Noida Institute of Engineering and Technology, Greater Noida

Aptitude 1

Unit: V

Subject Name
Mathematics I

Faculty Name
Mr. Sudhir Singh
Department
Mathematics

Course Details
B Tech- 1st Sem.

Contents

- Simplification
- Percentage
- Profit, Loss & discount
- Average
- Number & Series
- Coding & decoding

Course Objective (CO.5)

- Pre- requisites (if any) Knowledge of Intermediate Mathematics of UP Board or equivalent Board. Course Objectives: The objective of this course is to familiarize the graduate engineers with techniques in calculus, multivariate analysis, aptitude and linear algebra. It aims to equip the students with standard concepts and tools from intermediate to advanced level that will enable them to tackle more advanced level of mathematics and applications that they would find useful in their disciplines. The students will learn: To apply the knowledge of differential calculus in the field of engineering. To deal with functions of several variables that are essential in optimizing the results of real life problems. Multiple integral tools to deal with engineering problems involving centre of gravity, volume etc. To deal with aptitude that is required in different branches of Engineering to graduate engineers. The essential tools of matrices and linear algebra, eigen values and diagonalization in a comprehensive manner are required.

Unit Objective (CO.5)

Course Objective This course aims to sensitize students with the gamut of skills which facilitate them to enhance their employability quotient and do well in the professional space. These skills are imperative for students to establish a stronger connect with the environment in which they operate.

Course Outcomes 2020-21 (B. Tech. – 1st Sem)

Course Name: Mathematics-I (KAS 103)	
CO1	Apply the concept of matrices to solve linear simultaneous equations
CO2	Apply the concept of successive differentiation and partial differentiation to solve problems of Leibnitz theorems and total derivatives .
CO3	Apply partial differentiation for evaluating maxima, minima, Taylor's series and Jacobians.
CO4	llustrate multiple integral to find area, volume, centre of mass and centre of gravity.
CO5	Demonstrate the basic concept of Profit, Loss, Number & Series, Coding & decoding.

CO-PO Mapping 2020-21 (B. Tech. – 1st Sem)

Course Name: Mathematics-I (KAS 103)												
CO	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**
CO1	3	2	1	1	3	2	-	-	-	2	2	3
CO2	3	3	2	3	3	-	-	-	-	2	3	3
CO3	3	2	3	3	3	2	-	-	-	2	3	3
CO4	3	2	3	3	2	2	-	-	-	2	2	3
CO5	1	1	1	1	1	-	-	-	-	2	-	3
Mean	**2.6**	**2**	**2**	**2.2**	**2.4**	**2.0**	-	-	-	**2**	**2.5**	**3**

Prerequisite (CO.5)

- Basic concept of mathematics

Simplification (CO.5)

Basic Rules of Simplification

- **BODMAS Rule**
- It defines the correct sequence in which operations are to be performed in a given mathematical expression to find the correct value. This means that to simplify an expression, the following order must be followed -

B = Brackets, the order - (), {} and [] - should be strictly followed.

O = Order (Powers, Square Roots, etc.)

D = Division

M = Multiplication

A = Addition

S = Subtraction

Topic objective of Simplification (CO. 5)

Eliminate the unnecessary parts of a process. Combine and rearrange the rest of the process. **Simplify** the necessary part of the process.

Simplification(Contd.) (CO.5)

Example 1: Solve $4 + 10 - 3 \times 6 \div 3 + 4$

$= 4 + 10 - 18/3 + 4 = 4 + 10 - 6 + 4$ (Division and multiplication, left to right)

$= 14 - 6 + 4 = 8 + 4 = 12$ (Addition and Subtraction, left to right)

Example 2: Evaluate or simplify the following expression

(a) $9 - \{ 7 - 24 \div (8 + 6 \times 2 - 16) \}$

(b) $(- 3) \times (- 12) \div (- 4) + 3 \times 6$

(c) $17 - \{ 8 \div (2 \times 3 - 4) \}$

(d) $5 \times 2 - [3 - \{ 5 - (7 + 2 \times 4 - 19)\}]$

Multiple Choice Questions (CO.5)

Ques. 1 : $(47 \times 562.58) \div (23 \times 112.23) = ?$

(a) 17 (b) 10 (c) 18 (d) 21

Ques. 2 : $(4874 + 5995 + 3329) \div (712 + 510 + 325) = ?$

(a) 9 (b) 11 (c) 7 (d) 11

Ques. 3 : $25.05 \times 123.95 + 388.999 \times 15.001 = ?$

(a) 900 (b) 8950 (c) 8935 (d) 8975

Ques. 4 : $\sqrt{4090} \times \sqrt{12163} + 49 = (?)$

(a) 29 (b) 49 (c) 33 (d) 39

Ques. 5: If $x = (\sqrt{126} \times \sqrt{63} \times \sqrt{45}) / (\sqrt{147} \times \sqrt{243})$, then the value of x is

(a) $\sqrt{5}$ (b) $\sqrt{10}$ (c) 10 (d) 5

Percentages (CO.5)

- The term per cent means ‘for every hundred’. It can best be defined as:

“ A fraction whose denominator is 100 is called a percentage, and the numerator of the fraction is called the rate per cent.”

- **Basic concept:**

X% of Y (or) X of Y%

= X/100 × Y ; = X × Y/100

=XY/100 ; = XY/100

Topic objective of Percentages (CO. 5)

Percent Describe the relationship between ratios, fractions, decimals and **percents**. Identify the decimal equivalent of a **percent**. Identify the fractional equivalent of a **percent**. Label **percentages** with the symbol %.

Percentages (CO.5)

Example 1: 28% of 450 + 45% of 280

$= 28/100 \times 450 + 45/100 \times 280$

$= 2 \times 280 \times 45/100$

$= 252$

Example 2: Evaluate or simplify the following expression

(a)50/3% of 600gm -100/3% of 180gm

(b) 45 % of 750 – 25% of 480

(c) 860 % of 50 + 50 % of 860

Application of Percentage (CO.5)

- **Type 1: Salary based Problem**

Example 1 : A man spends 60% of his income. His income is increased by 20% and his expenditure also increases by 10%. Find the percentage decrease in his saving?

Solution : Let initially income is 100.

So, expenditure = 60 and saving = 40

now income is increased by 20% i.e. 120.

So, expenditure = (70/100)*120 = 84 and saving = 36 so % percent decrease in saving = (4/40)*100 = 10%

Application of Percentage (CO.5)

Example 2: P's income is 20% more than Q's income. How much % Q's income less than P's income ?

