with second person sitting to second right of first person?

(a) TS (b) US (c) RV (d) PR

Ans: (a)

8. Which of the following has the pair with second person sitting to immediate right of the first person?

(a) PT (b) PQ (c) UV (d) None of these

Ans: (d)

9. What is the Position of R.

(a) Cann't determined (b) Between Q and T

(c) Second to the right on Q (d) None of these

Ans: (b)

10. What is the position of V

(a) Second to the left of P (b) Between P and U

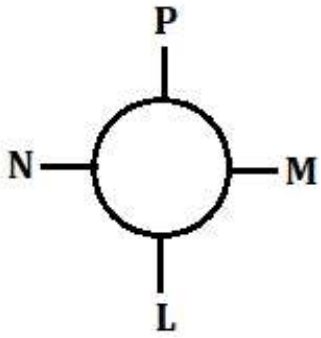
(c) Fourth to left of T (d) None of these

Ans: (a)

PRACTICE QUESTIONS

1. L, M, N and P are sitting around a circular table facing the centre P sits to left of N. L sits between N and M. What is the position of M?

Solution Diagram:



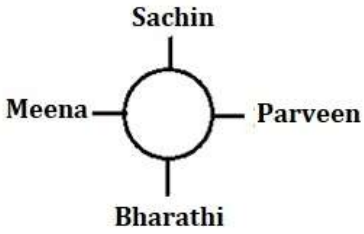
(a) immediate left (b) Right to the P

(c) Right to the N (d) between L and P

Ans: (d)

2. Sachin sits to left to Meena. But Sachin is not an immediate neighbour of Bharathi. Parveen sits to Right of Bharathi all the four are sitting around circular table. So who is the right to Meena?

Solution Diagram:



(a) Parveen (b) Bharathy (c) Sachin (d) Meena

Ans: (a)

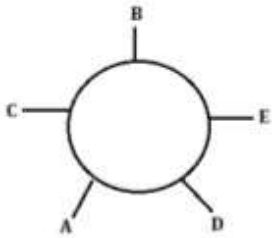
Directions (Qns 3 to 5) Study the following information carefully to answer the question.

i) A, B, C, D and E are sitting around a circular table facing the centre.

ii) C is neighbour of A and B

iii) B sits immediate left of E

Solution Diagram:



3. What is the position of D

(a) D sits immediate right of E

(b) Third to the right of B

(c) Second to the left C

(d) None of these

Ans: (d)

4. Which of the following is correct?

(a) A who is second to left of B

(b) B who is second to left of D

(c) D is between A and E

(d) C who is second to left of E

Ans: (b)

5. Which of the following is wrong?

(a) D who is second to right of C

(b) A who is second to right of E

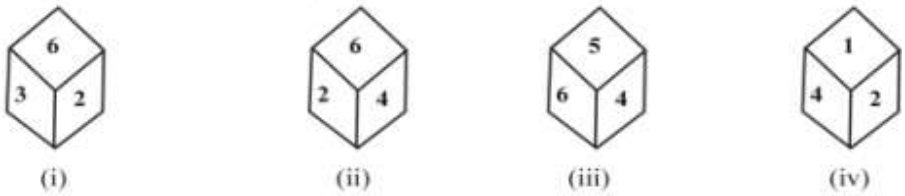
(c) A is between C and D

(d) None of these

Ans: (a)

DICE

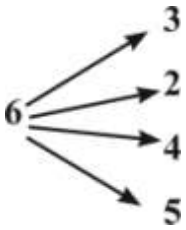
1. The four different position of a dice are given below :



Which number is on the face opposite 6?

(a) 1 (a) 2 (c) 3 (d) 4

Solution:

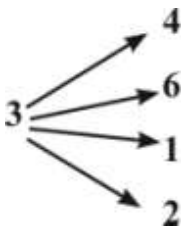


Ans: (a)

2. How many dots are there on the dice facing opposite to the one with three dots?:

(a) 2 (a) 4 (c) 5 (d) 6

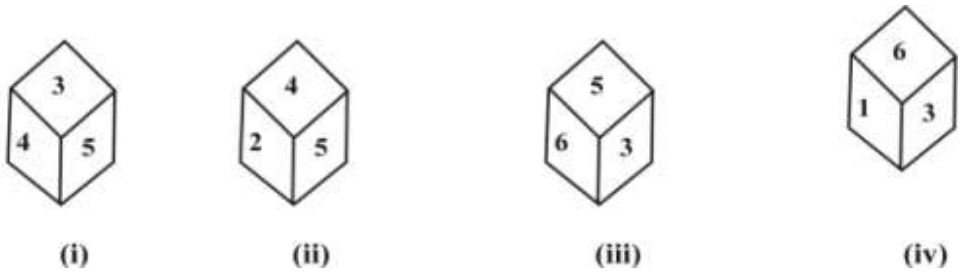
Solution:



5 is the opposite of 3 dots

Ans : (c)

3. Show below are four different position of the same dice. Find the number on the face opposite the face showing 6



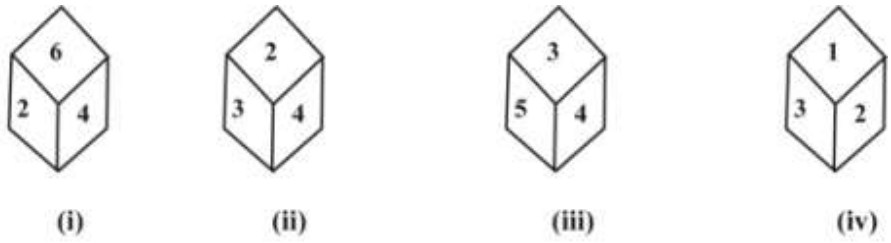
(a) 1 (b) 2 (c) 4 (d) 5

Solution:

4 is the opposite number of 6

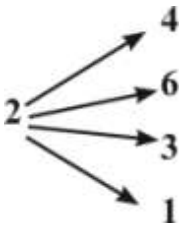
Ans: (c)

4. A dice is thrown four times and its four different position are show below. Find the number on the face opposite the face showing 2.



