9. **Arithmetic mean of $x_1, x_2, x_3 \ldots\ldots\ldots x_n$ is $\bar{x}$ then Arithmetic mean of $2x_1 + 3, 2x_2 + 3, \ldots\ldots\ldots 2x_n + 3$ is ________**

1) $2\bar{x}$ 2) $2\bar{x} + 3$ 3) $3\bar{x} + 3$ 4) $2\bar{x} - 3$

10. **Who first said that something divide by zero can not be defined.**

1) Archemedes 2) Bhaskaracharya

3) Varahamihara 4) Apastambha

11. **From a well shuffled pack of playing cards one card is drawn at random. The probability that it is neither a spade nor an ace is**

1) $\frac{36}{51}$ 2) $\frac{19}{132}$ 3) $\frac{9}{13}$ 4) $\frac{7}{52}$

12. **From first 200 naturals one number is selected at random. The chance that it is divisible by 3 or 5 is _____**

1) $\frac{93}{200}$ 2) $\frac{77}{200}$ 3) $\frac{67}{200}$ 4) $\frac{37}{100}$

13. **A Survey shows that 63% people in a city read newspaper A whereas 76% read newspaper B.**
If x% of people read both newspapers, then a possible value of x can be

1) 65 2) 55 3) 37 4) 29

14. **The modern study of set theory was initiated by**

1) Sakuntala Devi 2) George Cantor

3) Rene Descartes 4) Euclid

15. **$2^{\log_4 x} + 3^{\log_9 y} = 13$ and $2x - 3y = 114$ then $5x - 3y =$ ________**

1) 357 2) 161 3) 218 4) 178

గణిత చంద్రిక

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విషయ సూచిక

సంపాదకీయం

పాఠక మహాశయులకు నమస్కారం. సుప్రసిద్ధ గణిత శాస్త్రవేత్త మరియు మన ఏ.ఐ.ఎం.ఈడి జీవిత సభ్యులు శ్రీ ఆర్ సి గుప్తా మహాశయులకు పద్మశ్రీ పురస్కారం 2023 సంవత్సరానికి గాను లభించినందుకు ఎంతో సంతోషంగా ఉంది. ఈ సందర్భంగా ఈ సంచికను వారి ముఖచిత్రంతో విడుదల చేయడం జరుగుతోంది. వారి జీవిత విశేషాలు కొన్నింటిని ఈ సంచికలో ముద్రిస్తున్నాము. గణిత ప్రియులందరికి ఈ సంచిక బాగా నచ్చుతుందని ఆశిస్తున్నాము. పద్మశ్రీ ఆర్.సి. గుప్తా గారికి ఆ భగవంతుడు ఆయురారోగ్య ఐశ్వర్యాలను ప్రసాదించాలని కలకాలం వారు మన ఏ.ఐ.ఎం.ఈడి కి వారి అమూల్య సలహాలను సహకారాన్ని అందిస్తారని ఆశిస్తున్నాము. ఈ సంచిక కూడా ఆన్లైన్ పద్ధతిలోనే అందిస్తున్నాము. పాఠకులు గమనించ ప్రార్థన.

Dr. B.B. రామశర్మ
ప్రధాన సంపాదకులు

CLASS - X

1. **$(x-\alpha)(x-\beta)(x-\gamma) = ax^3 + bx^2 + cx + d$ then $(1-\alpha^2)(1-\beta^2)(1-\gamma^2)=$**

1) $(a+b)^2 - (c+d)^2$ 2) $(b+d)^2 - (a+c)^2$
3) $a^2+b^2+c^2+d^2$ 4) $(a+c)^2 - (b+d)^2$

2. **Natural numbers are divided into groups $\{1\}\{2,3\}\{4,5,6\}\{7,8,9,10\}$ .... The first number in 100^{th} group is_____**

1)5051 2)5050 3)4951 4)6280

3. **Degree of $(1+x)(1+2x^2)(1+3x^3)\ldots(1+99x^{99})$ is ___**

1) 4531 2)6150 3)99 4) None of these

4. **If $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{4^2}+\ldots\ldots\infty = x$ then $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\frac{1}{7^2}+\ldots\ldots\infty =$ _______**

1) $\frac{x}{2}$ 2) $\frac{3x}{4}$ 3) $\frac{3x}{8}$ 4) $\frac{2x}{3}$

5. **Sum of all exterior angles of a regular hexagon is**

1) 360° 2) 1080° 3) 720° 4) 180°

6. **$\sqrt{x^2+\sqrt{x^2+\sqrt{x^2+\ldots\ldots\infty}}} = 4$ then x = ________**

1) $2\sqrt{3}$ 2)6 3) $3\sqrt{2}$ 4)2

7. **If x + y + z = 12 and x,y,z > 0 then maximum value of $\sqrt[3]{x^2y^2z^2}+3$ is ....**

1)12 2)19 3)11 4)9

8. **$(a+b+c)^2 + (a-b+c)^2 + (a-b-c)^2 + (a+b-c)^2 = K(a^2+b^2+c^2)+L(ab+bc+ca)$ Then KL+K+L+3 =_____**

1)4 2)7 3)11 4)17

9. $\left[\left(2^{0.5}+3^{0.5}\right)^2-5\right]^2 =$ ________

1)24   2)18.5   3) $\sqrt{6}$ 4) $2\sqrt{6}$

10. $[1+x+x^2+........+x^{n-1}][x-1]+1 =$ ________

1)x^n 2)x^n-2 3) $\dfrac{x^n}{x-1}$ 4) $x^{n-1}-1$

11. *If* $x^2+y^2 = 1$ *then* $(3x-4x^3)^2+(4y^3-3y)^2 =$ ________

1)0   2)1   3)12   4)-1

12. Reflection of (3, 4) in y-axis is

1)(-3, 4)   2)(4, 3)   3)(-4, -3)   4)(0, 4)

13. Number of straight lines that can be made pass through (1, 1), (2, 8)is

1)1   2)2   3)4   4) Infinite

14. Number of circles that can pass through (0, 0), (4, 0) is

1)One   2)Two   3)Zero   4) infinite

15. P is an interior point of rectangle ABCD whose length is 8 and breadth is 6.

Then $\dfrac{PA^2+PC^2-PD^2}{PB^2} =$ ________

1)2   2)1   3)3   4)8

ముఖచిత్ర పరిచయం

Eminent Mathematician "PadmaShri"

Prof. R.C. GUPTA

P.S.N. Sastry
Ex- President A.I.M.Ed

Padma Shri Prof. R.C.Gupta

My first meeting with Prof. R. C. Gupta was in 2001 during the AMTI Conference in Ernakulam, Kerala. Since then he continued to be life member of our A.I.M.Ed. I was very much impressed with Prof.Gupta's mathematical genius. I noticed that he was a very simple man.