Solution : B income = 100

A income = $100 \times 120/100 = 120$

$\% = (120 - 100/120) \times 100 = 16.67\%$

Example 3: A reduction of 20% percent in the price of rice enables a housewife to buy 5 kg more for rupees 1200. Find the reduced price per kg of rice.

Solution : let original price is x rupees per kg

$1200/(4x/5) - 1200/x = 5$ We will get $x = 60$,

so reduced price = $(4 \times 60)/5 = 48$

Application of percentage (CO.5)

- **Type 2: Population Related Problem**
- **Concept :** Let the population of a town be P now and suppose it increases at the rate of R % per annum, Then:

Case 1: Population after n year = $P\ (1+ R/100)^n$

Case 2: Population n years ago = $P/\ (1+ R/100)^n$

Example : The population of a town is 15000. It increases by 10 percent in the first year and 20 percent in the second year. But in the third year it decreases by 10 percent. What will be the population after 3 years.

Solution : $15000 \times (11/10) \times (12/10) \times (9/10) = 17820$

Application of percentage (CO.5)

- **Type 3: Examination based problem**

Example : A got 30% of the maximum marks in an examination and failed by 10 marks. However, B who took the same examination got 40% of the total marks and got 15 marks more than the passing marks. What were the passing marks in the examination?

Solution : $(30/100) \times T = P - 10$

$(40/100) \times T = P + 15$

So, you will get $P = 85$

Application of percentage (CO.5)

- **Type 4: Concept of net change or net effect(only valid for 2-D)**

Case 1: If x% increases and y% also increases

Then, net effect = x + y + xy/100

Case 2: If x% increases and y% decreases

Then, net effect = x – y – xy/100

Example 1: Rishi salary is first increased by 20% and then decreased by 25%. How much percent the salary increased/decreased ?

Solution : net change = 20 – 25 – 500/100

net change = -10

So percentage decrease is 10%.

Application of percentage (CO.5)

- **Type 5: Election based problem**

Example : In an election a candidate who got 25% of the total votes polled was defeated by his rival by 270 votes. Assuming that there were only 2 candidates in the election, find the total number of votes polled.

Solution : let total number of votes polled = x

$$75\%\ x - 25\%\ x = 270$$

$$50\%\ \text{of}\ x = 270$$

$$x = (270 \times 100)/50$$

$$x = 540$$

Multiple Choice Questions (CO.5)

Ques. 1 : Ankita is 25 years old. If Rahul's age is 25% greater than that of Ankita then how much percent Ankita's age is less than Rahul's age?

(a) 40% (b) 35% (c) 10% (d) 20%

Ques. 2 : In an examination, 50% of the students passed in Science and 75% passed in Social, while 20% students failed in both the subjects. If 270 students passed in both subjects, find the total number of students who appeared in the exam?

(a)400 (b)540 (c)600 (d)750

Multiple Choice Questions (CO.5)

Ques. 3 : The population of a village has increased annually at the rate of 20%. If at the end of 3 years it is 21600, the population in the beginning of the first year?

(a) 10000 (b) 12500 (c) 15000 (d) 17500

Ques. 4 : A student has to get 40 percent marks to pass an examination. He got 60 marks but fails by 20 marks. Find the maximum marks of the examination.

(a) 150 (b) 200 (c) 300 (d) 400

Ques. 5 : If the price of a commodity is increased by 30%, by how much % a consumer must reduce his consumption so to keep the expenditure same ?

(a) 100/13 (b) 200/13 (c) 300/13 (d) 400/13

Assignment (CO.5)

Q.1 A got 37.5 % marks less than B, then by what percent the marks of B is more than the marks of A?

(a) 60 % (b) 37.5 % (c) 27.27 % (d) 40 %

Q.2 In an election contest between A and B, A wins by the margin of 240 votes. If A gets 60% of the total votes, total votes are:

(a) 1000 (b) 900 (c) 800 (d) 1200

Q.3 A's salary is 20% more than B's; B's salary is 10% less than C's. If A's salary is Rs. 1080, find C's salary.

(a) 900 (b) 1200 (c) 1000 (d) none of these

Q.4 In an examination, 50% students failed in English and 40% in Math and 15% students failed in both subjects. If 200 students passed in both the subjects, find the number of students appeared in the exam.

(a) 500 (b) 600 (c) 800 (d) 1000

Assignment – 1 (CO.5)

Q.5 The price of petrol increased by 25% and so a person reduced his consumption by 25%. What percentage is the rise or fall in the expenditure incurred by him on petrol?

(a) 6.25% increasing (b) 0.625% decreasing

(c) 6.25% decreasing (d) 0.625 increasing

Q.6 The length of a rectangle is increased by 60%. By what percent would be width have to be decreased to maintain the same area?

(a) 37.5 % (b) 60% (c) 75% (d) None of these

Q. 7 In an election between two candidates, the candidate who got 60% of valid votes won by a majority of 200 votes. If out of total votes polled 80% votes are valid. What is the total number of votes polled?

(a) 1000 (b) 1250 (c) 1500 (d) 1300

Assignment – 1 (CO.5)

Q. 8 A candidate scores 25 % marks and fails by 30 marks, while another candidate who scores 50 % marks get 20 marks more than the minimum marks required to pass the examinations. Find the maximum marks for the examination.

(a) 200 (b) 100 (c) 400 (d) 500

Q. 9 Reduction in price of sugar by 20% allows a household to buy 45 kg more for Rs.450. Find the original price of the sugar.

(a) Rs 2/ kg (b) Rs 2.5/ kg (c) Rs 3/ kg (d) None

Q. 10 In an examination, 34% of the students failed in Mathematics and 42% failed in English. If 20% of students failed in both the subjects, then the percentage of students who passed in both the subjects was:

(a) 44 (b) 50 (c) 54 (d) 56

Recap (CO.5)

- **Basic concept of percentage**
- **Different type of question**

(1) Salary based Problem

(2) Population Related Problem

(3) Examination based problem

(4) Concept of net change or net effect(only valid for 2-D)

(5) Election based problem

Profit & Loss (CO.5)

- **Basic Concept**
- Profit = SP – CP
- Profit % = (SP/CP − 1) × 100
- Loss = CP – SP
- Loss % = (1 − SP/CP) × 100
- Formulae

SP = CP (1 ± x/100)

Where, +x = profit %

−x = loss %

Topic objective of Profit & Loss (CO. 5)

Profit and **loss** account is prepared after the preparation of trading account. The main **objective** of preparing **profit** and **loss** account is to achieve the operating results of a company at the end of accounting period. **Profit** and **loss** account is a nominal account having debit side and credit side.

