Previous Year Questions 2024

Q1: The smallest irrational number by which √20 should be multipled so as to get a rational number, is: (2024)

(a) √20

(b) √2

(c) 5

(d) √5

Ans: (d)

(a) $\sqrt{20}\times\sqrt{20} = 20 = \frac{p}{q}, q\neq 0$

But $\sqrt{20}$ is not the smallest among all options.

(b) $\sqrt{20}\times\sqrt{2} = \sqrt{40} = 2\sqrt{5}$ is irrational

(c) $\sqrt{20}\times 5 = 10\sqrt{5};$ is irrational

(d) $\sqrt{20}\times\sqrt{5} = \sqrt{100}$

$= \frac{10}{1} = \frac{p}{q}, q\neq 0$

Hence, option (d) is correct.

Q2: The LCM of two prime numbers p and q (p > q) is 221. Then the value of 3p – q is: (2024)

(a) 4

(b) 28

(c) 38

(d) 48

Ans: (c)

The numbers p and q are prime numbers,

∴ HCF (p, q) = 1

Here, LCM(p, q) = 221

∴ As, p > q

p = 17, q = 13

(As p × q = 221)

Now, 3p – q = 3 × 17 – 13

= 51 – 13

= 38

Q3: A pair of irrational numbers whose product is a rational number is (2024)

(a) (√16, √4)

(b) (√5, √2)

(c) (√3, √27)

(d) (√36, √2)

Ans:(c)

Here √3 and √27 both are irrational numbers.

The product of $\sqrt{3}\times\sqrt{27} = \sqrt{3\times27}$

$= \sqrt{81}$

$= \frac{9}{1} = \frac{p}{q}; q \neq 0$

∴ 9 is a rational number.

Q4: Given HCF (2520, 6600) = 40, LCM (2520, 6600) = 252 × k, then the value of k is: (2024)

(a) 1650

(b) 1600

(c) 165

(d) 1625

Ans:(a)

HCF(2520, 6600) = 40

LCM(2520, 6600) = 252 × k

∴ HCF × LCM = Ist No. × IInd No.

∴ 40 × 252 × k = 2520 × 6600

$\Rightarrow \quad k = \frac{2520\times6600}{40\times252}$

⇒ k = 1650

Q5: Teaching Mathematics through activities is a powerful approach that enhances students' understanding and engagement. Keeping this in mind, Ms. Mukta planned a prime number game for class 5 students. She announced the number 2 in her class and asked the first student to multiply it by a prime number and then pass it to the second student. The second student also multiplied it by a prime number and passed it to the third student. In this way by multiplying by a prime number, the last student got 173250.

Now, Mukta asked some questions as given below to the students: (2024)

(A) What is the least prime number used by students?

(B) How many students are in the class?

OR

What is the highest prime number used by students?

(C) Which prime number has been used maximum times?

Ans:

(A)

2	173250
3	86625
3	28875
5	9625
5	1925
5	385
7	77
11	11
	1.

So least prime no. used by students = 3(because 2 is announced by the teacher, so the least number used by the students is 3)

(B) As the last student got $173250 = 2 \times 3 \times 3 \times 5 \times 5 \times 5 \times 7 \times 11$

there are 7 factors other than 2, which is announced by teacher. So, Number of student = 7

OR

Highest prime number used by student = 11

(C) Prime number 5 is used maximum times i.e., 3 times.

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Previous Year Questions 2023

Q6: The ratio of HCF to LCM of the least composite number and the least prime number is (2023)

(a) 1 : 2

(b) 2 : 1

(c) 1 : 1

(d) 1 : 3

Ans:(a)

Sol: Least composite number = 4

Least prime number = 2

∴ HCF = 2, LCM = 4

∴ Required ratio = HCF / LCM = 2/4

i.e. 1 : 2

Q7: Find the least number which when divided by 12, 16, and 24 leaves the remainder 7 in each case. (2023)

Ans: 55

Given, least number which when divided by 12, 16 and 24 leaves remainder 7 in each case

∴ Least number = LCM(12, 16, 24) + 7

= 48 + 7

= 55

Q8: Two numbers are in the ratio 2 : 3 and their LCM is 180. What is the HCF of these numbers? (2023)

Ans:30

Let the two numbers be 2x and 3x

LCM of 2x and 3x = 6x, HCF(2x, 3x) = x

Now, 6x = 180

⇒ x = 180/6

x = 30

Q9: Prove that √3 is an irrational number. (2023)

Ans: Let us assume that √3 is a rational number.

