Exercise 1.1 Class 10 Maths CH- 1 Real Numbers Solutions

(From New NCERT book) Session 2023 - 24

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1. Express each number as a product of its prime factors:
(i) 140 (ii) 156 (iii) 3825 (iv) 5005 (v) 7429

Solution:
Concept: First, find the factor for each number and then write the prime factors in ascending order with the multiply sign.

(i) 140
Product of prime factor of 140:
Therefore, $140 = 2 \times 2 \times 5 \times 7 \times 1$
$140 = 2^2 \times 5 \times 7$
Hence, 140 can be expressed as a product of its prime factors which is $2^2 \times 5 \times 7$.

(ii) 156
Product of prime factor of 156:
$156 = 2 \times 2 \times 13 \times 3 \times 1$
$156 = 2^2 \times 13 \times 3$
Hence, 156 can be expressed as a product of its prime factors which is $2^2 \times 13 \times 3$.

(iii) 3825

Product of prime factor of 3825:

$3825 = 3 \times 3 \times 5 \times 5 \times 17 \times 1$

$3825 = 3^2 \times 5^2 \times 17$

Hence, 3825 can be expressed as a product of its prime factors which is $3^2 \times 5^2 \times 17$.

(iv) 5005

Product of prime factor of 5005:

$5005 = 5 \times 7 \times 11 \times 13 \times 1$

$5005 = 5 \times 7 \times 11 \times 13$

Hence, 5005 can be expressed as a product of its prime factors which is $5 \times 7 \times 11 \times 13$.

(v) 7429

Product of prime factor of 7429:

$7429 = 17 \times 19 \times 23 \times 1$

$7429 = 17 \times 19 \times 23$

Hence, 7429 can be expressed as a product of its prime factors which is $17 \times 19 \times 23$.

2. Find the LCM and HCF of the following pairs of integers and verify that LCM × HCF = product of the two numbers.

(i) 26 and 91

(ii) 510 and 92

(iii) 336 and 54

Solution:

(i) Given: 26 and 91

Prime factors of 26 = $2 \times 13 \times 1$

Prime factors of 91 = $7 \times 13 \times 1$

Now, LCM (26, 91) = $2 \times 7 \times 13$ = **182**

and HCF (26, 91) = **13**

For Verification:

Now, product of 26 and 91 = $26 \times 91 = 2366$

And product of LCM and HCF = $182 \times 13 = 2366$

Hence, LCM × HCF = product of the 26 and 91.

Hence verified.

(ii) **Given:**510 and 92

Prime factors of 510 = $2 \times 3 \times 17 \times 5 \times 1$

Prime factors of 92 = $2 \times 2 \times 23 \times 1$

Now, LCM(510, 92) = $2 \times 2 \times 3 \times 5 \times 17 \times 23$ = **23460**

And HCF (510, 92) = **2**

For Verification:

Now, product of 510 and 92 = $510 \times 92 = 46920$

And Product of LCM and HCF = $23460 \times 2 = 46920$

Hence, LCM × HCF = product of the 510 and 92.

Hence verified.

(iii) Given:336 and 54

Prime factors of 336 = $2 \times 2 \times 2 \times 2 \times 7 \times 3 \times 1$

Prime factors of 54 = $2 \times 3 \times 3 \times 3 \times 1$

Now, LCM(336, 54) = $2^4 \times 3^3 \times 7 = 16 \times 27$ = **3024**

And HCF(336, 54) = 2×3 = **6**

For Verification:

Now, product of 336 and 54 = $336 \times 54 = 18{,}144$

And product of LCM and HCF = $3024 \times 6 = 18{,}144$

Hence, LCM × HCF = product of the 336 and 54.

Hence verified.

3. Find the LCM and HCF of the following integers by applying the prime factorisation method.

(i) 12, 15 and 21

(ii) 17, 23 and 29

(iii) 8, 9 and 25

Solution:

(i) Given: 12, 15 and 21

Prime factors of 12 = $2 \times 2 \times 3 = 2^2 \times 3^1$

Prime factors of 15 = $5^1 \times 3^1$

Prime factors of 21 = $7^1 \times 3^1$

Here 3 is a common prime factor of the given numbers and has the smallest power is 1.