Profit & Loss (CO.5)(Contd.)

Example 1: The CP of an article is $5/6^{th}$ of the SP. What is the percentage profit or loss?

Solution : CP = 5/6 of SP

$$SP/CP = 6/5$$

$$\text{Profit \%} = (6/5 - 1) \times 100 = 20$$

Example 2: A man bough 18 oranges for a rupee and sold them at 12 oranges for a rupee. What is the profit percentage?

Solution : CP of 18 = SP of 12

$$SP/CP = 18/12 = 3/2$$

$$\text{Profit \%} = (3/2 - 1) \times 100 = 50$$

Profit & Loss (CO.5)(Contd.)

Example 3: If a wholesaler sells a tin of coffee at ₹ 528.He faces a loss of 12%. If he decides to sell it at ₹ 636, what will be profit percentage?

Solution : $SP = CP\,(1 - x/100)$

$$528 = CP\,(1 - 12/100)$$

$$CP = ₹\ 600$$

$$\text{Profit} = 636 - 600 = 36$$

$$\text{Profit \%} = (36/600) \times 100 = 6$$

Profit & Loss(CO.5) (Contd.)

Example 4: If a sari is sold for ₹ 2880 the seller will face 10% loss, at what price should he sell to gain 20% profit?

Solution: $SP = CP(1 - x/100)$

$2880 = CP\ (1 - 10/100)$

$CP = ₹\ 3200$

Now, to gain 20% profit

Selling price $= 3200(1 + 20/100)$

$SP = ₹\ 3840$

Discount (CO.5)

- **Marked Price :** the marked price or list price is the price that is indicated or marked on the product.
- Markup(m) = MP − CP

  Markup % = (MP/CP − 1) ×100
- **Discount :** Discount is the reduction given on the marked price.
- Discount = MP− SP

Discount % = (1− SP/MP) × 100

- **Successive Discount** : If two successive discount of x% and y% are converted into single equivalent discount

= x + y − xy/100

Topic objective of Discount (CO. 5)

Discounts to reward customers who purchase in bulk, repeat customers and employees build customer loyalty. ... Promotional **discounts**, used sparingly, offer temporary advantages including maximising sales, revenue and profit.

Discount (CO.5)(Contd.)

- **Formulae :** Selling Price = $MP(1-d/100)$
- $CP(1\pm x/100) = SP = MP\,(1-d/100)$

Example 1 : A discount of 20% is given on the marked price of an article. The shopkeeper charges sales tax of 10% on the discounted price. If the selling price be ₹1848, what is the marked price (in rupees) of the article?

Solution: Let the MP be x.

Then, $1848 = MP(1-20/100)(110/100)$

$MP = 2100$

Discount (CO.5)(Contd.)

Example 2: A shopkeeper marks his goods 20% above his cost price and gives 15% discount on the marked price. Find his gain%.

Solution: Let, CP of an article = ₹ 100

Then, marked price of an article = ₹120

$$\text{Selling price} = MP\,(1-d/100)$$

$$= 120(1-15/100)$$

$$= 102$$

$$\text{gain \%} = (102-100)/100 \times 100 = 2$$

Discount (CO.5) (Contd.)

Example 3:

(a) If two successive discount are 30% and 10%. Find single equivalent discount.

Solution:

$$\text{single equivalent discount} = 30 + 10 - 300/100$$

$$= 37\%$$

(b) A tire is sold at three successive discount of 20%, 30% and 20%. What is the net discount?

Solution : $$\text{single discount} = 20 + 30 - 600/100$$

$$= 44\%$$

$$\text{Net discount} = 44 + 20 - 880/100 = 55.2\%$$

Multiple Choice Questions (CO.5)

Ques. 1 : A shopkeeper uses weight of 460 gram instead of 500 gram and the sells the articles at the cost price. What is the profit percentage?

(a) 40% (b) 23% (c) 8.7 % (d) 20%

Ques. 2 : The MP of an article is 30% higher than its CP and 20% discount is allowed on this article then the profit percentage?

(a) 10% (b) 14% (c) 4% (d) 25%

Ques. 3 : A single discount equivalent to three successive discounts of 5%, 10%, 20% is?

(a) 68.4% (b) 35% (c) 31.6% (d) 32%

Multiple Choice Questions (CO.5)

Ques. 4 : A trader uses a weight of 920 gram instead of 1 kg and sells the articles at the marked price which is 15% above the cost price. Find the profit percentage.

(a) 20% (b) 23% (c) 25% (d) 10 %

Ques. 5 : The marked price of a shirt and trousers are in the ratio 1 : 2. The shopkeeper gives 40% discount on the shirt. If the total discount on both is 30% , then the discount offered on the trousers is?

(a) 15% (b) 20% (c) 25% (d) 30%

Assignment – 2 (CO.5)

Ques. 1 : A man sold an umbrella for Rs. 1800 and incurs a loss of 20%, and then what is the cost price of the umbrella?

(a) 1440 (b) 2160 (c) 2250 (d) 2320

Ques. 2 : The cost price of 12 pens is equal to the selling price of 10 pens. Find the gain percent.

(a) 20% (b) 25% (c) 10% (d) 16.66%

Ques. 3 : A toy is sold at 25% profit. If it had been sold at 15% loss, the selling price would have been Rs. 120 less. The toy costs

(a) Rs. 240 (b) Rs. 360 (c) Rs. 300 (d) Rs. 350

Ques. 4 : A retailer marks all his goods at 50% above the cost price and offers a discount of 25% on the marked price. What is his actual profit on the sales?

(a) 25% (b) 12.5% (c) 15% (d) 20%

Assignment – 2 (CO.5)

Ques. 5 : A dealer offers a discount of 10% on the marked price of an article and still makes a profit of 20%. If its marked price is Rs. 800, then the cost price is?

(a) Rs. 600 (b) Rs. 700 (c) Rs. 800 (d) Rs. 900

Ques. 6 : An article is listed at Rs. 1800 and two successive discounts of 8% and 8% are given on it. How much would the seller gain or loss, if he gives a single discount of 16% instead of two discounts?

(a) Rs. 11.52 loss (b) Rs. 11.52 gain

(c) Rs. 12.62 loss (d) Rs. 12.52 gain

Ques. 7 : A single discount equivalent to three successive discounts of 5%, 10%, 20% is?

(a) 68.4% (b) 35% (c) 31.6% (d) 32%

Assignment – 2 (CO.5)

Ques. 8 : Pankaj purchased an item for Rs. 7500 and sold it at the gain of 24%. From that amount he purchased another item and sold it at the loss of 20%. What is his overall gain/loss?