Then √3 = a/b; where a and b (≠ 0) are co-prime positive integers.

Squaring on both sides, we get

$3 = a^2/b^2$

⇒ $a^2 = 3b^2$

⇒ 3 divides a^2

⇒ 3 divides a ________(i)

= a = 3c, where c is an integer

Again, squaring on both sides, we get

$a^2 = 9c^2$

⇒ $3b^2 = 9c^2$

⇒ $b^2 = 3c^2$

⇒ 3 divides b^2

⇒ 3 divides b ________(ii)

From (i) and (ii), we get 3 divides both a and b.

⇒ a and b are not co- prime integers.

This contradicts the fact that a and b are co-primes.

Hence, √3 is an irrational number.

Previous Year Questions 2022

Q10: Two positive numbers have their HCF as 12 and their product as 6336. The number of pairs possible for the numbers is (2022)

(a) 2

(b) 3

(c) 4

(d) 1

Ans:(a)

Sol: Given, HCF = 12

Let two numbers be 12a and 12b

So. 12a x 12b = 6336

$\Rightarrow$ ab = 44

We can write 44 as product of two numbers in these ways:

ab = 1 x 44 = 2 x 22 = 4x 11

Here, we will take a = 1 and b = 44 ; a = 4 and b = 11.

We do not take ab = 2 x 22 because 2 and 22 are not co-prime to each other.

For a = 1 and b = 44, 1^{st} no. = 12a = 12, 2^{nd} no. = 12b = 528

For a = 4 and b = 11, 1^{st} no. = 12a = 48, 2^{nd} no. = 12b = 132

Hence, we get two pairs of numbers, (12, 528) and (48, 132).

Q11: If 'n' is any natural number, then $(12)^n$ cannot end with the digit (2022)

(a) 2

(b) 4

(c) 8

(d) 0

Ans: (d)

Sol:

- For any natural number **n**, the expression $(12)^n$ cannot end with the digit 0.
- This is because the number 12 does not contain the prime factor 5, which is necessary for a number to end in 0.
- Thus, regardless of the value of n, $(12)^n$ will never end with 0.

Q12: The number 385 can be expressed as the product of prime factors as (2022)

(a) 5 x 11 x 13

(b) 5 x 7 x 11

(c) 5 x 7 x 13

(d) 5 x 11 x 17

Ans: (b)

Sol: We have,

5	385
7	77
11	11
	1

∴ Prime factorisation of 385 = 5 x 7 x 11

Previous Year Questions 2021

Q13: Explain why 2 x 3 x 5 + 5 and 5 x 7 x 11 + 7 x 5 are composite numbers. (2021)

Ans: We have, 2 x 3 x 5 + 5 and 5 x 7 x 11 + 7 x 5.

We can write these numbers as:

2 x 3 x 5 + 5 = 5(2 x 3 + 1)

= 1 x 5 x 7

and 5 x 7 x 11 + 7 x 5 = 5 x 7(11 + 1)

= 5 x 7 x 12 = 1 x 5 x 7 x 12

Since, on simplifying. we find that both the numbers have more than two factors.

So. these are composite numbers.

Previous Year Questions 2020

Q14: The HCF and the LCM of 12, 21 and 15 respectively, are (2020)

(a) 3, 140

(b) 12, 420

(c) 3, 420

(d) 420, 3

Ans: (c)

Sol: We have,

12 = 2 x 2 x 3 = 2^2 x 3

21= 3 x 7

15 = 3 x 5

∴ HCF (12, 21, 15) = 3

and LCM (12, 21 ,15) = 2^2 x 3 x 5 x 7

= 420

Q15: The LCM of two numbers is 182 and their HCF is 13. If one of the numbers is 26. find the other. (2020)

Ans: Let the other number be x

As, HCF (a, b) x LCM (a, b) = a x b

⇒ 13 x 182= 26x

⇒ x = 13 x 182 / 26

= 91

Hence, other number is 91.