Prof. Gupta who was a regular follower of A.I.M.Ed programs, once told me this "Mr.Sasrty! Your organization is doing very good work. As my duty, I would like to contribute some amount for the sake of a program related to History of Maths" and gave total 60 thousand rupees to our organization in two installments. I raised some more amount from donors and made a total of one lakh rupees. With the interest earned on that amount, every year we started arranging "Prof R. C. Gupta Endowment Lecture" and got appreciation from maths lovers all over India.

I am very happy that I have made his wish come true. I am very happy to note that Central Government conferred the title of "Padma Shri" to Prof.R.C.Gupta, for his valuable services in Mathematics. I wish that almighty blesses him with good health and long life. His suggestions are always solicited for our A.I.M.Ed.

CLASS - IX

1. Two concentric circles have radii 6,8 units. Then Area of ring shape formed is ______ Sq.units nearly

1)88 2)64 3)72 4)100

2. $\frac{1}{4+2\sqrt{3}}+\frac{1}{4-2\sqrt{3}}=x$ **then** $x^9-2^9=$ ______

1)1 2)0 3) $7\sqrt{3}$ 4) $\sqrt{3}$

3. A square has diagonal $\sqrt{8a^2}$ then its perimeter exceeds side by ________

1) $6a\sqrt{2}$ 2)2a 3)6a 4) $a\sqrt{2}$

4. Number of positive integer divisors of 200 is _____

1)12 2)10 3)6 4)18

5. $1-2+3-4+5-6+\dots\dots\dots-2020=$ ________

1) Positive odd integer 2)Positive even integer

3) Negative even integer 4)Negative odd integer

6. Number of positive integer solutions of $x^{x+1}=8$ is ______

1) 3 2)2 3)4 4)None of these

7. $x\sqrt{3}+y\sqrt{2}=\sqrt{18}+\sqrt{12}$ **then** $x^2+y^2-xy=$ ______ **where** $x, y\in N$

1)7 2)10 3)4 4)0

8. $\frac{1+x^3}{1+x}+\frac{1+y^3}{1+y}+\frac{1-x^3}{1-x}+\frac{1-y^3}{1-y}=$

1) x^2+y^2-1 2) $2(x^2+y^2+2)$

3) $2x^2+2y^2-3$ 4) x^2+y^2-2

9. **Which of the following is not a rational number**

1) 1 2) $1.\overline{3}$ 3) $\sqrt{9}$ 4) $\sqrt{5}$

10. **Rama said "Multiplying my number by 5 and adding 8 to it gives the same answer as subtracting my number from 20". My number is**

1) 1 2) 2 3) 3 4) 4

11. **Exterior angle of an equilateral triangle is**

1) 60 2) 100 3) 120 4) 80

12. **A quadrilateral with exactly two pairs of equal consecutive sides is called**

1) Parallelogram 2) Trapezium
3) Rectangle 4) Kite

13. **How many measurements are sufficient to draw a unique quadrilateral.**

1) 4 2) 5 3) 3 4) 6

14. **Number of diagonals in a regular n-sided polygon is________**

1) $\frac{n(n+1)}{2}$ 2) $\frac{n(n+3)}{2}$ 3) $\frac{n(n-3)}{2}$ 4) none

15. **Two numbers are said to be in the ratio 3 : 5. If 9 be subtracted from each, they are in the ratio of 12 : 23. The numbers are**

1) 21,35 2) 33,55 3) 27,45 4) none

KAPREKAR CONSTANT

– B. Venkata Vaibhav
M.Tech. IITDM Kancheepuram

6174 is the Kaprekar Constant. This number is special as we always get this number when following steps are followed for any four digit number such that all digits of number are not same, i.e., for all four digit numbers excluding (0000, 1111, ...)

- Sort four digits in ascending order and store result in a number "asc".
- Sort four digits in descending order and store result in a number "desc".
- Subtract number larger number from smaller number, i.e., abs(asc – desc).
- Repeat above three steps until the result of subtraction doesn't become equal to the previous number.
- We always end up with 6174.

ILLUSTRATION :

n = 2324

1) asc = 2234
2) desc = 4322
3) Difference = 2088
4) Repeating above steps as difference is not sameas n

n = 2088

1) asc = 0288
2) desc = 8820
3) Difference = 8532
4) Repeating above steps as difference is not same as n.

n = 8532

1) asc = 2358
2) desc = 8532
3) Difference = 6174
4) Repeating above steps as difference is not same as n.

n = 6174

1) asc = 1467
2) desc = 7641
3) Difference = 6174
4) Stopping here as difference is same as n.

CLASS - VIII

1. Which of the following is a difference between the upperclass limit and lower class limit of the class interval

1) data 2) size 3) raw data 4) none

2. Which of the following shows the height of the bar in the histogram

1) upperlimit 2) lowerlimit 3) frequency 4) none

3. In a histogram the width of bars are

1) equal 2) unequal 3) can't say 4) none

4. A circle graph shows the relationship between a whole and its ________.

1) angles 2) sectors 3) parts 4) none

5. $1^3 + 2^3 + 3^3 + ... + 9^3 =$

1) 43^2 2) 44^2 3) 45^2 4) 46^2

6. If a = digit at the hundreds place
b = digit at the tens place
c = digit at the one's place,
then which of the following is always divisible by 7 ?