(a) Loss of Rs. 140 (b) Gain of Rs. 60

(c) Loss of Rs. 60 (d) neither gain or Loss

Ques. 9 : A man purchases a certain number of toffees at 6 per rupee and the same number of toffees at 7 per rupee. He mixes the toffees and sells them at 6 per rupee. What is his gain or loss percent?

(a) 6.692% loss (b) 7.692% gain

(c) 7.692% loss (d) 7.386% gain

Ques. 10 : The difference between the selling prices after a discount of 40% on Rs.500 and two successive discount of 36% and 4% on the same amount is :

(a) 0 (b) Rs.2 (c) Rs.1.93 (d) Rs.7.20

Recap (CO.5)

- Basic concept of Profit & Loss
- Profit = SP – CP
- Loss = CP – SP
- Formulae

  $SP = CP\ (1 \pm x/100)$
- Basic concept of Discount
- Discount = MP– SP
- $CP\ (1 \pm x/100) = SP = MP\ (1 - d/100)$
- Concept of successive discount

Average (CO.5)

- **Average** = Sum of observation/Number of observation

Example 1: Find the average of all prime numbers between 30 and 50.

Solution : there are five prime numbers between 30 and 50.

There are 31, 37, 41, 43 and 47.

Required average = (31 + 37 + 41 + 43 + 47)/5

= 199/5 = 39.8

Example 2: Find the average of first 85 natural numbers.

Solution : Sum of first n natural number = n(n + 1)/2

So, sum of first 85 natural numbers = (85 × 86)/2 = 3655

Required Average = 3655/85 = 43

Average (CO.5)(Contd.)

Example 3: Nine person went to a hotel for taking their meals. Eight of them spent ₹ 12 each on their meals and the ninth spent ₹ 8 more than the average expenditure of all the nine. What was the total money spent by them?

Solution : let the average expenditure of all the nine be ₹ x.

then, $12 \times 8 + (x+8) = 9x$

$$8x = 104 \text{ or } x = 13$$

total money spent $= 9x = 9 \times 13 = ₹117$

Example 4: The average weight of 10 person in a boat is increased by 1.8 kg when one of the crew, who weight 53 kg is replaced by new man. Find the weight of the new man.

Solution : total weight increased $= 1.8 \times 10 = 18$ kg

Weight of new man $= 53 + 18 = 71$ kg

Topic objective of Average (CO. 5)

In statistics, an **average** is defined as the number that measures the central tendency of a given set of numbers. The **objectives** of statistical **Average** can be: 1. To facilitate comparison. For instance, measures of central value, by reducing the mass of data to one single figure, enable comparison to be made.

Multiple Choice Question (CO.5)

Ques. 1 : The average age of 10 students in a class is 20. If a new student is also included, then the new average age of all the students increases by 1. The age of the new student is?

(a) 21 (b) 30 (c) 31 (d) 41

Ques. 2 : A student on her first 3 tests received an average score of N points. If she exceeds her previous average score by 20 points on her fourth test, then what is the average score for the first 4 tests?

(a) N + 20 (b) N + 10 (c) N + 4 (d) N + 5

Multiple Choice Question (CO.5)

Ques. 3 : Average of 13 number is 68. Average of its first seven numbers is 63 and last seven number is 70.Find out the seventh number.

(a) 45 (b) 47 (c) 49 (d) 52

Ques. 4 : Average of 10 numbers is 14.8.if two numbers 5 and 23 are replaced by 13 and 26 respectively, then what is the new average?

(a) 15.9 (b) 13.8 (c) 16.3 (d) 14.5

Ques. 5 : The mean of three numbers is 21. The range of this data set is 12 and the difference between the two smallest numbers is 3. The greatest of the three numbers is.

(a) 24 (b) 27 (c) 25 (d) 28

Assignment – 3 (CO.5)

Ques. 1 : The average age of four boys, five years ago was 9 years. On including a new boy, the present average age of all the five is 15 years. The present age of the new boy is

(a) 14 years (b) 6 years (c) 15 years (d) 19 years

Ques. 2 : If the average of 39, 48, 51, 63, 75, 83, x and 69 is 60, then the value of x is :

(a) 52 (b) 53 (c) 50 (d) 51

Ques. 3 : A batsman makes a score of 58 runs in the 15th innings and thus increases his average by 3 runs. What is the average after 15th inning?

(a) 12 (b) 14 (c) 16 (d) 18

Ques. 4 : The average of 5 consecutive numbers is n. If the next two numbers are also included, the average of the 7 number will

(a) Increase by 2 (b) Increase by 1

(c) Remain the same (d) Increase by 1.4

Assignment – 3 (CO.5)

Ques. 5 : In a family of 5 members, the average age at present is 33 years. The youngest member is 9 years old. The average age of the family just before the birth of the youngest member was

(a) 24 years (b) 30 years (c) 29 years (d) 25 years

Ques. 6 : The average age of 14 girls and their teacher's age is 15 years. If the teacher's age is excluded, the average reduces by 1. What is the teacher's age?

(a) 32 years (b) 30 years (c) 29 years (d) 35 years

Ques. 7 : If out of 10 selected students for an examination, 3 were of 20 years, age, 4 of 21 and 3 of 22 years, the average age of the group is

(a) 22 years (b) 21 years (c) 21.5 years (d) 20 years

Ques. 8 :Out of four numbers the average of the first three is 16 and that of the last three is 15. If the last number is 20 then the first number is

(a) 23 (b) 25 (c) 28 (d) 21

Recap (CO.5)

- **Average** = Sum of observation/Number of observation

Number & Series (CO.5)

- **Tips For Number Series**
- (1) Try to observe if there are any familiar numbers in the given series.
- (2) Familiar numbers are the numbers which are easy to identify like primes numbers, perfect squares, cubes.
- (3) If you are unable to find familiar number, Calculate the differences between the numbers and observe the pattern in the differences.
- (4) If the differences are growing slowly it might be an addition or subtraction series or If the differences are growing rapidly it might be a square series, cube series, or multiplicative series.

Number & Series (CO.5) (Contd.)

- (5) If the differences also are not having any pattern then observe every alternate number (i.e. every 3rd number form a series) for any pattern.
- (6) The possible cases may be like sum or the average of two consecutive numbers gives 3rd number.
- (7)If still you do not find any pattern, it signifies that the series follows a complex pattern. Check for cases like multiplying the number and adding/subtracting a constant number from it to reach the pattern.