(a) 3 (a) 4 (c) 5 (d) 6

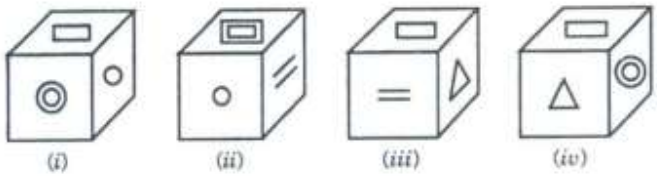
Solution:



2 எதிர் 5 மட்டுமே

Ans : (c)

Directions: Questions 5 to 7 are based on the following illustrations which are four views of a cube



5. The symbol at the bottom if (iv) is

(a) (b) (c) (d)

Ans: (d)

6. The symbol opposite the face having the symbol = is

(a) (b) (c) (d)

Ans: (c)

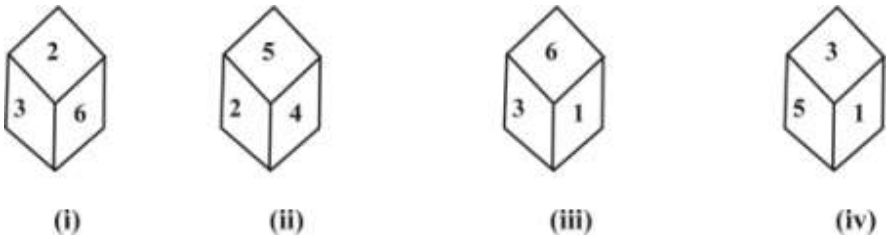
7. The symbol opposite the face having the symbol Δ is

(a) (b) (c) (d)

Ans: (a)

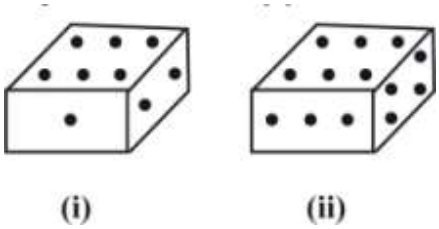
PRACTICE QUESTIONS

1. What number is opposite 3, if four different position of a dice are as show below?



(a) 6 (a) 4 (c) 3 (d) 2

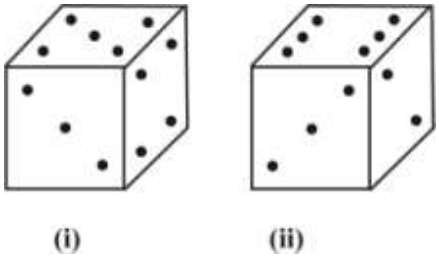
2. Two positions of a block are shown below:



When six is at the bottom what number will be at the top?

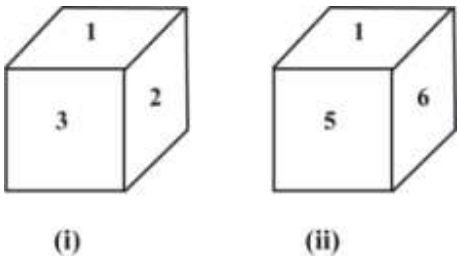
(a) 1 (a)2 (c) 4 (d) 5

3. Two positions of a dice are shown below. If the face with 1 dot is at the bottom then the number of data on the top is



(a) 2 (a) 3 (c) 4 (d) 5

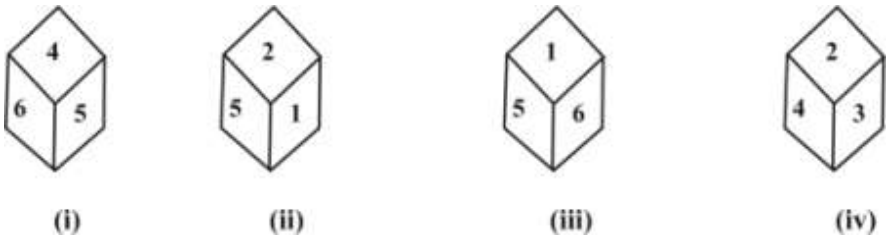
4. Two position of a dice are shown when 4 is at the bottom what number will be on the top?



(i) (ii)

(a) 1 (a) 2 (c) 5 (d) 6

5. Which number is on the face opposite 4, if the four different positions of a dice are as shown in the figure given below:



(i) (ii) (iii) (iv)

(a) 5 (a) 3 (c) 2 (d) 1

1	2	3	4	5
a	d	b	a	d

ALPHA NUMBER SERIES

1. In a certain code, 1 is coded as $, 5 as %, 9 as *, 3 as +, 7 as #, 4 as ? How is 435971 coded in that code.

(a) ?+%*#$ (b) ?+*#%$ (c) $?+%*# (d) ?+*%#$

Solution:

1 → $, 5 → %, 9 → *, 3 → +, 7 → #, 4 → ?