1) 2a+3b+c 2) 3a+2b+c 3) 2a-3b+c 4) 3a-2b+c

7. Divide the sum of $\frac{-13}{5}$ **and** $\frac{12}{7}$ **by the product of** $\frac{-13}{7}$ **and** $\frac{-1}{2}$**, result is _____**

1) $\frac{-62}{65}$ 2) $\frac{-65}{62}$ 3) $\frac{62}{65}$ 4) $\frac{+65}{62}$

8. If 2791A is divisible by 9, then the missing digit in place of A is ______

1) 8 2) 7 3) 6 4) 5

7. A square of side 10cm is cut into two equal rectangles. Perimeter of the square is P. Perimeter of the rectangle is Q. then which is of the following is true

1) 2Q - P = 20 2) Q - P = 10
3) P - 2Q = 10 4) 2Q - P = 10

8. A three digit number 4a3 is added to another three digit number 984 to get four digit number 13b7 which is divisible by 11 then a + b =

1) 15 2) 11 3) 10 4) 12

9. If 1st December is Thursday, next 1st January falls on

1) Saturday 2) Sunday 3) Thursday 4) Tuesday

10. If ∪ represents '-1'; ∩ represents '+1' Then the value of –3 corresponds to the figure

1) ∪ ∩ ∪ ∩∪ ∩ 2) ∪ ∩∩∪ ∩
3) ∩∪∪∩∪∪ 4) ∪∪∩∪∪

11. Who was popularly known as "Father of Statistics"?

1) R.A.Fishar 2) A.R.Mohauty
3) S.Ramanuja 4) Eular

12. I am a decimal number, who is half of one fourth of 100. Who am I ?

1) 12.5 2) 25 3) 12.8 4) 12

13. Raja walks $1\frac{1}{2}$ meters 1 second. How much distance will he walk in 15 minutes ?

1) 130.5m 2) 1350m 3) 13.50m 4) 1305m

14. How many one fourths are needed to be added to to $3\frac{1}{4}$ make 6 ?

1) 8 2) 11 3) 4 4) 6

15. Which of the following is incorrect ?

1) $\frac{1}{2}>\frac{1}{3}>\frac{1}{4}$ 2) $\frac{2}{5}<\frac{4}{5}<1$ 3) $\frac{2}{3}>\frac{3}{4}>\frac{7}{8}$ 4) $\frac{1}{6}<\frac{2}{5}<\frac{3}{4}$

SOME EXAMPLES OF MATHS IN EVERYDAY LIFE - PART - 1

Dr.K. Pushpalatha,
M.Sc., M.Phil, M.Tech (CSE), PhD (Mathematics)

MAKING ROUTINE BUDGETS

How much should I spend today? When I will be able to buy a new car? Should I save more? How will I be able to pay my EMIs? Such thoughts usually come into our minds. The simple answer to such type of question is Maths. We prepare budgets based on simple calculations with the help of simple mathematical concepts. So, we can't say, I am not going to study Maths ever! Everything which is going around us is somehow related to Maths only.

Application:

- Basic mathematical operations (addition, subtraction, multiplication, and division)
- Calculation of percentage
- Arithmetic calculations

CONSTRUCTION PURPOSE

Maths is the basis of any construction work. A lot of calculations, preparations of budgets, setting targets, estimating the cost, etc., are all done based on Maths. If you don't believe it, ask any contractor or construction worker, and they will explain as to how important Maths is for carrying out all the construction work.

Application:

- Preparing budgets
- Taking measurements
- Estimating the cost and profit
- Arithmetic calculations

EXERCISING & TRAINING

I should reduce some body fat! Will I be able to achieve my dream body ever? How? When? Will I be able to gain muscles? Here, the simple concept that is followed is Maths. Yes! based on simple mathematical concepts, we can answer to above-mentioned questions. We set our routine according to our workout schedule, count the number of repetitions while exercising, etc., just based on Maths.

Application:

- Basic Mathematical Operations (additions, subtraction, multiplication, and division)
- Logical and Analogical Reasoning

INTERIOR DESIGNING

Interior designing seems to be a fun and interesting career but, do you know the exact reality? A lot of mathematical concepts, calculations, budgets, estimations, targets, etc., are to be followed to excel in this field. Interior designers plan the interiors based on area and volume

13. If the number 2345 a 60 b is exactly divisible by 3 and 5, then the maximum value a+b is

1) 12 2) 13 3) 14 4) 15

14. The number of factors of 1080 is

1) 32 2) 28 3) 24 4) 36

15. The HCF of first 100 natural numbers is

1) 2 2) 100 3) 1 4) none

CLASS - VII

1. Sum of three consecutive integers is 24. Among these three the highest integer is

1) 10 2) 7 3) 8 4) 9

2. If $\angle A=(2x-17)^{o}$, $\angle B=(3x-53)^{o}$, and $\angle C=(5x-50)^{o}$ If $\angle A$, $\angle B$, $\angle C$ forms a complete angle then the difference between largest and smallest angles is

1) 111° 2) 91° 3) 190° 4)79°

3. If a number is tripled and then decreased by 18 the result is 54, Then the value of 4 times that number increased by 30 is

1) 122 2) 124 3) 126 4) 128

4. What decimal of an hour is a second :

1) 0.016 2) 0.0025 3) 0.00027 4) 0.00036

5. In an entrance examination 60% marks are required to get a seat. Gopi got 232 Marks and lost his seat by 8marks. Maximum marks in the test is ______

1) 300 2) 400 3) 500 4) 600

6. 13 Times a number is added to the number to get 112 then the number is

1) 4 2) 6 3) 9 4) 8

CLASS - VI

1. **Number of even prime numbers is**
   2) 2 2) 0 3) 1 4) unlimited
2. **Which of the following numbers is divisible by 4**
   1) 8675231 2) 9843212 3) 1234567 4) 543123
3. **Which of the following numbers is divisible by 9**
   1) 9076185 2) 92106345 3) 10349576 4) 95103476
4. **The sum of the prime numbers between 60 and 75 is**
   1) 199 2) 201 3) 211 4) 272
5. **If X and Y are co-prime, then their LCM is______**
   1) xy 2) x+y 3) $\frac{x}{y}$ 4) 1
6. **The least number divisible by 15, 20, 24, 32 and 36 is**
   1) 1440 2) 1660 3) 2880 4) None of those
7. **The smallest number which when diminished by 3 is divisible by 21, 28, 36 and 45 is**
   1) 1257 2) 1260 3) 1263 4) None of those
8. **Three numbers are in the ratio 1:2:3 and their HCF is 6, the numbers are**
   1) 4,8,12 2) 5,10,15 3) 6,12,18 4) 10, 20,30
9. **If an integer a is greater than 7, then $|7 - a| =$ _____**
   1) 7-a 2) a-7 3) 7+a 4) -7-a
10. **Which of the following number is prime**
    1) 23 2) 51 3) 38 4) 26
11. **The smallest prime just greater than the HCF of 84 and 144 is**
    1) 11 2) 17 3) 19 4) 13
12. **STOP → RQVU : PRIZE → GBKTR then BRUSH → ___**
    1) CSVTI 2) GRTQA 3) DTWUJ 4) JUWTD

calculations to calculate and estimate the proper layout of any room or building. Such concepts form an important part of Maths.