Topic objective of Number & Series (CO. 5)

Series Number Sequence: Concepts & Tricks. ... A numerical **series** is given in which a **number** is wrongly placed. You are asked to identify that particular wrong **number**. A numerical **series** is given in which a specific **number** is missing. You are required to find out that missing **number**.

Number & Series (CO.5) (Contd.)

- **Different type question pattern**
- **Type 1: Fibonacci Series**

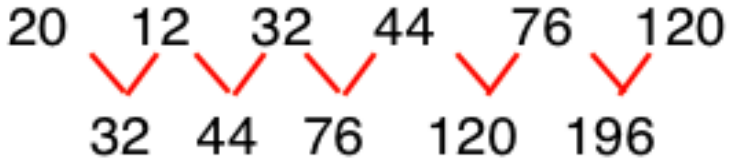
  The Fibonacci sequence is a series of numbers where a no. is found by adding up the nos. before it.

Example 1: 0,1,1,2,3,5,8,13,21,___.

Solution :

Example 2: 20, 12, 32, 44, 76, 120,____.

Solution :



Number & Series (CO.5) (Contd.)

- **Type 2: Addition series**

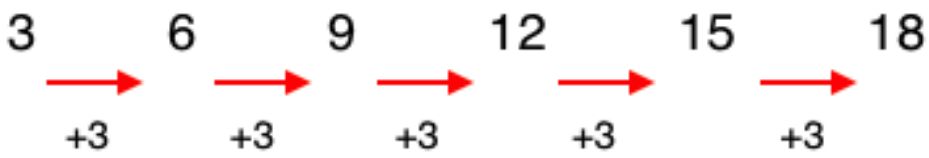
  There can be 2 types of pattern in addition series.

(A) Same number Addition series

In this type of series, the difference between 2 consecutive elements is same i.e. same digit is to be added to the previous element to obtain the next element.

Example : 3, 6, 9, 15, 18,____.

Solution



Number & Series (CO.5) (Contd.)

(B) Increasing order Addition series

In the given series, the difference between 2 consecutive numbers is in increasing order.

Example : 2, 5, 9, 14, 20, 27,____.

Solution :

Number & Series (CO.5) (Contd.)

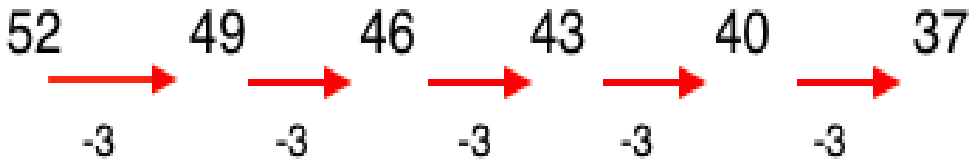
- **Type 3: Subtraction series**

(A) Same Number Subtraction Series

In this type of series, each time the same number is subtracted from the previous element to obtain the next element.

Example : 52, 49, 46, 43, 40,____.

Solution :

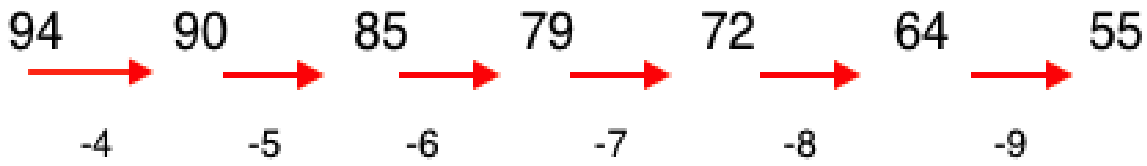


Number & Series (CO.5) (Contd.)

(B) Increasing order Subtraction Series

Example : 94, 90, 85, 79, 72, 64,____.

Solution : Here the difference between 2 consecutive elements is in increasing order.



Number & Series (CO.5) (Contd.)

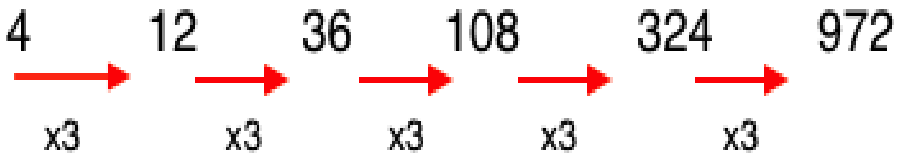
Type 4: Multiplication Series

(A) Same number multiplication Series

In this series, the ratio between 2 consecutive elements is same.

Example : 4, 12, 36, 108, 324,____.

Solution :



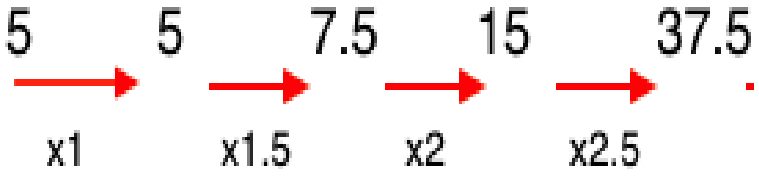
Number & Series (CO.5) (Contd.)

(B) Increasing order of Multiplication Series

In this type of series, elements are multiplied in increasing order to find the next element.

Example : 5, 5, 7.5, 15,__

Solution :

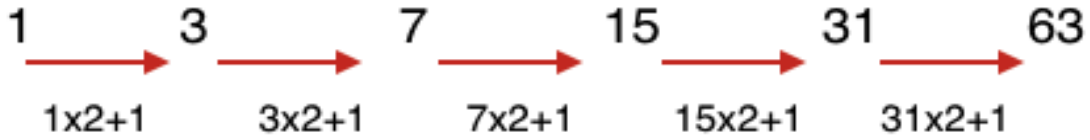


Number & Series (CO.5) (Contd.)

Type 5: Addition & Multiplication together

Example : 1, 3, 7, 15, 31,____.

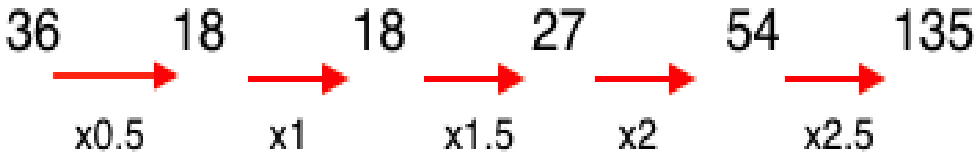
Solution :



Type 6: Decimal Fraction

Example : 36, 18, 18, 27, 54,___.