4	3	5	9	7	1
↓	↓	↓	↓	↓	↓
?	+	%	*	#	$

Ans: (a)

2. If a certain language 'Make and break' means 'te ne se', and 'break the glass' means 'ne he me' and 'glass is beautiful' means 'he je de'? Which of the following stands for 'and' in that language?

(a) ne (b) te (c) se (d) te or se

Solution:

Make and Break	→	te ne se
Break the class	→	ne he me
Glass is beautiful	→	he je de

Ans: (d)

3. If a certain language 'lovely garden' means 'op ne', and 'garden free' means 'op ja' and 'free resort', means 'ja ws' ? Which of the following denote 'resort' in that language?

(a) op (b) ws (c) ne (d) te

Solution:

Lovely garden	→	op ne
Garden free	→	op ja
Free resort	→	ja ws

Ans: (b)

4. If a certain language 'she is busy' means 'ka ta jo, and 'she has gone' means 'pa ta ma' and 'days are gone', means 'bo la pa' ? Which of the following denote 'has' in that language?

(a) ka (b) ma (c) ta (d) ta or ma

Solution:

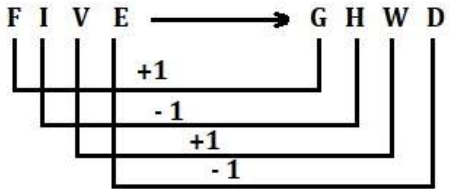
She is busy	→	ka ta jo
She has gone	→	pa ta ma
Days are gone	→	bo la pa

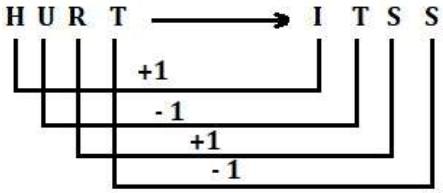
Ans: (b)

5. If a certain language 'FIVE' as written as 'GHWD'. How is 'HURT' coded?

(a) GTSS (b) ITSS (c) ITSS (d) ITQU

Solution:



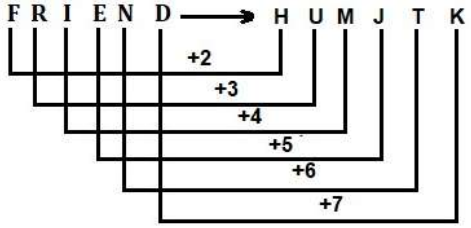


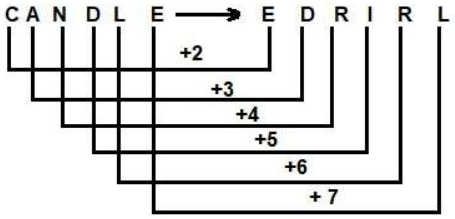
Ans: (b)

6. If a certain language 'FRIEND' as written as 'HUMJTK'. How is 'CANDLE' coded?

(a) EDRIRL (b) EMBFDJ (c) UOFDBH (d) SMDDBH

Solution:





Ans: (a)

7. If a certain language 'BUILT' means '5#32@', and 'TRIBE' means '@835©'? How is 'RULE' coded?

(a) 8#2© (b) 92@© (c) 9#@2 (d) 9@#2

Solution:

B	U	I	L	T		T	R	I	B	E
↓	↓	↓	↓	↓		↓	↓	↓	↓	↓
5	#	3	2	@		@	9	3	5	©

R	U	L	E
↓	↓	↓	↓
9	#	2	©

Ans: (a)

8. If a certain language ‘DOME’ means ‘8943’, and ‘MEAL’ means ‘4321’? How is ‘38249’ coded?

(a) FUBNO (b) UFNBM (c) BNFUE (d) EDAMO

Solution:

D	O	M	E		M	E	A	L
↓	↓	↓	↓		↓	↓	↓	↓
8	9	4	3		4	3	2	1

3	8	2	4	9
↓	↓	↓	↓	↓
E	D	A	M	O

Ans: (d)

9. If a certain language ‘blue’ means ‘green’, green means red, red means yellow, yellow means blue, blue means. Where so what is the colour for black board?

(a) white (b) yellow (c) red (d) black

Solution:

Ans: (d)

10. ‘R’ is coded as 2, ‘T’ as 4 , ‘M’ as 5, ‘J’ as 3, ‘W’ as 6, How is the number ‘TJWR’ coded?

(a) 4362 (b) 4526 (c) 4625 (d) 4325

Solution:

R → 2, T → 4, M → 5, J → 3, W → 6,

T	J	W	R
↓	↓	↓	↓
4	3	6	2

Ans: (a)

PRACTICE QUESTIONS

1. In a certain code 'UNDER' is written as '6152@', DEAF as written as '52#7'. How is 'FRAUD' as coded?

(a) 7@#65 (b) @7#65 (c) 7@#56 (d) 7#@65

Solution:

U	N	D	E	R		D	E	A	F
↓	↓	↓	↓	↓		↓	↓	↓	↓
6	1	5	2	@		5	2	#	7

F	R	A	U	D
↓	↓	↓	↓	↓
7	@	#	6	5

Ans: (a)

2. In a certain code 'BOLD' is written as '5124', SIDE as written as '9647'. How is 'BOSE' as coded?

(a) 5917 (b) 5719 (c) 5791 (d) 5197

Solution:

B	O	L	D		S	I	D	E
↓	↓	↓	↓		↓	↓	↓	↓
5	1	2	4		9	6	4	7

B	O	S	E
↓	↓	↓	↓
5	1	9	7

Ans: (d)

3. If a certain language 'compound interest' means 'te ne', and 'interest high' means 'te ja' and 'high loan' means 'ja pa'? Which of the following denote 'LOAN' in that language?