Application:

- Geometry
- Ratios and Percentages
- Mathematical Operations
- Calculus and Statistics

FASHION DESIGNING

Just like interior design, Maths is also an essential concept of fashion design. From taking measurements, estimating the quantity and quality of clothes, choosing the color theme, and estimating the cost and profit, to producing cloth according to the needs and tastes of the customers, Maths is followed at every stage.

Application:

- Basic Mathematical Operations
- Ratios and Percentages
- Geometry

SHOPPING AT GROCERY STORES AND MARKETING:

The most obvious place where you would see the application of basic mathematical concepts is your neighborhood grocery store and supermarket. The schemes like ‘Flat 50% off, ‘Buy one get one free, etc., are seen in most of the stores. Customers visit the stores, see such schemes, estimate the quantity to be bought, the weight, the price per unit, discount calculations, and finally the total price of the product, and buy it. The calculations are done based on basic mathematical concepts. Thus, here also, Maths forms an important part of our daily routine.

Application:

- Mathematical Operations
- Ratio and Percentage
- Algebra

COOKING & BAKING

In your kitchen also, the Maths is performed. For cooking or baking anything, a series of steps are followed, telling us how much of the quantity is to be used for cooking, the proportion of different ingredients, and methods of cooking, the cookware to be used, and many more. Such are based on different mathematical concepts. Indulging children in the kitchen while cooking anything, is a fun way to explain Maths as well as basic cooking methods.

Application:

- Mathematical Algorithm
- Mathematical Operations
- Ratios and Proportions

8. Ravi purchased a mobile for Rs.9400 and a tab for Rs.12530. Estimae the excess amount he paid to tab than mobile :

1) Rs. 4000 2) Rs.3000 3) Rs.5000 4) Rs.3130

9. Geetha purchased a motor cycle and a scooter for Rs.75,000 and Rs.53,000: and sold them for Rs.63,000 and Rs.65,000. Her profit or loss on this deal ____

1) Profit 2) Loss
3) No profit or loss 4) cannot say

10. Three blanks in the same order : a, aa, aab, aabb, a_bbc, aa_bc_

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

11. Side of a square is 4cm. Possible sides of a rectangle whose perimeter is equal to perimeter of square are :

1) 6 2) 5 3) 4 4) 3

12. a, b and c are three natural numbers. Exactly two of them are odd. The correct statement is

A a + b + c + ab + bc + ca is odd.
B ab + bc + ca is even

1) A True, B False 2) A False, B True
3) Both are True 4) Both are false

13. 111111 x 111111 =

1) 123454321 2)12345654321
3) 1234567891 4) 123456781

14. 9984 ÷ 8 = 1248 then 9984 ÷ 32 =

1) 624 2) 312
3) 156 4) none of these

15. ab is a prime then ba also a prime. Number of such primes below 100....

1) 2 2) 4 3) 3 4) 5

Some Problems from MSET- 2022

CLASS - V

1. **A part of 100 number table is given here. The values in first row third coloumn; second row first coloumn; third row second coloumn in the same order :**

   1) 24, 36,45
   2) 26,34,45
   3) 26, 36,45
   4) 24, 34, 45

	35	

2. **Two natural numbers differ by 41. The bigger number is grater than 30 times the smaller number plus 10. The smaller number is ....**

   1) 11 2) 7 3) 71 4) 1

3. **Define $a \otimes b = 2a + 2b - ab$: if $3 \otimes x = 2 \otimes x$ then $x =$**

   1) 2 2) 1 3) 0 4) Such x does not exits

4. **At present Gopal salary is Rs.25,000. Every year his salary is increased by Rs.1500. His slary in the year 2027 is Rs._____**

   1) 32,750 2) 34,000 3) 31,0000 4) 32,500

5. **Next two numbers in the series 2, 4, 7, 12, 19....**

   1) 27, 43 2) 30, 42 3) 30, 43 4) 27, 45

6. **Some peococks and Rabits are in a zoo. Number of Rabits are twice peacoks. Total number of legs are 80. Then number of Peacocks _______**

   1) 16 2) 8 3) 4 4) 20

7. **Ravi and Gopi are brothers. Ravi's fee is three times his brothers fee. Father gave Rs.1500 to pay their fee. After payment, Ravi returned Rs.300 to his father. Ravi's fee is Rs. _______**

   1) 300 2) 800 3) 900 4) 400

BRIEF ACADEMIC BIOGRAPHY OF "PADMA SHRI" PROF. R.C. GUPTA

(Member, International Commission on History of Mathematics, Padma Shri recipient 2023)

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• EDUCATION, RESEARCH AND REACHING:

Born in 1935 at Jhansi, Gupta graduated from the Lucknow University in 1955. From the same university, he passed the M.Sc. (mathematics) examination in 1957 securing FIRST POSITION in order of merit and the Certificate in French course in 1958. In 1965, he obtained a Diploma (Mech. Engg.) form the School of Careers (London). He was awarded the Ph.D. degree by the Ranchi University in 1971 for a thesis on "Trigonometry in Ancient and Medieval India" (1970; 472 pages), and the Honorary Doctorate in Historical Science by the World University (U.S.A) in 1986. Prof. Gupta's teaching experience (often enriched by historical gleanings) spans four decades from intermediate to post-graduate level, and his post-doctoral research work covers over 400 papers and articles.

• PRIZES, MEDALS AND OTHER HONOURS:

Gupta won the B.I.C Physics Medal (Jhansi) in 1953 and the Lucknow University gymnastic championship for two years, 1954-55 and 1955-56. The University awarded him the Raja Shankar Sahay Gold Medal in 1956 and the Devi Sahay Mishra Gold Medal in 1957. He won the first prize in acrobatics (pommelled horse) in all U.P Competition 1958. In 1991, he was elected FELLOW of the National Academy of Science, India. The Kunda Kunda Academy (Indore) awarded him *the Arhat Vacana* first prize in 1992. He has been elected a member (no.600) of the International Academy of the History of Science, Paris in 1995. In1996, a Distinguished Service Award was presented to him by the Vijnana Parishad of India (Society for Applications of Mathematics). The community panchayat felicitated him during the All India Gahoi Maha Sabha Executive meet (Jhansi, 1997). He was awarded Kund Kund Academy Award 1998. He was awarded of National Fellowship by I.I.A.S., Shimla, 2001, Elected Full Member of Paris Acad., 2002, (membership no.305). Membership Awarded 2009 Kenneth O. May Medal for History of Mathematics (July 2009). Padma Shri Awardee 2023 (Literature & Education).