Solution :



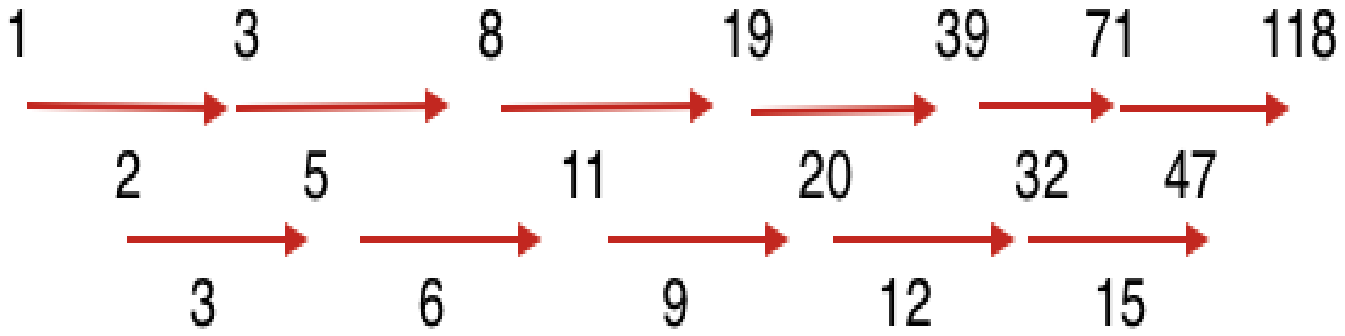
Number & Series (CO.5) (Contd.)

Type 7: Difference of difference series

Calculate the differences between the numbers given in the series provided in the question. Then try to observe the pattern in the new set of numbers that you have obtained after taking out the difference.

Example : *1*, *3*, *8*, *19*, 39, *71*, _____.

Solution :



Number & Series (CO.5) (Contd.)

Type 8: Twin series

In this type of series, odd place element males one series while the even place elements make another series.

Example : 3, 6, 6, 12, 9, 18,_____.

Solution :

Type 9: Tri-series

Example : *2, 9, 23, 3, 8, 25, 4,_____.*

Number & Series (CO.5) (Contd.)

Type 10: Square series & Cube series

Example : 4, 9, 16, 25, 36, 49,_____.

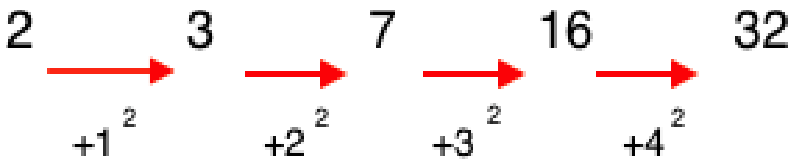
Solution : In the given series, the following pattern is used

$2^2, 3^2, 4^2, 5^2, 6^2, 7^2, 8^2$

Type 11: Square & Cube addition

Example : 2, 3, 7, 16,_____.

Solution : In the given series, the following pattern is used



Multiple Choice Questions (CO.5)

- Finding the Missing terms

Ques. 1: 1, 6, 15,?, 45, 66, 91

(a) 25 (b) 26 (c) 27 (d) 28

Ques. 2: 625, 5, 125, 25, 25, ?,5

(a) 5 (b) 25 (c) 125 (d) 625

Ques. 3 : 225, 196, 169, ?, 121, 100, 81

(a) 156 (b) 144 (c) 136 (d) 123

Ques. 4: 13 : 2197 :: 16 : ?

(a) 256 (b) 2744 (c) 4096 (d) 3378

Ques. 5 : 1015, 508, 255, 129, 66.5, ?, 20.875

(a) 34.50 (b) 35 (c) 35.30 (d) 35.75

Multiple Choice Questions (CO.5)

- Find out the wrong number.

Ques. 6 : 196 169 144 121 101

(a) 101 (b) 121 (c) 169 (d) 196

Ques. 7 : 3 10 27 4 16 64 5 25 125

(a) 3 (b) 4 (c) 10 (d) 27

Ques. 8 : 2 5 10 17 26 37 50 64

(a) 17 (b) 26 (c) 37 (d) 64

Ques. 9 : 16 22 30 45 52 66

(a) 30 (b) 45 (c) 52 (d) 66

Ques. 10 : 125 126 124 127 123 29

(a) 126 (b) 124 (c) 123 (d) 129

Assignment – 4 (CO.5)

Ques. 1 : 1, 2, 9, ?, 16900

(a) 19 (b) 121 (c) 100 (d) 45

Ques. 2 : 2, 4, 16, 512, ?

(a) 2048 (b) 16384 (c) 524288 (d) 131072

Ques. 3 : 6, 9, 7, 10, 8, 11, ?

(a) 14 (b) 8 (c) 9 (d) 11

Ques. 4 : 563, 647, 479, 815, ?

(a) 672 (b) 386 (c) 279 (d) 143

Ques. 5 : 0, 7, 26, 63, 124, ?

(a) 210 (b) 215 (c) 211 (d) 224

Assignment – 4 (CO.5)

Ques. 6 : 72, 9, 82, 10, 88, 16, 86, 14, 99, ?

(a) 102 (b) 22 (c) 18 (d) 16

Ques. 7 : 6, 5, 7, 12.5, 27, ?

(a) 69 (b) 57.5 (c) 67.5 (d) 69.5

Ques. 8 : 2, 11, 58, 295, 1482,?

(a) 6750 (b) 4450 (c) 6459 (d) 7419

Ques. 9 : 7, 12, 20, 37, 81, 206, ?

(a) 324 (b) 306 (c) 280 (d) 574

Ques. 10 : 6, 24, 60, 120, 210, ?

(a) 363 (b) 336 (c) 346 (d) 333

Recap (CO.5)

- **Tips For Number Series**
- **Different type question pattern**

(1) Fibonacci Series

(2) Addition series

(3) Subtraction series

(4) Multiplication Series

(5) Addition & Multiplication together

(6) Decimal Fraction

(7) Difference of difference series

(8) Twin series

(9) Tri-series

Coding & Decoding (CO.5)

- Coding means to hide the meaning of any message and decoding means to understand the actual meaning of that message.
- Coding-decoding is one of the most important topic in reasoning section of any competitive exams. We can expect 5-6 questions from this section.

Types of Coding-Decoding:

- Letter Coding
- Number Coding
- Symbol Coding
- Deciphering Message Word Coding/Numerical Coding
- Substitution Coding

Topic objective of Coding & Decoding(CO. 5)

Coding is a process used to encrypt a word, a number in a particular code or pattern based on some set of rules. **Decoding** is a process to decrypt the pattern into its original form from the given codes. ... Number **Coding** In this type of questions, a word is replaced by certain numbers according to some specific rule.

