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CBSE Class 10-Mathematics: Chapter – 1 Real Numbers Part 5 (For CBSE, ICSE, IAS, NET, NRA 2022)

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Question 6:

Explain why $7 \times 11 \times 13 + 13$ and $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5$ are composite numbers.

Answer:

Numbers are of two types – prime and composite.

Prime numbers can be divided by 1 and only itself, whereas composite numbers have factors other than 1 and itself.

It can be observed that

$$\begin{aligned} &7 \times 11 \times 13 + 13 \\ &= 13 \times (7 \times 11 + 1) \\ &= 13 \times (77 + 1) \\ &= 13 \times 78 \\ &= 13 \times 13 \times 6 \end{aligned}$$

The given expression has 6 and 13 as its factors.

Therefore, it is a composite number.

$$\begin{aligned} &7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5 \\ &= 5 \times (7 \times 6 \times 4 \times 3 \times 2 \times 1 + 1) \\ &= 5 \times (1008 + 1) \\ &= 5 \times 1009 \end{aligned}$$

1009 cannot be factorized further

Therefore, the given expression has 5 and 1009 as its factors.

Hence, it is a composite number.

Question 7:

There is a circular path around a sports field. Sonia takes 18 minutes to drive one round of the field, while Ravi takes 12 minutes for the same. Suppose they both start at the same point and at the same time, and go in the same direction. After how many minutes will they meet again at the starting point?

Answer:

It can be observed that Ravi takes lesser time than Sonia for completing 1 round of the circular path. As they are going in the same direction, they will meet again at the same time when Ravi will have completed 1 round of that circular path with respect to Sonia. And the total time taken for completing this 1 round of circular path will be the LCM of time taken by Sonia and Ravi for completing 1 round of circular path respectively i.e., LCM of 18 minutes and 12 minutes.

$$18 = 2 \times 3 \times 3 \text{ And, } 12 = 2 \times 2 \times 3$$

$$\text{LCM of 12 and 18} = 2 \times 2 \times 3 \times 3 = 36$$

Therefore, Ravi and Sonia will meet together at the starting point after 36 minutes.

Question 8

Prove that $\sqrt{5}$ is Irrational.

Answer:

Let us prove $\sqrt{5}$ irrational by contradiction.

Let us suppose that $\sqrt{5}$ is rational. It means that we have co-prime integers a and b ($b \neq 0$) such that $\sqrt{5} = \frac{a}{b}$

$$\Rightarrow b\sqrt{5} = a$$

Squaring both sides, we get

$$\Rightarrow 5b^2 = a^2 \dots (1)$$

It means that 5 is factor of a^2

Hence, 5 is also factor of a by Theorem. ... (2)

If, 5 is factor of a , it means that we can write $a = 5c$ for some integer c .

Substituting value of a in (1),

$$5b^2 = 25c^2$$

$$\Rightarrow b^2 = 5c^2$$

It means that 5 is factor of b^2 .

Hence, 5 is also factor of b by Theorem. ... (3)

From (2) and (3), we can say that 5 is factor of both a and b.

But, a and b are co-prime.

Therefore, our assumption was wrong. $\sqrt{5}$ cannot be rational. Hence, it is irrational.

Question 9:

Write down the decimal expansions of those rational numbers in Question 1 which have terminating decimal expansions.

Answer:

$$(i) \frac{13}{3125} = \frac{13}{5^5} = \frac{13 \times 2^5}{5^5 \times 2^5} = \frac{13 \times 2^5}{10^5} = \frac{416}{10^5} = 0.00416$$

$$(ii) \frac{17}{8} = \frac{17}{2^3} = \frac{17 \times 5^3}{2^3 \times 5^3} = \frac{17 \times 5^3}{10^3} = \frac{2125}{10^3} = 2.215$$

$$(iii) \frac{15}{1600} = \frac{15}{2^6 \times 5^2} = \frac{15 \times 5^4}{2^6 \times 5^2 \times 5^4} = \frac{15 \times 5^4}{10^6} = \frac{9375}{10^6} = 0.009375$$

$$(iv) \frac{23}{2^3 \times 5^2} = \frac{23 \times 5^1}{2^3 \times 5^2 \times 5^1} = \frac{23 \times 5^1}{10^3} = \frac{115}{10^3} = 0.115$$

$$(v) \frac{6}{15} = \frac{2}{5} = \frac{2 \times 2}{5 \times 2} = \frac{4}{10} = 0.4$$

$$(vi) \frac{35}{50} = \frac{7}{10} = 0.7$$