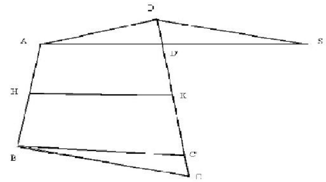


Figure 3

From AD' //HK, BC'// HK and H is the midpoint of AB, we know ABC'D' is a trapezoid, so

$$HK = \frac{1}{2}(AD' + BC'') \qquad (5.1)$$

and D'K = C'K

It is given that

$$HK = \frac{1}{2}(AD + BC) \qquad (5.2)$$

and DK = CK

And DD' = DK – D'K, CC' = CK – C'K. So DD' = CC'

From AD' //HK//BC', <DD'S = <CC'B, so Triangle DD'S is congruent to Triangle CC'B. Hence BC = DS.

From (5.1) and (5.2) we get

$$AD' + BC' = AD + BC$$

By the congruence of BC' = SD' and BC = DS, we have

$$AD' + SD' = AD + DS$$

i.e. $\quad AS = AD + DS.$

This can happen only if A, D, S are on a line, that means AD // HK // BC. So ABCD is a trapezoid.

So the integers $(3^k - 1)$ and $(3^k + 1)$ are both positive powers of 2, and they are 2 apart. So the only possibilities are $3^k - 1 =$ and $3^k + 1 = 4$. Hence $k = 1$. This implies $m = 2$, $n = 3$

The solutions are $m = n = 1$ and $m = 2$, $n = 3$

5. Prove that if a middle lane of a quadrangle is equal to half the sum of its sides, then the quadrangle is a trapezoid, i.e. given a quadrangle ABCD and the middle of AB is H, the middle of CD is K. Then if HK is 1/2 of BC + AD, then ABCD is a trapezoid, i.e. BC is parallel to AD.

Definition : A trapezoid (Figure 2) is a quadrilateral with two sides parallel. The middle lane is the line segment joining the middle points of two nonparallel sides.

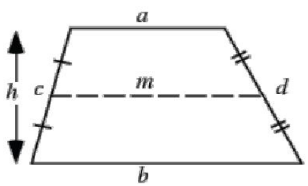


Figure 2

Proof : Assume ABCD is not a trapezoid, i.e. AD, HK and BC are not parallel. Then, we can draw AD' //HK and BC'// HK. Extend AD' such that D'S = BC'. And connect DS.

• PROFESSIONAL APPOINTMENTS

After serving the Lucknow Christian College for a year, Gupta joined the Birla Institute of Technology in 1958, and was successively promoted to the posts of Assistant Professor (1961), Associate Professor (1976) and Professor of Mathematics (1982). In 1979, he was also appointed Professor Incharge of Research Centre for History of Science, B.I.T Ranchi, in which he served upto his retirement in 1995. In recognition to his active work, Dr. Gupta was appointed, in 1972, as the Indian Representative on the International Commission on History of Mathematics which is a joint commission of the International Union for Histroy and Philosophy of Science and the International Mathematical Union. He became a reviewer for the mathematical Reviews (American Math. Society, U.S.A) in 1973. In 1979, he was appointed the Founder-Editor of Ganita Bharati (issn 0970-0307) which is now a reputed international journal in the field of history of mathematical sciences especially with reference to India.

- **MEMBERSHIP OF LEARNED ORGANIZATIONS:** Besides the international Commission on History of Mathematics (Executive Committee, 1977-1989), Dr. Gupta is a Life Member of about 50 leading learned societies and organization including the Asiatic Society (Calcutta). Bharatiya Vidya Bhavan (Mumbai), Astronomical Society of India, National Academy of Sciences, India, Indian Science Congress Association (individual Benefactor/ Donor, since 1983), Indian Mathematical Society, Indian Society for History of Mathematics (Editorial and Publication Secretary since 1981), Assam Academy of Math. Bharata Ganita Parishad, Delhi Association of Math. Teachers, Gujarat Ganit Mandal, and National Academy of Mathematics. He is patron of the Aryabhata Inst. of Math. Sciences (Kannur) and an Endowment Patron of the Association of Mathematics Teachers of India (Chennai). He has been elected Vice-President of the A.I.M.T. Calcutta and President of and A.M.T.I., Chennai, for the years 1994, 1995, 1996, 1997 and 1998, also for 1994-2007. Re-elected unanimously for 2008-10.

(a) First, we observe that m and n are positive integers, since

$2^n > 0,$

$3^m = 2^n + 1 > 1,$

So, $m > 0$.

So m is a positive integer, 3^m is a positive integer. So $2^n = 3^m - 1$ is an integer, then n has to be nonnegative integer. (a negative power of 2 is a proper franction). Moreover $n \neq 0$. (if $n = 0$, $3^m = 2$, which is impossible.)

So, both m and n are positive integers.

(b) Next, we notice that $m = n = 1$ is a solution. Now let's assume $n > 1$. Then

$2^n = 0 (\text{mod } 4)$

From (4.1), we have

$3^m = 2^n + 1 = 1 \ (\text{mod } 4)$

So, $m = 2k$, where k is a positive integer.

Now, we have $2^n = 3^{2k} - 1$

Factoring it, we get

$2^n = (3^k + 1)(3^k - 1)$

From (3.6) it follows that y is even and $y = 2k$ for some integer k. Substituting this into (3.6) we get $0 = 8k^3 + 2z^3$ and $0 = 4k^3 + z^3$.

The latter equation can be written as $z^3 = 2 \,.\, 0^3 + 4(k)^3$ which is of the same type as (3.1) and

$|z| + |-k| + |0| < |x| + |y| + |z|$, unless $x = 0$ and $y = 0$

This again contradicts the minimality assumption unless $x = 0$, and $y = 0$. The latter two equalities and (3.1) imply $z = 0$. Therefore, the only solution is $x = 0$, $y = 0$, $z = 0$.

