Real Numbers

Case Study Based Questions

Case Study 1

A shopkeeper has 420 science stream books and 130 arts stream books. He wants to stack them in such a way that each stack has the same number and they take up the least area of the surface.

Based on the above information, solve the following questions:

Q1. A number has no factor other than 1 and number itself is:

a. composite

b. prime

c. do not say anything

d. None of these

Q2. What is the maximum number of books that can be placed in each stack for this purpose?

a. 10

b. 14

c. 12

d. 15

Q3. Which mathematical concept is used to solve the problem?

a. Prime factorisation method

c. Arithmetic progression

d. None of the above

Q4. If the shopkeeper double the quantity, then the maximum number of books that can be placed in each stack:

a. remains same

b. double

c. triple

d. None of these

Q5. Find the LCM of the given book streams:

a. 5450

b. 5460

c. 2730

d. None of these

Case Study 2

A seminar is being conducted by an educational organisation, where the participants will be educators of different subjects. The number of participants in Hindi, English and Mathematics are 60, 84 and 108 respectively.

Based on the above information, solve the following questions:

Q1. The sum of the powers of each prime factor of 108 is:

a. 2

b. 3

C. 4

d. 5

Q2. In each room the same number of participants are to be seated and all of them being in the same subject, hence maximum number of participants that can accommodated in each room are:

a. 14
b. 12
c. 16
d. 18

Q3. What is the minimum number of rooms required during the event?

a. 11
b. 31
c. 41
d. 21

Q4. The LCM of 60, 84 and 108 is:

a. 3780
b. 3680
c. 4780
d. 4680

Q5. The product of HCF and LCM of 60, 84 and 108 is:

a. 55360
b. 35360
c. 45500
d. 45360

Case Study 5

Exponential Laws

Srikanth has made a project on real numbers, where he finely explained the applicability of exponential laws and divisibility conditions on real numbers. He also included some assessment questions at the end of his project as listed below. Answer them.

(i) For what value of n, 4^n ends in 0?

(a) 10 (b) when n is even

(c) when n is odd (d) no value of n

(ii) If a is a positive rational number and n is a positive integer greater than 1, then for what value of n, a^n is a rational number?

(a) when n is any even integer (b) when n is any odd integer

(c) for all $n > 1$ (d) only when $n = 0$

(iii) If x and y are two odd positive integers, then which of the following is true?

(a) $x^2 + y^2$ is even (b) $x^2 + y^2$ is not divisible by 4

(c) $x^2 + y^2$ is odd (d) both (a) and (b)

(iv) The statement 'One of every three consecutive positive integers is divisible by 3' is

(a) always true (b) always false

(c) sometimes true (d) None of these

(v) If n is any odd integer, then $n^2 - 1$ is divisible by

(a) 22 (b) 55 (c) 88 (d) 8

Case Study 6

Daily Life Situations

Real numbers are extremely useful in everyday life. That is probably one of the main reasons we all learn how to count and add and subtract from a very young age. Real numbers help us to count and to measure out quantities of different items in various fields like retail, buying, catering, publishing etc. Every normal person uses real numbers in his daily life. After knowing the importance of real numbers, try and improve your knowledge about them by answering the following questions on real life based situations.

(i) Three people go for a morning walk together from the same place. Their steps measure 80 cm, 85 cm and 90 cm respectively. What is the minimum distance travelled when they meet at first time after starting the walk assuming that their walking speed is same?

(a) 6120 cm (b) 12240 cm (c) 4080 cm (d) None of these

(ii) In a school Independence Day parade, a group of 594 students need to march behind a band of 189 members. The two groups have to march in the same number of columns. What is the maximum number of columns in which they can march?

(a) 9 (b) 6 (c) 27 (d) 29

(iii) Two tankers contain 768 litres and 420 litres of fuel respectively. Find the maximum capacity of the container which can measure the fuel of either tanker exactly.

(a) 4 litres (b) 7 litres (c) 12 litres (d) 18 litres

(iv) The dimensions of a room are 8 m 25 cm, 6 m 75 cm and 4 m 50 cm. Find the length of the largest measuring rod which can measure the dimensions of room exactly.

(a) 1 m 25 cm (b) 75 cm (c) 90 cm (d) 1 m 35 cm

(v) Pens are sold in pack of 8 and notepads are sold in pack of 12. Find the least number of pack of each type that one should buy so that there are equal number of pens and notepads.

(a) 3 and 2 (b) 2 and 5 (c) 3 and 4 (d) 4 and 5

Case Study 7

Activity on Real Numbers

In a classroom activity on real numbers, the students have to pick a number card from a pile and frame question on it if it is not a rational number for the rest of the class. The number cards picked up by first 5 students and their questions on the numbers for the rest of the class are as shown below. Answer them.

(i) Suraj picked up $\sqrt{8}$ and his question was - Which of the following is true about $\sqrt{8}$?

(a) It is a natural number (b) It is an irrational number

(c) It is a rational number (d) None of these

(ii) Shreya picked up 'BONUS' and her question was - Which of the following is not irrational?

(a) $3-4\sqrt{5}$ (b) $\sqrt{7}-6$ (c) $2+2\sqrt{9}$ (d) $4\sqrt{11}-6$

(iii) Ananya picked up $\sqrt{15}-\sqrt{10}$ and her question was - $\sqrt{15}-\sqrt{10}$ is _____ number.

(a) a natural (b) an irrational (c) a whole (d) a rational

(iv) Suman picked up $\frac{1}{\sqrt{5}}$ and her question was - $\frac{1}{\sqrt{5}}$ is _____ number.

(a) a whole (b) a rational (c) an irrational (d) a natural

(v) Preethi picked up $\sqrt{6}$ and her question was - Which of the following is not irrational?

(a) $15+3\sqrt{6}$ (b) $\sqrt{24}-9$ (c) $5\sqrt{150}$ (d) None of these

Case Study 9

Divisibility Rules

HCF and LCM are widely used in number system especially in real numbers in finding relationship between different numbers and their general forms. Also, product of two positive integers is equal to the product of their HCF and LCM.

Based on the above information answer the following questions.

(i) If two positive integers x and y are expressible in terms of primes as $x = p^2q^3$ and $y = p^3q$, then which of the following is true?

(a) HCF $= pq^2 \times$ LCM (b) LCM $= pq^2 \times$ HCF

(c) LCM $= p^2q \times$ HCF (d) HCF $= p^2q \times$ LCM

(ii) A boy with collection of marbles realizes that if he makes a group of 5 or 6 marbles, there are always two marbles left, then which of the following is correct if the number of marbles is p?

(a) p is odd (b) p is even (c) p is not prime (d) both (b) and (c)

(iii) Find the largest possible positive integer that will divide 398, 436 and 542 leaving remainder 7, 11, 15 respectively.

(a) 3 (b) 1 (c) 34 (d) 17

(iv) Find the least positive integer which on adding 1 is exactly divisible by 126 and 600.

(a) 12600 (b) 12599 (c) 12601 (d) 12500

(v) If A, B and C are three rational numbers such that $85C - 340A = 109$, $425A + 85B = 146$, then the sum of A, B and C is divisible by

(a) 3 (b) 6 (c) 7 (d) 9