Q16: Given that HCF (135, 225) = 45, find the LCM (135, 225). (CBSE 2020)

Ans: We know that

LCM × HCF = Product of two numbers

∴ LCM (135, 225) = Product of 135 and 225 / HCF(135, 225)

= 135 x 225 / 45

= 675

So, LCM (135, 225) = 675

Previous Year Questions 2019

Q17: If HCF (336, 54) = 6. find LCM (336, 54). (2019)

Ans: Using the formula: HCF (a, b) x LCM (a, b) = a x b

∴ HCF (336, 54) x LCM (336, 54) = 336 x 54

⇒ 6 x LCM(336, 54) = 18144

⇒ LCM (336, 54) = 18144 / 6

= 3024

Q18: The HCF of two numbers a and b is 5 and their LCM is 200. Find the product of ab. (2019)

Ans: We know that HCF (a, b) x LCM (a, b)=a x b

⇒ 5 x 200 = ab

⇒ ab = 1000

Q19: 1f HCF of 65 and 117 is expressible in the form 65n - 117, then find the value of n. (2019)

Ans: Since, HCF (65 ,117) = 13

Given HCF (65, 117) = 65n - 117

13 = 65n - 117

⇒ 65n = 13 +117

⇒ n = 2

Q20: Find the HCF of 612 and 1314 using prime factorization. (2019)

Ans: Prime factorisation of 612 and 1314 are

612 = 2 x 2 x 3 x 3 x 17

1314 = 2 x 3 x 3 x 73

∴ HCF (612, 1314) = 2 x 3 x 3

= 18

Q21: Prove that √5 is an irrational number. (2019)

Ans: Let us assume that √5 is a rational number.

Then √5 = a/b where a and b (≠ 0} are co-prime integers,

if Squaring on both sides, we get

$5 = \frac{a^2}{b^2} \Rightarrow a^2 = 5b^2$

⇒ 5 divides a^2

⇒ 5 divides a ----------(i)

⇒ a = 5c, where c is an integer

Again, squaring on both sides, we get

$a^2 = 25c^2$

⇒ $5b^2 = 25c^2$

⇒ $b^2 = 5c^2$

⇒ 5 divides b^2 ----------(ii)

⇒ 5 divides b

From (i) and {ii), we get 5 divides both a and b.

⇒ a and b are not co-prime integers.

Hence, our supposition is wrong.

Thus, √5 is an irrational number.

Q22: Prove that √2 is an irrational number. (2019)

Ans: Let us assume √2 be a rational number.

Then, √2 = p/q where p, q (q ≠ 0) are integers and co-prime. ;

On squaring both sides. we get

$2 = \frac{p^2}{q^2} \Rightarrow p^2 = 2q^2$ ------------(i)

⇒ 2 divides p^2

⇒ 2 divides p -----------(ii)

So, p = 2a, where a is some integer.

Again squaring on both sides, we get

$p^2 = 4a^2$

$\Rightarrow 2q^2 = 4a^2$ (using (i))

$\Rightarrow q^2 = 2a^2$

$\Rightarrow$ 2 divides q^2

$\Rightarrow$ 2 divides q -----------(iii)

From (ii) and (iii), we get

2 divides both p and q.

$\therefore$ p and q are not co-prime integers.

Hence, our assumption is wrong.

Thus √2 is an irrational number.

Q23: Prove that 2 + 5√3 is an irrational number given that √3 is an irrational number. (2019)

Ans: Suppose 2 + 5√3 is a rational number.

We can find two integers a, b (b ≠ 0) such that

2 + 5√3 = a/b, where a and b are co -prime integers.

$5\sqrt{3} = \frac{a}{b} - 2 \Rightarrow \sqrt{3} = \frac{1}{5}[\frac{a}{b} - 2]$

$\Rightarrow$ √3 is a rational number.

[$\because$ a, b are integers, so $\frac{1}{5}[\frac{a}{b} - 2]$ is a rational number]

But this contradicts the fact that √3 is an irrational number.

Hence, our assumption is wrong.

Thus, 2 + 5√3 is an irrational number.

Q24: Write the smallest number which is divisible by both 306 and 657. (CBSE 2019)

Ans: Given numbers are 306 and 657.

The smallest number divisible by 306 and 657 = LCM(306, 657)

Prime factors of 306 = 2 × 3 × 3 × 17

Prime factors of 657 = 3 × 3 × 73

LCM of (306, 657) = 2 × 3 × 3 × 17 × 73

= 22338

Hence, the smallest number divisible by 306 and 657 is 22,338.