(a) ka (b) pa (c) ne (d) te

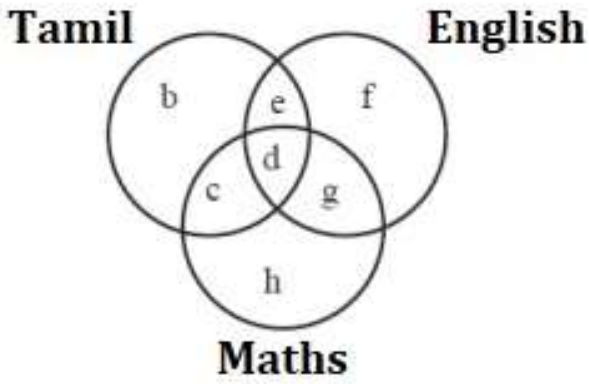
Solution:

Compound Interest	→	te ne
Interest high	→	te ja
High loan	→	ja pa
So, Loan	→	pa

Ans: (b)

LOGICAL REASONING

The figure given below consists of three inter setting circles which represents sets of student who know Tamil, English & Maths.



1. Which letter represents the sets of students who know Maths and English but not Tamil?
(a) c (b) h (c) g (d) e
Ans: (c)

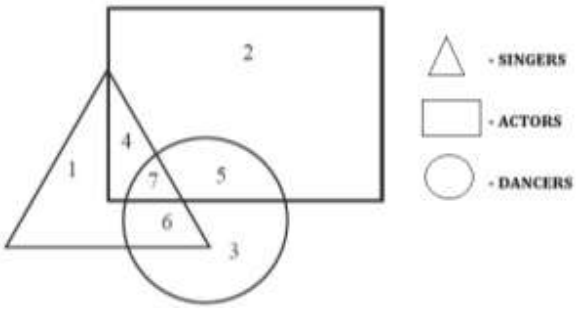
2. Which letter represents the sets of students who know Tami and but not English & Maths?
(a) d (b) c (c) b (d) e
Ans: (c)

3. Which letter represents the sets of students who know Tamil and English but not Maths?
(a) e (b) c (c) d (d) g
Ans: (a)

4. Which letter represents the sets of students who know Tamil and Maths but not English?
(a) h (b) c (c) f (d) d
Ans: (b)

5. Which letter represents the sets of students who know all subjects?
(a) g (b) c (c) h (d) d
Ans: (d)

The figure given below consists of three inter setting circles which represents sets of singers, Actors and Dancers.



1. How many persons are dancers?
(a) 3 (b) 6 (c) 7 (d) 5
Ans: (a)

2. How many persons are actors?
(a) 4 (b) 7 (c) 5 (d) 2
Ans: (d)

3. How many persons are singers?
(a) 6 (b) 4 (c) 7 (d) 1
Ans: (d)

4. How many actors are singers?
(a) 11 (b) 10 (c) 9 (d) 8
Ans: (a)

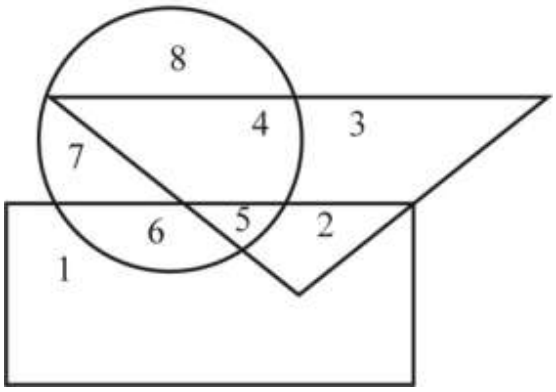
5. How many actors are dancers?
(a) 10 (b) 11 (c) 12 (d) 9
Ans: (c)

6. How many singers are dancers?
(a) 10 (b) 11 (c) 12 (d) 13
Ans: (d)

7. How many persons are talented in all performance?
(a) 4 (b) 7 (c) 6 (d) 5
Ans: (b)

PRACATICE QUESTIONS

Directions (Questions 1 to 5) In the following questions, answers are to be based on the diagram given below, where the triangle represents doctors, the circle represents players and the rectangle represents artists.



1. Which numbered space in the diagram represents doctors who are also players and artists?
(a) 2 (b) 3 (c) 4 (d) 5

2. Which number represents artists who are also players only?
(a) 4 (b) 6 (c) 7 (d) 8

3. Which number represents artists who are neither players nor doctors?
(a) 1 (b) 2 (c) 3 (d) 4

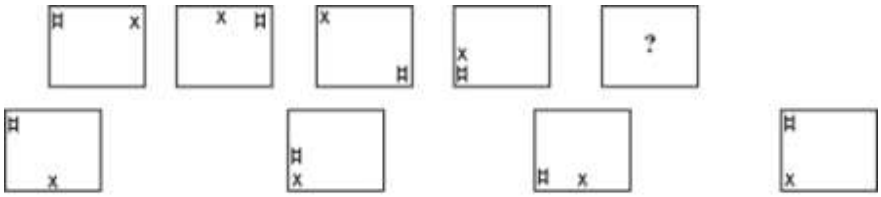
4. Which number represents doctors who are neither players nor artists?
(a) 2 (b) 3 (c) 4 (d) 5