Coding & Decoding (CO.5) (Contd.)

- **Type 1: Letter Coding**
- **Order List of Alphabets:**

Position of Alphabets from Left to Right (Forward Order) -

A	B	C	D	E	F	G	H	I	J	K	L	M
1	2	3	4	5	6	7	8	9	10	11	12	13
N	O	P	Q	R	S	T	U	V	W	X	Y	Z
14	15	16	17	18	19	20	21	22	23	24	25	26

Table - 1

Position of Alphabets from Right to Left (Backward Order) -

Z	Y	X	W	V	U	T	S	R	Q	P	O	N
1	2	3	4	5	6	7	8	9	10	11	12	13
M	L	K	J	I	H	G	F	E	D	C	B	A
14	15	16	17	18	19	20	21	22	23	24	25	26

Table - 2

Opposite Alphabets -

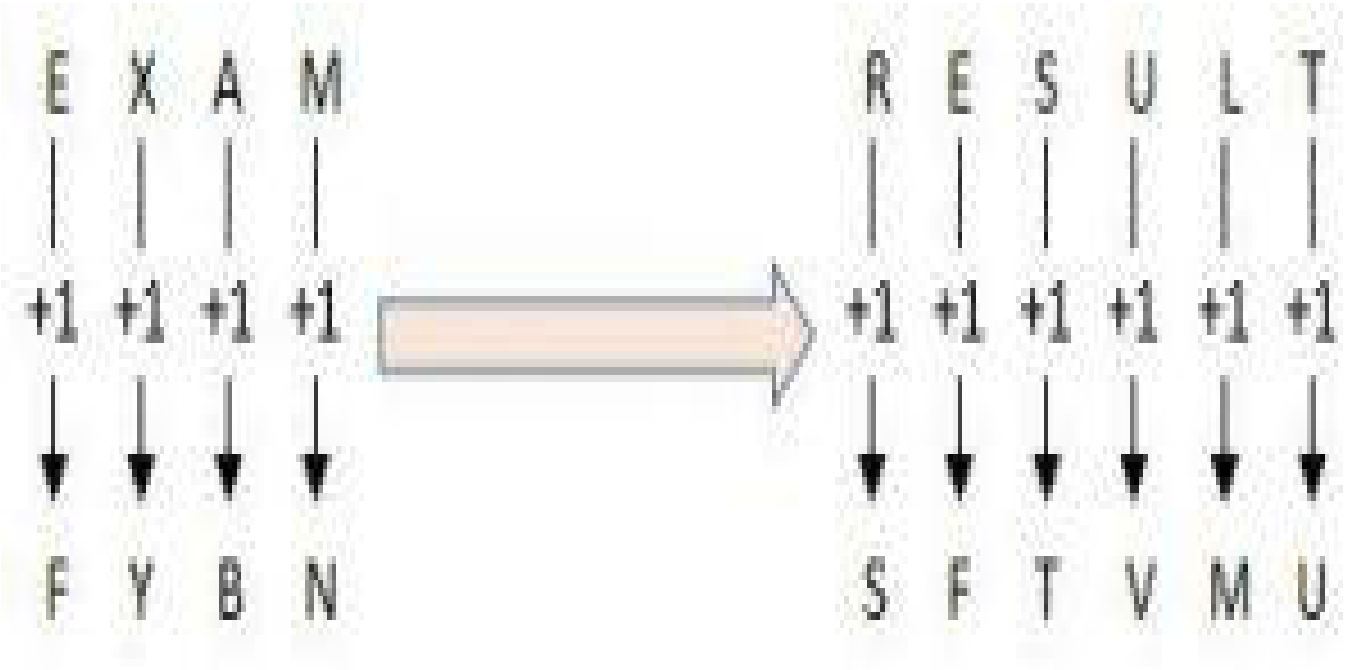
A	B	C	D	E	F	G	H	I	J	K	L	M
Z	Y	X	W	V	U	T	S	R	Q	P	O	N

Table -3

Coding & Decoding (CO.5) (Contd.)

Example : If "EXAM" is coded as "FYBN", how is "RESULT" coded in the same language?

Solution :



Coding & Decoding (CO.5)(Contd.)

- **Type 2: Number Coding**

  Number Coding are based on numbers or numerical digits, given on some special pattern which look likes some code. In this first you have to look the both letter code and notice the numeric digit coded to that alphabet, and answer the common pattern available in the option.

  Example: If “ADDA” is coded as “5885”, “PEN” is coded as "147", how is “EDEN” coded in the same language?

  Solution :

A	D	D	A		P	E	N		E	D	E	N
5	8	8	5		1	4	7		4	8	4	7

Coding & Decoding(CO.5) (Contd.)

- **Type 3: SYMBOL CODING:**

  Symbol Coding are based on Symbols. In this type of coding either alphabetical code are assigned to symbols or symbols are assigned to alphabets.

  Example: If "LESD" is written as " @ $ & # " , "NAC" is written as " % ? * ", how "CANDLES" is coded in the same way?

  Solution :

Coding & Decoding (CO.5)(Contd.)

- **Type 4: Deciphering Message Word Coding/Numerical Coding**
- **Example** : In a certain language, "put tir fin" means "delicious juicy fruit"; "tie dip sig" means "beautiful white lily"; and "sig lon fin" means "lily and fruit". What is the code for "and"?
- **Solution :** "lon" is common code for word 'and' .

Coding & Decoding (CO.5) (Contd.)

- **Type 5: Substitution Coding**

  In this type of coding, some particular words are assigned with certain substitution and on the basis of substitution word the code is derived.

Example : If 'white' is called 'blue', 'blue' is called 'red', 'red' is called 'yellow', 'yellow' is called 'green', 'green' is called 'black', 'black' is called 'violet' and 'violet' is called 'orange', then what would be the colour of human blood?

Solution : the colour of human blood is 'red' but here 'red' is called 'yellow'. So, the colour of human blood will be 'yellow'.

Multiple Choice Questions (CO.5)

- **Directions (1-5):** Read the following information carefully and answer the questions given below. All the codes given below are only in two letters format.

  "Banks are digital today" is written as "Zi Li Ki Ti", "Money transfer through banks" is written as "Di Ki Si Fi", "Digital money easy today" is written as "Si Zi Ti Bi" and "Today we have leave" is written as "Gi Xi Vi Zi".

  (1) What is the possible code for "Easy for transfer"?

  (a) Fi Bi Zi (b) Di Ji Bi

  (c) Bi Ti Ui (d) Fi Li Xi

Multiple Choice Questions (CO.5)

(2) If "Banks have money" is coded as "Gi Si Ki", then what will be the code for "Leave"?