4. Solve the following equation in integers :

$$3^m - 2^n = 1$$

Definition : Modular Arithmetic means recycling of integers when they reach a fixed value, e.g., a 12 hour clock or integers a, b, n, we write a = b (mond n), read "a is congruent to b modulo n", if a – b is a multiple of n, e.g., 38 = 14(mod 12) because 38 – 14 = 24 = 2*12.

Solution. For this question, we can solve it by finding all solutions and providing there are no others.

$3^m - 2^n = 1$(4.1)

• FOREIGN VISITS:

In 1977, Prof. Gupta visited U.K. to address the British Society for History of Mathematics at Cambridge, and to present an invited paper in the XVth International Congress of History of Science held at the University of Edinburgh. During this ICHS, he presided over a session of Scientific Section II. The visit to Germany in January, 1980 was to give talks at the International Colloquium on History of Mathematics (Oberwolfach) and Deutsches Museum (Munich) In the same year, he visted U.S.A. and Canada where he was a visting Scientist in the University of Calgary, and presented a paper at the Montreal meeting of the Canadian Society for the History and Philosophy of Mathematics (June, 1980). In 1985, he again visited U.S.A to give invited talks during the XVIIth I.C.H.S at Berkeley, and to participate in several international meetings related to history of mathematics.

• CONFERENCES AND LECTURES IN INDIA:

During the last 30 years. Dr. Gupta has attended scores of learned conferences in India and abroad. He has presented research papers and delivered lectures in many national and international gatherings. These include the international Sanskrit Conference, New Delhi, 1972; Aryabhata Jayanti, Bihar Research Society, Patna, 1972; Copernicus Celebrations, New Delhi, 1973, Jainological Conference, Delhi, 1974; International Seminar on Aryabhata, Indian National Science Academy, New Delhi, 1976; Fourth Annual Conference of the Indian Society for History of Mathematics, Delhi, 1980; Discovery of India Series, Nehru Centre, Bombay, 1984; Symposium on Relevance of History of Mathematics, Allahabad, 1985; International Seminar on Jaina Mathematics, Hastinapur, 1985; National Seminar on Scientific Hertage of India , Bangalore, 1986; I.A.U. Colloquium on History of Oriental Astronomy, New Delhi, 1987; etc. Prof. Gupta presided over an academic session during the Symposium on History of Mathematics and Astronomy (Lucknow, 1989 and also in 1997). He gave a talk at the Indian Inst. of Science, Bangalore on 1990, and delivered four lectures at the Ramanujan Inst. Chennai, 1991. He spoke on Vedic Math at the B.M.S Conference Ranchi 1994, and delivered the key-paper during the Seminar on Concept of Zero, New Delhi, 1997. Recently he delivered 3rd Hasi Majumdar Memorial Lecture, University of Calcutta, March 2007.

It is easy to find (0,0,0) is a solution. And we will prove there is no other solution in integers.

Assume that $|x| + |y| + |z|$ is the smallest positive integer for which an equation (3.1) is true. It is obvious that x is even, therefore $x = 2t$ for some integer t. This implies that

$$8t^3 = 2y^3 + 4z^3 \qquad (3.4)$$

Dividing (3.4) by 2, we get

$$4t^3 = y^3 + 4z^3$$

$$y^3 = 4t^3 - 2z^3$$

$$y^3 = 2(-z)^3 + 4t^3 \qquad (3.5)$$

Which is the same types as (3.1). Hence $(y, -z, t)$ is also a solution of the original equation (3.1). And it is clear that

$$|y| + |-z| + |t| < |x| + |y| + |z|, \text{ if } x \neq 0.$$

This leads to a contradiction with the assumption of the minimality of $|x| + |y| + |z|$ unless $x = 0$.

Therefore, $x = 0$. And it follows that $0 = 2y^3 + 4z^3$ which implies that

$$0 = y^3 + 2z^3. \qquad (3.6)$$

(b) It is obvious that (0,1) and (1,0) are two sets of solutions. Now we can consider the solutions in the remaining range when $-1 < x < 0$ and $0 < x <> 1$.

(c) When $-1 < x < 0$, $x^3 < 0$, so $y^3 = 1 - x^3 > 1$ by (2.1), that means $y > 1$ which contradicts (a). So $0 < x < 1$.

(d) When $0 < x < 1$, $0 < x^3 < 1$, so $0 < y^3 < 1$ by (2.1), that means $0 < y < 1$.

Now we know $0 < x < 1$ and $0 < y < 1$.

So, $x^3 > x^4$ and $y^3 > y^4$

Hence, $x^3 + y^3 > x^4 > y^4$. Then it is impossible to have bothe $x^3 + y^3$ and $x^4 + y^4$ equal to 1.

So, (0,1) and (1,0) are the only solutions in real numbers.

3. Solve the following equation in integers :

$$x^3 = 2y^3 + 4z^3$$

Solution. The **integers** are formed by the natural numbers including 0 (0, 1, 2, 3, ...) together with the negatives of the non-zero natural numbers (–1, –2, –3, ...). Solving an equation of x, y and z in integer means we need to find all the integer triples (x,y,z)'s satisfying the following equation (3.1)

$$x^3 = 2y^3 + 4z^3 \qquad (3.1)$$

• PUBLICATIONS:

The prestigious journal Ganita-Bharati, edited by Dr. Gupta, has been regularly published since 1979. As part of this activity, he edited the Proceedings of the Fourth Conference of the I.S.H.M. (Delhi, 1982) and the Datta-Vogel Centenary Volume (Delhi, 1988). Gupta's Historical and Cultural Glimpses of Ancient Indian Mathematics (in Hindi) and Historical and Cultural Glimpses of Medieval Indian Mathematics (in Hindi) have been recently published by the N.C.E.R.T. (New Delhi, 1997). By now the number of his research papers, articles, notes, reports and reviews, as published in the Indian and Foreign journals has already gone upto 500.

Key to MSET = 2022 Questions

Class	Questions														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
V	2	4	1	4	3	2	3	1	3	1	4	1	2	2	2
VI	3	2	1	4	1	1	3	3	2	1	4	4	2	1	3
VII	4	1	3	3	2	4	1	3	2	1	4	1	2	2	3
VIII	2	3	1	3	3	1	1	1	4	2	3	4	2	3	2
IX	1	2	3	1	3	4	1	2	1	1	2	1	1	4	2
X	4	3	4	2	1	1	2	2	2	2	3	1	2	2	1

SRINIVASA RAMANUJAN

Deevi Hema Hasitha
D/O Sateesh Kumar Deevi
Inter Ist year, Sri Chaithanya College
Vijayawada , AP, India

The world is designed and maintained with some mathematical logical conditions.