5. Which numbers represent players who are neither artists nor doctors?
(a) 1, 2 (b) 3, 4 (c) 6, 7 (d) 7, 8

1	2	3	4	5
D	B	A	B	D

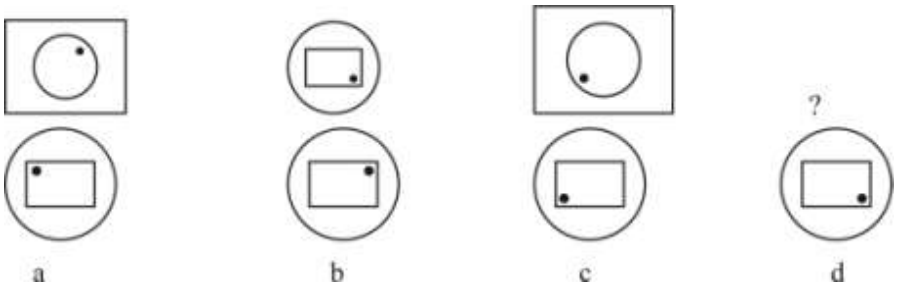
DIAGRAMMATIC SEQUENCES

1. What is the next logical image in the sequence?



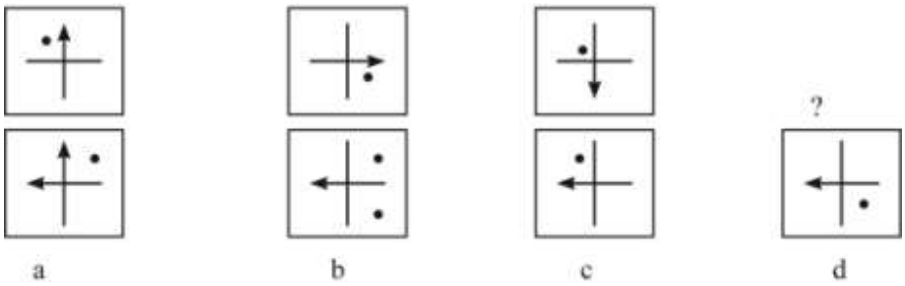
Ans: (d)

2. What is the next logical image in the sequence?



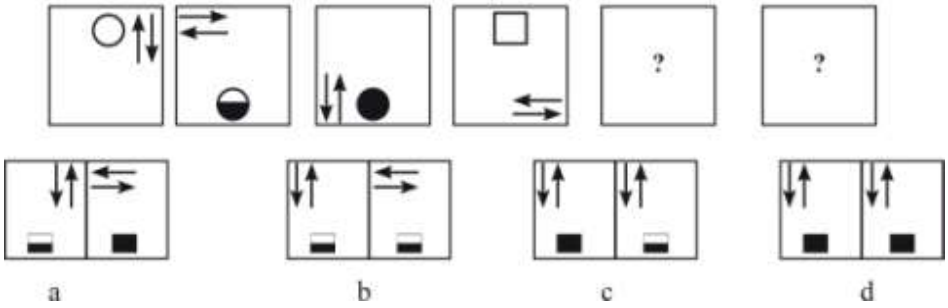
Ans: (a)

3. What is the next logical image in the sequence?



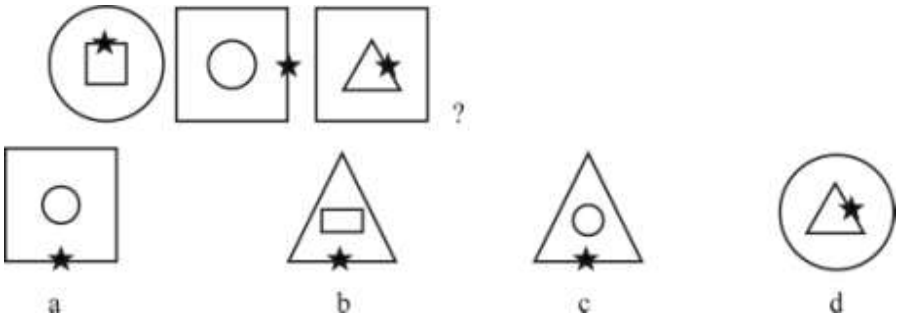
Ans: (d)

4. What is the next logical image in the sequence?



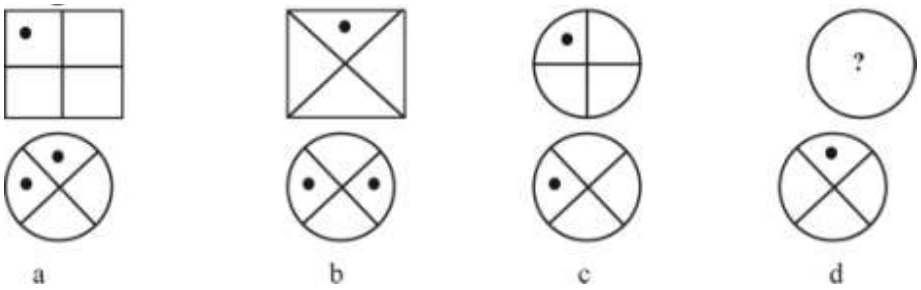
Ans: (a)

5. What is the next logical image in the sequence?



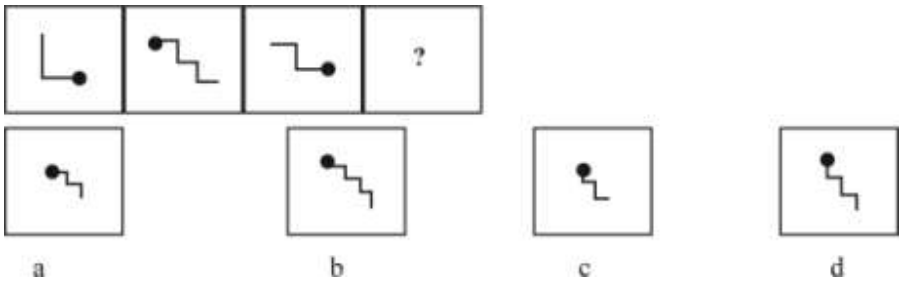
Ans: (b)