(a) Di (b) Li (c) Zi (d) Vi

(3) What is the code for "Transfer"?

(a) Di (b) Ti

(c) Fi (d) Cannot be determined

(4) What is the word for the code "Si" in the given code language?

(a) Today (b) Banks (c) Money (d) Digital

(5) If "Money market easy" is written as "Bi Si Ci", then what will be the code for "Market"?

(a) Bi (b) Si (c) Ci (d) Either Si or Ci

Multiple Choice Questions (CO.5)

Question 6 : In a certain code, TEACHER is written as VGCEJGT. How is CHILDREN written in that code ?

(a)EJKNEGTP (b)EGKNFITP

(c)EJKNFGTO (d)EJKNFTGP

Question 7: If MACHINE is coded as 19-7-9-14-15-20-11, how will code DANGER?

(a) 11-7-20-16-11-24 (b)13-7-20-9-11-25

(c)10-7-20-13-11-24 (d)13-7-20-10-11-25

Multiple Choice Question (CO.5)

Question 8: In certain code language, '617' means 'sweet and hot', '735' means 'coffee is sweet' and '263' means 'tea is hot'. Which of the following mean 'coffee is hot' ?

(a)731 (b)536 (c)753 (d)None of these

Question 9: If 'grass is green' is coded as '$#@', 'grass in pink' is coded as '%@&' and ' green colour park' is coded as '$&*' , then what is the code for 'colour is green' ?

(a) $*& (b) &$# (c) $*# (d) @$*

Question 10: If blue is coded as green, green is coded as white and white is code as black, and then what will be the code for the colour of grass?

(a) White (b) Green (c) Black (d) none of these

Assignment – 5 (CO.5)

Ques. 1 : If in a certain code "RANGE" is coded as 12345 and "RANDOM" is coded as 123678. Then the code for the word "MANGO" would be?

(a) 82357 (b) 84629 (c) 82347 (d) 83274

Ques. 2 : If "PROMPT" is coded as QSPLOS, then "PLAYER" should be?

(a) QMBZFS (b) QMBXDQ (c) QUREXM (d) URESTI

Ques. 3 : In a certain code language, 'no more food' is written as 'ta ka da' and 'more than that' is written as 'sa pa ka'. How is 'that' written in that code language?

(a) Sa (b) ka (c) sa or pa (d) data inadequate

Ques. 4 : In a certain code GUEST is written as 53@$2 and MEAN is written as 6@4#. How is SAME written in that code?

(a) 4$6@ (b) $46@ (c) $36@ (d) 5$6@

Assignment – 5 (CO.5)

Ques. 5 :In certain code, RELATION is written as ZKDQMNHS and NOSE is written as NMDR. How will MISTER be written in that code?

(a) NHRQFS (b) QHLMDQ (c) RHLMDQ (d) RHLQDS

Ques. 6 : In certain code language, CHANAKYA is coded as ZBPZMZSX. How will KAUTILYA be coded in the same code language?

(a) ZBMNFGZP (b) ZBORGFZP (c) ZBOMFGZP (d) ZBONGFZP

Ques. 7 :In a certain code language, 732 means 'intelligent trained faculty' 285 means 'highly intelligent student', 816 means 'student and teacher'. Which numerical symbol in that code language stands for 'highly'?

(a) 5 (b) 8 (c) 7 (d) 2

Ques. 8 :In certain code language SERIES is coded as 5625 and PIPE is coded as 2116. How will WAP be coded in the same code language?

(a) 1331 (b) 1600 (c) 1728 (d) 4096

Recap (CO.5)

Types of Coding-Decoding:

- Letter Coding
- Number Coding
- Symbol Coding
- Deciphering Message Word Coding/Numerical Coding
- Substitution Coding

Expected Questions for University Exam

Ques. 1: If $x = (\sqrt{126} \times \sqrt{63} \times \sqrt{45}) / (\sqrt{147} \times \sqrt{243})$, then the value of x is

(a) $\sqrt{5}$ (b) $\sqrt{10}$ (c) 10 (d) 5

Ques. 2: A reduction of 20% percent in the price of rice enables a housewife to buy 5 kg more for rupees 1200. Find the reduced price per kg of rice.

Ques. 3: A student has to get 40 percent marks to pass an examination. He got 60 marks but fails by 20 marks. Find the maximum marks of the examination.

Ques. 4 : If the price of a commodity is increased by 30%, by how much % a consumer must reduce his consumption so to keep the expenditure same ?

Ques. 5 : If a sari is sold for ₹ 2880 the seller will face 10% loss, at what price should he sell to gain 20% profit?

Expected Questions for University Exam

Ques. 6 : A shopkeeper marks his goods 20% above his cost price and gives 15% discount on the marked price. Find his gain%.

Ques. 7 : The average weight of 10 person in a boat is increased by 1.8 kg when one of the crew, who weight 53 kg is replaced by new man. Find the weight of the new man.

Ques. 8 : The mean of three numbers is 21. The range of this data set is 12 and the difference between the two smallest numbers is 3. Find the greatest of the three numbers.

Ques. 9: 13 : 2197 :: 16 : ?

(a) 256 (b) 2744 (c) 4096 (d) 3378

Ques. 10 : 1015, 508, 255, 129, 66.5, ?, 20.875

(a) 34.50 (b) 35 (c) 35.30 (d) 35.75

Expected Questions for University Exam

Ques. 11 : Find out the wrong number of :

125 126 124 127 123 129

Ques. 12: If "Money market easy" is written as "Bi Si Ci", then what will be the code for "Market"?

Ques. 13: If MACHINE is coded as 19-7-9-14-15-20-11, how will code DANGER?

Ques. 14: If 'grass is green' is coded as '$#@', 'grass in pink' is coded as '%@&' and ' green colour park' is coded as '$&*' , then what is the code for 'colour is green' ?

Ques. 15 : A Shopkeeper buys two bicycles for Rs. 750. He sells first bicycle at a profit of 22% and the second bicycle at a loss of 8%. What is the SP of first bicycle if in the whole transaction there is no profit no loss?

Summary (CO.5)

We discussed the following points with students:

- Course Objective
- COs and POs of subject
- Mapping of COs and Pos
- Prerequisite and Recap
- Simplification
- Percentage
- Profit, Loss & discount
- Average
- Number & Series
- Coding & decoding
- MCQs

Reference

- Website - https://www.GovernmentAdda.com
- Books references – R.S. Agrawal

Thank You