We need the deep research in mathematics to understand the nature of work. Since long back huge number of scientists are working to understand the world created formulas. India also having a prestigious role in developing the mathematical background of created nature. Dr Srinivasa Ramanujan is one among them.

Dr. Srinivasa Ramanujan was an Indian mathematician who made significant contributions to mathematical analysis ,number theory,and continued fractions .

that there is such a tetrahedron. Let E b its longest edge. i.e., the length of E is no shorter than that of any other edge. And let E be adjacent to an obtuse angle A in some triangluar face F. We known that in any triangle the largest side is always opposite the largest angle, so the largest side S in F is located opposite the angle A. The side S is longer than E, so we came to a contradiction tht E is not shorter than any other edge. The contradiction prove the theorem.

2. Solve the following system of equations (in real numbers :

$$x^3 + y^3 = 1$$
$$x^4 + y^4 = 1$$

Solution. Solving a sytem of equations of x and y means we need to find all the real pairs (x,y)' s satisfying both the following equation (2.1) and (2.2)

$$x^3 + y^3 = 1 \quad (2.1)$$
$$x^4 + y^4 = 1 \quad (2.2)$$

(a) At first, we observe that $-1 \le x \le 1$ and $1 \le y \le 1$ from (2.2), since both x^4 and y^4 are nonnegative.

$x^4 \ge 0,$

$y^4 = 1 - x^4 \le 1,$

Then, $-1 \le y \le 1$

And similarly, we get $-1 \le x \le 1$.

SOME PROBLEMS FOR THE MATH OLYMPIAD

B. Ritwik,
Class 12, Khammam

1. Is there a tetrahedron such that its every edge is adjacent to some obtuse angle for one of the faces?

Ans. No

Definitions : In geometry, a **tetrahedron** (Figure 1) is a polyhedron composed of four triangular faces, three of which meet at each vertex. Here, a **face** is a polygon bounded by a circuit of edges, an usually including the flat (plane) region inside the boundary. An **edge** of the tetrahedron is the line segments joining two vertices. An **angle** is the figure formed by two rays sharing a common vertex in the same face. And the **obtuse angles** are angles large than a right angle and smaller than a straight angle (between 90° and 180°).

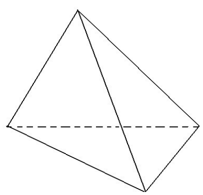


Figure - 1

Proof : We will prove that there is no tetrahedron whose every edge is adjacent to some obtuse angle for one of the faces. Let us assume the contrary, i.e.

He was born on December 22.1887,in eurode, Tamilnadu, India and died on April 26,1920 in kumbakonam, Tamilnadu, India.

Ramanujan's father's name was k.Srinivasa Iyengar and his mother's name was komalatammal . His father worked as a clerk in a cloth merchants shop and his mother was a housewife. Ramanujan's parents were Brahmins, a caste of people traditionally associated with the priesthood and scholarly pursuits.

Ramanujan's formal education was limited. He attended in school in kumbakonam, a town in Tamilnadu, India, but he struggled with the curriculum and eventually dropped out. He continued to study mathematics on his own, however, and began to make significant contributions to the field. Ramanujan's lack of formal education is often cited as evidence of his innate mathematical genius.

Ramanujan made many contributions to mathematics, including his work on infinite series and continued fractions. Some of his most famous contributions include the Ramanujan prime and the Ramanujan theta function. He also discovered many identities and equations in number theory, such as the Ramanujan -Nagell equation.

One of contemporary Indian mathematician Mahalanobis told him about a **mathematical puzzle** The puzzle describes that a friend lives in a street with houses numbered 1 onwards. There are more than 50 houses. What will be the number of the friend's house if the sums of all the houses on the other side will be equal to each other? Ramanujan solved it without using paper while he was making tea.

Even though Mahalanobis had an answer ready, he said that it is not the only answer. He said that there are infinite such sets that define this puzzle and can be the answer. Mahalanobis had the answer of 289 houses ready and the friend's house number was 204. Ramanujan, on the other hand, expressed that there are multiple answers in the following ways.

Number of Houses	House number of a Friend
8	6
49	35
1681	1189
9800	6930

Applications of Quadratics to Equation of motion

Venkat Satwik
12th Class, Khammam

It is well known that there are three equations of motion in Kinematics.

They are namely

$$\nu = u + at \quad .... (1)$$

$$s = ut + \frac{1}{2}at^2 \quad .... (2)$$

$$\nu^2 = u^2 + 2as \quad .... (3)$$

We use quadratic in t from (2) as follows

$$s = ut + \frac{1}{2}at^2$$

$$\Rightarrow \frac{1}{2}at^2 + ut - s = 0$$

Solving for t We get equation (1)

$$t = \frac{v-u}{a}$$

Example:

By using Division Method, find the LCM of 24 & 18

Answer = Steps of finding LCM by Division Method is as :-

2	24	18
2	12	9
2	6	9
3	3	9
3	1	3
	1	1

Step 1: Write the given numbers as shown on the left and divide them with the least prime number i.e 2.

Step 2: On division, write the quotient in each case below the number.

Step 3: If any number is not divisible by its respective divisor, it is to be written as such in the next line.

Step 4: Keep on dividing the quotient until you get 1(as quotient of all) in the last row.

Step 5: Multiply all the divisors to get LCM of given numbers.

Step 6: Hence, LCM = $2 \times 2 \times 2 \times 3 \times 3 = 72$.

The LCM is useful in various mathematical applications, such as fraction operations, simplifying expressions, solving equations, and finding common denominators.

RAMANUJAN'S ANSWER TO STRAND PUZZLE GIVEN BY MAHALANOBIS

He explained that adding numbers before 6 and after 6 will give the same answer. It is all the same for the numbers displayed in the table above. This is a brilliant **maths day puzzle** we solve to commemorate the genius of Ramanujan.

THE HARDY RAMANUJAN NUMBER

An incident happened when Ramanujan was not well. His health was continuously deteriorating. When he was on his deathbed, his mentor Hardy came to see him. He looked disappointed when he explained that the cab he took had a number plate of 1729.