6. What is the next logical image in the sequence?



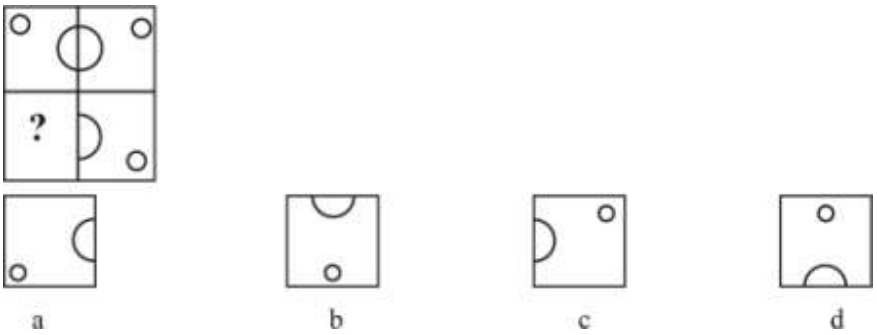
Ans: (d)

7. What is the next logical image in the sequence?



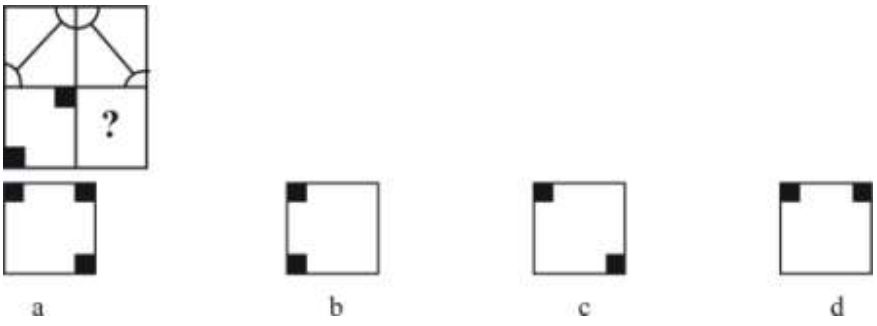
Ans: (b)

8. What is the next logical image in the sequence?



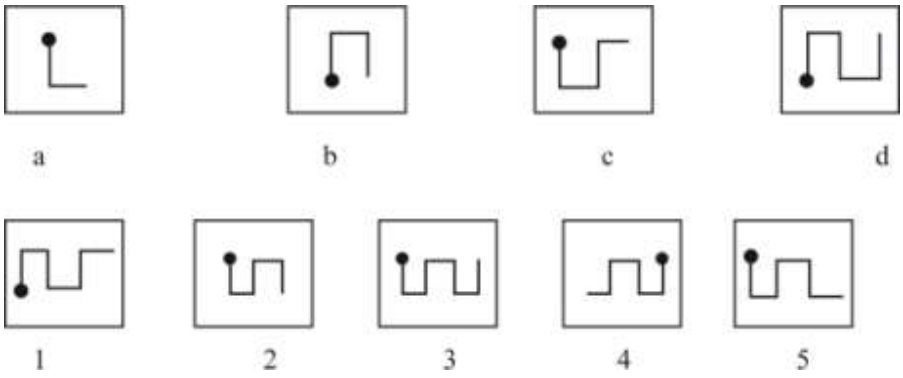
Ans: (a)

9. What is the next logical image in the sequence?



Ans: (c)

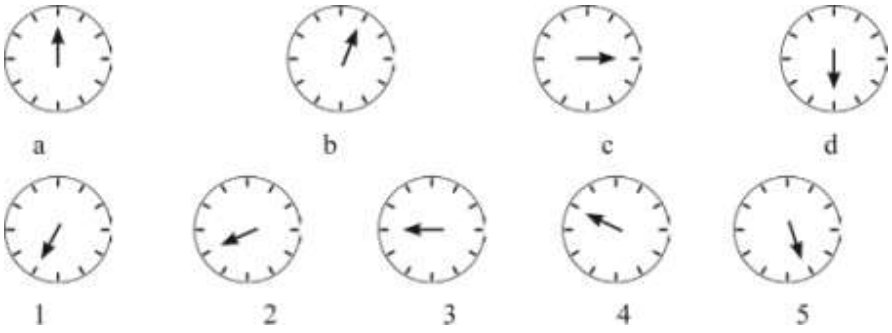
10. What is the next logical image in the sequence?