Therefore,HCF(12,15,21) = **3**

and ***LCM = product of each prime factor with the greatest power***

LCM(12,15,21) = $2^2 \times 3^1 \times 5^1 \times 7^1 = 2 \times 2 \times 3 \times 5 \times 7 =$ **420**

Hence, the LCM and HCF of 12, 15, and 21 are 420 and 3.

(ii) Given: 17, 23 and 29

Prime factors of 17 = 17×1

Prime factors of 23 = 23×1

Prime factors of 29 = 29×1

Here 1 is a common prime factor of the given numbers and has the smallest power 1.
Therefore, HCF(17,23,29) = 1
and ***LCM = product of each prime factor with the greatest power***
LCM(17,23,29) = 17 × 23 × 29 = **11339**
Hence, the LCM and HCF of 17, 23, and 29 are 11339 and 1.

(iii) Given: 8, 9 and 25
Prime factors of 8 = 2 × 2 × 2 × 1 = 2^3
Prime factors of 9 = 3 × 3 × 1 = 3^2
Prime factors of 25 = 5 × 5 × 1 = 5^2
Here 1 is a common prime factor of the given numbers and has the smallest power 1.
Therefore, HCF(8,9,25) = 1
and ***LCM = product of each prime factor with the greatest power***
LCM(8,9,25) = $2^3 \times 3^2 \times 5^2$ = 2 × 2 × 2 × 3 × 3 × 5 × 5 = 1800
Hence, the LCM and HCF of 8, 9, and 25 is 1800 and 1.

4. Given that HCF (306, 657) = 9, find LCM (306, 657).
Solution: Given: HCF (306, 657) = 9
As we know,
HCF × LCM = Product of the two given numbers
Therefore, 9 × LCM = 306 × 657
LCM = (306 × 657)/9 = 34 × 657 = 22338
Hence, LCM(306,657) = 22338

5. Check whether 6n can end with the digit 0 for any natural number n.

Solution:
[Concept: If a number ends with the digit 0 then it will be divisible by 2 and 5 both. So, here first, write the given numbers as a product of prime factors and then check whether this prime factorisation contains 2 and 5 or not. If it contains 2 and 5 both, then the given number ends with the digit zero, otherwise, not.]

Given n is a natural number. Let us assume that 6^n ends with zero, thus, 6^n is divisible by 2 and 5 both.
But prime factors of 6 are **2 × 3**
Prime factorization of 6n = $(\mathbf{2 \times 3})^{\mathbf{n}}$
Thus, the prime factorization of 6^n doesn't contain the prime number 5.
So the fundamental theorem of Arithmetic guarantees that there are no other primes in the factorization of 6^n. So, our assumption has 6^n ends with zero is wrong.
Hence, there is no natural number n for which 6^n ends with the digit 0.

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

Solution:
Concept: We know if a number is composite, if it has at least one factor other than 1, and the number itself.

Given: (7 × 11 × 13) + 13
Taking 13 as a common factor, we get,

$= 13(7 \times 11 \times 1 + 1) = 13(77 + 1) = 13 \times 78 = \mathbf{13 \times 3 \times 2 \times 13}$
Thus, it is the product of prime factors **2,3, and 13.**
Hence, $7 \times 11 \times 13 + 13$ is a composite number.

Now, $(7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1) + 5$
Taking 5 as a common factor, we get,
$= 5(7 \times 6 \times 4 \times 3 \times 2 \times 1 + 1) = 5(1008 + 1) = \mathbf{5 \times 1009}$
Thus, it is the product of prime factors **5 and 1009.**
Hence, $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5$ is a composite number.

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?

Solution:
Given: Time taken by Sonia to drive one round of the field = 18 min
Time taken by Ravi to drive one round of the field = 12 min

Since Both Sonia and Ravi move in the same direction and at the same time, we have to find the exact number of minutes when they will be meeting again at the starting point is the LCM of 18 and 12.
Now, prime factors of $18 = 2 \times 3 \times 3 = \mathbf{2 \times 3^2}$
Prime factors of $12 = 2 \times 2 \times 3 = \mathbf{2^2 \times 3}$
LCM = product of each prime factor with the greatest power
Therefore, $\text{LCM}(18,12) = 2^2 \times 3^2 = 2 \times 3 \times 3 \times 2 = \mathbf{36}$

Hence, Sonia and Ravi will meet again at the starting point after 36 minutes.