Ramanujan did not take time even on his deathbed to explain that it is not a dull number at all. It is the mathematical expression of the sum of two different cubes. In fact, it is the smallest sum of two different sums of cubes of different numbers.

$1729 = 12^3 + 1^3 = 10^3 + 9^3$

Hardy was taken by surprise. His ill condition did not cloud his genius mind to make such deductions. This is **what Ramanujan number** is called.

Ramanujan was awarded several honors during his lifetime and posthumously. He was elected a fellow of the Royal society of London in 1918 ,becoming one of the youngest fellows in the society's history. In 1924 ,he was awarded the Srinivasa Ramanujan medal by the Indian National Science Academy.

After his death, he was awarded the padma Bhushan , one of the India's highest civilian honors, in 1954. In 2012,he was posthumously awarded the Indian government's highest civilian honor, the Bharat Ratna.

Ramanujan was a self taught mathematician who made significant contributions to the field despite having no formal training in mathematics. His work has had a everlasting impact on the field of mathematics and continues to inspire mathematicians today. Ramanujan was also known for his unique approach to mathematics and his ability to see patterns and connections that others could not.

can be extended to find the LCM of more than two numbers by iteratively applying the formula. For example, to find the LCM of 3, 4, and 5:

LCM(3, 4) = (3 * 4) / GCD(3, 4) = 12 / 1 = 12

LCM(12, 5) = (12 * 5) / GCD(12, 5) = 60 / 1 = 60

Therefore, LCM(3, 4, 5) = 60.

LCM USING DIVISION METHOD:

To find the LCM by division method, we write the given numbers in a row separately by commas, then divide the numbers by a common prime number. We stop dividing after reaching the prime numbers. The product of common and uncommon prime factor is the LCM of given numbers. To find lcm using division method follow the below steps,

Step 1: Write the given numbers in a horizontal line, separating them by commas.

Step 2: Divide them by a suitable prime number, which exactly divides at least two of the given numbers.

Step 3: We put the quotient directly under the numbers in the next row. If the number is not divided exactly, we bring it down in the next row.

Step 4: We continue the process of step 2 and step 3 until all co-prime numbers are left in the last row.

Step 5: We multiply all the prime numbers by which we have divided and the co-prime numbers left in the last row. This product is the least common multiple of the given numbers.

EXAMPLE:

1. **Find the least common multiple (L.C.M) of 9 and 15 by using prime factorization method.**

Solution:

Step I:

Resolving each given number into its prime factors.

$9 = 3 \times 3 = 3^2$.

$15 = 3 \times 5$.

Step II:

The product of all the factors with highest powers.

= 3^2 × 5 = 3 × 3 × 5 = 45.

Step III:

The required least common multiple (L.C.M) of 9 and 15 = 45.

Example:2

For example, to find the LCM of 12 and 18:

Prime factorization of 12: 2^2 * 3^1

Prime factorization of 18: 2^1 * 3^2

The LCM will be the product of the highest powers of each prime factor: LCM(12, 18) = 2^2 * 3^2 = 36.

LCM formula: If you have two numbers, a and b, you can use the formula LCM(a, b) = (a * b) / GCD(a, b), where GCD represents the Greatest Common Divisor. This formula

LCM : UNDERSTANDING THE BASICS

Deevi Krishna Vamsi
Vighanasa Aagama Smartham
6th year Veda Gignana Peettam,
Tirumala

LCM stands for Least Common Multiple. It is a mathematical concept used to find the smallest multiple that two or more numbers have in common. The LCM is often used in various mathematical operations, such as adding or subtracting fractions with different denominators or solving equations involving multiple variables.

HOW TO FIND LCM:

LCM of numbers can be calculated using various methods. Let us see how to find the lowest common multiple (LCM) using the 3 methods given below. Each method is explained below with some examples.

- LCM by Listing Method
- LCM by Prime Factorization Method
- LCM using Division Method

LISTING MULTIPLES:

Start by listing the multiples of each number until you find a common multiple. The smallest common multiple will be the LCM. For example, to find the LCM of 4 and 6:

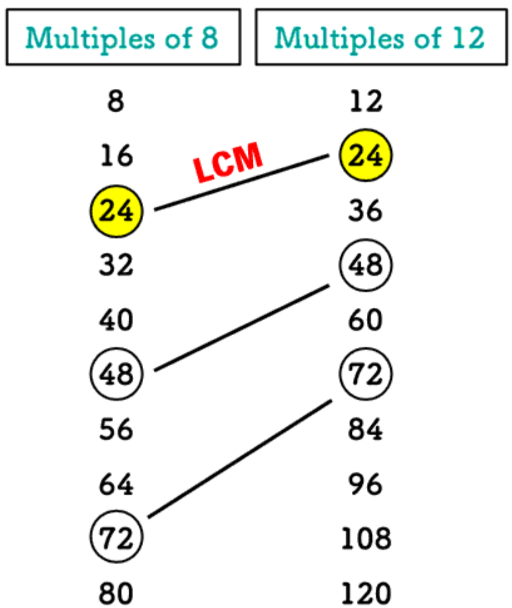
Multiples of 4: 4, 8, 12, 16, 20, ...
Multiples of 6: 6, 12, 18, 24, ...
The common multiple is 12, so LCM(4, 6) = 12.

The assumption here is that the numbers involved are positive whole numbers or positive integers.

For instance, 20 is a multiple of 10 since 20 divided by 10 equals 2 and more importantly, it has NO remainder.

This next concept may sound trivial but it is very important. **A number itself is its own multiple**. It is obvious to see that 5 is a multiple of 5 because 5 divided by 5 is 1 and without a remainder.

For example: Lets find LCM for 8 and 12



Here, circled numbers are common multiples but, yellow coloured circles are least common multiples i.e 24 in this case . so , we can say that LCM of 8 and 12 is 24.

Prime factorization:

To find the LCM of two or more numbers, we first find all the prime factors of the given numbers and write them one below the other. Take one factor from each common group of factors and find their product. Multiply the product with other ungrouped factors. The resultant is the LCM of given numbers.

Step I:

Resolve each given number into its prime factors and express the factors obtained in exponent form.

Step II:

Find the product of the highest powers of all the factors that occur in any of the given numbers.

Step III:

The product obtained in Step II is the required least common multiple (L.C.M).