Ans:

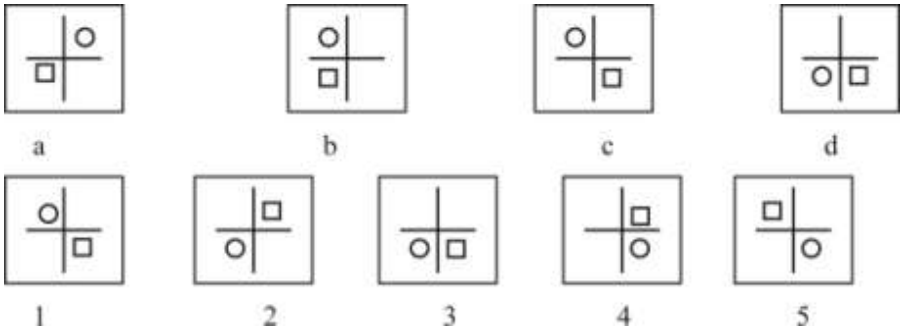
PRACTICE QUESTIONS

11. What is the next logical image in the sequence?



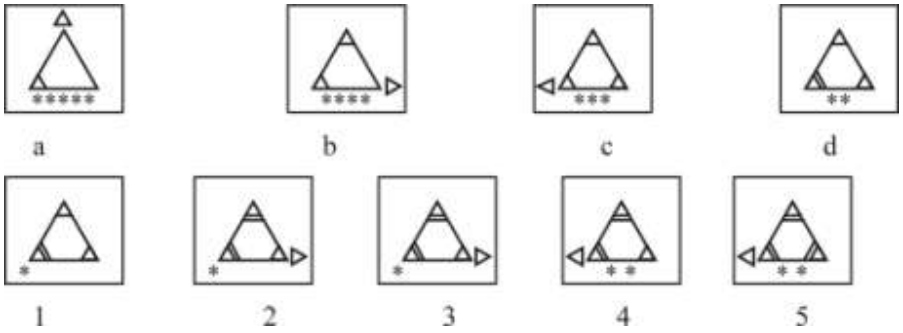
Ans: (4)

12. What is the next logical image in the sequence?



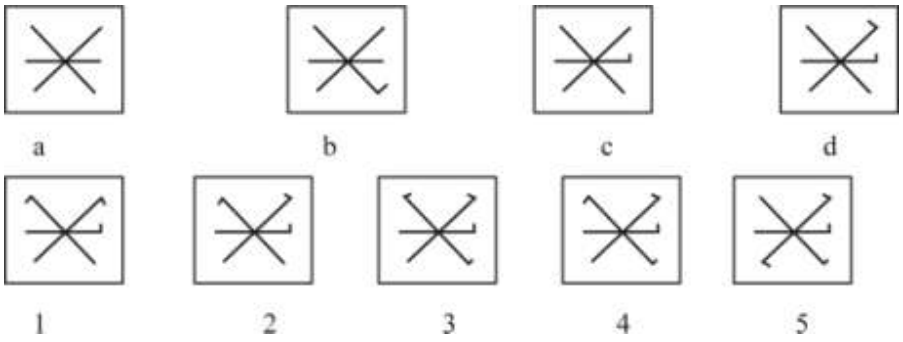
Ans: (2)

13. What is the next logical image in the sequence?



Ans: (1)

14. What is the next logical image in the sequence?



Ans: (2)

ALPHABETICAL SERIES

1. In a certain code TALKED is written as TLKEDA. How is OBSERVATION written in code?
Ans**:** VISROONIEBA

2. In a certain code WASTED is written as ADESTW. How is MARKET written in code?
Ans: AEKMRT

3. In certain code CAPSULE is written as DCSSRJD. How is TEACHER written in code?

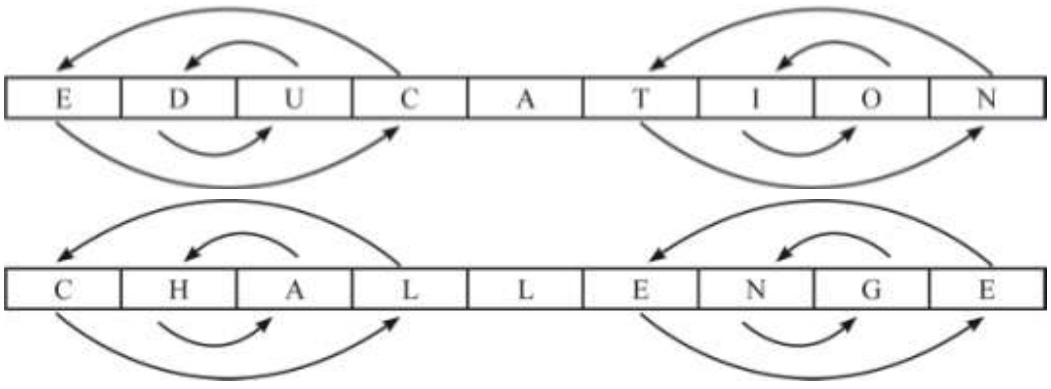
C	A	P	S	U	L	E
↓ +1	↓ +2	↓ +3	O	↓ –3	↓ –2	↓ –1
D	C	S	S	R	J	D

T	E	A	C	H	E	R
↓ +1	↓ +2	↓ +3	O	↓ –3	↓ –2	↓ –1
U	G	D	C	E	C	Q

Ans: UGDCECQ

4. In certain code CLASSIC is written as CIASSALC. How is DIAMOND written in code?
Ans: DNOMAID

5. In certain code EDUCATION is written as CUDEANOIT. How is CHALLENGE written in code?



Ans: LAHCLEGNE

6. In certain code YOUNG is written as ZRZUP. How is DREAM written in code?

Y	O	U	N	G
↓ +1	↓ +3	↓ +5	↓ +7	↓ +9
Z	R	Z	U	P

D	R	E	A	M
↓ +1	↓ +3	↓ +5	↓ +7	↓ +9
E	Y	J	H	V

Ans: EYJHV

7. In certain code OPTIMIZED is written as QQUKNJBFE. How is TAMILNADU written in code?

O	P	T	I	M	I	Z	E	D
↓ +2	↓ +1	↓ +1	↓ +2	↓ +1	↓ +1	↓ +2	↓ +1	↓ +1
Q	Q	U	K	N	J	B	F	E

T	A	M	I	L	N	A	D	U
↓ +2	↓ +1	↓ +1	↓ +2	↓ +1	↓ +1	↓ +2	↓ +1	↓ +1
V	B	N	K	M	O	C	E	V

Ans: VBNKMOCEV

8. In certain code EDIT is written as FFLX. How is MOUSE written in code?

E	D	IT	N
↓ +1	↓ +2	↓ +3	↓ +4
F	F	L	X

M	O	U	S	E
↓ +1	↓ +2	↓ +3	↓ +4	↓ +5
N	Q	X	W	J

Ans: NQXWJ

9. In certain code FARMER is written as EBQNDS. How is AGRICULTURE written in code?

F	A	R	M	E	R
↓ −1	↓ +1	↓ −1	↓ +1	↓ −1	↓ +1
E	B	Q	N	D	S

A	G	R	I	C	U	L	T	U	R	E
↓ −1	↓ +1	↓ +1	↓ +1	↓ −1	↓ +1	↓ −1	↓ +1	↓ −1	↓ +1	↓ −1
Z	H	Q	J	B	V	K	U	T	S	D

Ans: ZHQJBVKUTSD

10. In certain code NATURE is written as OZUTSD. How is BEAUTY written in code?

N	A	T	U	R	E
↓ +1	↓ −1	↓ +1	↓ −1	↓ +1	↓ −1
O	Z	U	T	S	D

B	E	A	U	T	Y
↓ +1	↓ −1	↓ +1	↓ −1	↓ +1	↓ −1
C	D	B	T	U	X

Ans: CDBTUX

PRACTICE QUESTIONS:

1. In a given code RANGE is coded as 61354, DIVIDE as 278724. How is INDIAN written in that code?
(a) 732713 (b) 737231 (c) 732712 (d) 737212

2. In a given code NUMBER is coded as 521647, COPTER as 893047. How is COMPUTER written in that code?
(a) 81932407 (b) 89123047 (c) 89132047 (d) 89132407

3. In a given code INITIAL is coded as 6, SIGNATURE as 8. How is PUNISHMENT written in that code?
(a) 7 (b) 9 (c) 10 (d) 11

4. In a given code BEE is coded as 12, RUN as 53. How is BEST written in that code?
(a) 44 (b) 46 (c) 45 (d) 47

5. K, I, G, E, _____
(a) A (b) B (c) C (d) D

1	2	3	4	5
a	c	b	b	c

LETTER SERIES

In each of the following letter series, some of the letters are missing which are given in that order as one of the alternatives below it. Choose the correct alternative.

1. a b b _ b a a _ a _ b a b _ a b a
(a)abab (b) bbaa (c) abba (d) aabb
The series is abb ab abb ab aab
Ans: (c) abba

2. ab _ d _ bcd _ abcde _ ab
(a) ceea (b) caea (c) aceb (d) caef
Ans: (d) caef

3. x _ z z _ _ y z _ x y _ u
(a) yzuzz (b) yuxuz (c) xyzuz (d) xyxzu
Ans: (b) yuxuz

4. _ bccb _cccb _ bcccc _ bbb
(a) bccb (b) cbbb (c) ccbb (d) cbcb
Ans: (b) cbbb

5. _ a _ b _ aabb _ ab _ a
(a) aaabb (b) ababb (c) babaa (d) babab
Ans: (d) babab

6. _ tu _ rt _ s _ usrtu _
(a) rtusru (b) rsutrr (c) rsurtr (d) rsurts
Ans: (d) rsurts

7. m _ nm _ n _ an _ a _ ma
(a) aamman (b) aammn (c) ammanm (d) amammn
Ans: (b) aammn

8. _ bc _ ca _ aba _ c _ ca
(a) abcbb (b) bbbcc (c) bacba (d) abbcc
Ans: (a) abcbb

9. c _ bbb _ abbbb _ abbb _
(a) aabcb (b) abccb (c) abacb (d) bacbb
Ans: (d) babab

10. pqr_ r _ r _ r _ qp _ prq
(a) qppqr (b) qprqp (c) pqpqr (d) qrppq
Ans: (c) pqpqr

11. bc_ b _ c _ b _ b _ ccb
(a) bbcb (b) cbbc (c) cbba (d) cbcb
Ans: (d) cbcb

12. A, C, E, ? I,
(a) G (b) F (c) H (d) J
Ans: (a) G

13. _ aa _ ba _ bb _ ab _ aab
(a) aaabb (b) bbaab (c) babab (d) bbbaa
Ans: (b) bbaab

14. JAP, KBQ, LCR, ? NET,
(a) STU (b) PRS (c) MDS (d) SMD
Ans: (c) MDS

15. _ _ aba _ _ ba _ ab
(a) abbbb (b) abbab (c) baabb (d) bbabb
Ans: (b) abbab

PRACTICE QUESTIONS

1. _ bcdbc _ dcabd _ bcdbc _ dc _ bd
(a) aaaaa (b) ccccc (c) ddddd (d) bbbbb

2. abab _ a _ _ ba _ bbb
(a) bbab (b) bbbb (c) abbb (d) abba

3. b _ acbda _ bd _ cb _ a _
(a) baadc (b) dcadc (c) cbdca (d) cdacb

4. a _ bbc _ aab _ cca _ bbcc
(a) bacd (b) acba (c) aaba (d) abba

5. x _ xxy _ x _ xy _ y
(a) yyxy (b) yxxy (c) xyxy (d) yyxx

1	2	3	4	5
a	b	b	b	a