

Exercise 1.3

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1. Express each of the following integers as a product of its prime.

(i) 420

Solution:

$$\begin{array}{r|l} 2 & 420 \\ \hline 2 & 210 \\ \hline 5 & 105 \\ \hline 7 & 21 \\ \hline 3 & 3 \\ \hline & 1 \end{array}$$

$$420 = 2 \times 2 \times 3 \times 5 \times 7$$

$$\therefore 420 = 2^2 \times 3 \times 5 \times 7$$

(ii) 468

Solution:

$$\begin{array}{r|l} 2 & 468 \\ \hline 2 & 234 \\ \hline 3 & 117 \\ \hline 3 & 39 \\ \hline 13 & 3 \\ \hline & 1 \end{array}$$

$$468 = 2 \times 2 \times 3 \times 3 \times 13$$

$$\therefore 468 = 2^2 \times 3^2 \times 13$$

(iii) 945

Solution:

$$\begin{array}{r|l} 5 & 945 \\ \hline 3 & 189 \\ \hline 3 & 63 \\ \hline 3 & 21 \\ \hline 7 & 7 \\ \hline & 1 \end{array}$$

$$945 = 3 \times 3 \times 3 \times 5 \times 7$$

$$\therefore 945 = 3^3 \times 5 \times 7$$

(iv) 7325

Solution:

$$\begin{array}{r|l}
 5 & 7325 \\
 \hline
 5 & 1465 \\
 \hline
 293 & 293 \\
 \hline
 & 1
 \end{array}$$

$$7325 = 5 \times 5 \times 293$$

$$\therefore 7325 = 5^2 \times 293$$

2. Determine the prime factorization of each of the following positive integer :

(i) 20570

Solution:

$$\begin{array}{r|l}
 5 & 20570 \\
 \hline
 2 & 4114 \\
 \hline
 11 & 2057 \\
 \hline
 11 & 187 \\
 \hline
 17 & 17 \\
 \hline
 & 1
 \end{array}$$

$$20570 = 2 \times 5 \times 11 \times 11 \times 17$$

$$\therefore 20570 = 2 \times 5 \times 11^2 \times 17$$

(ii) 58500

Solution:

$$\begin{array}{r|l}
 5 & 58500 \\
 \hline
 5 & 11700 \\
 \hline
 5 & 2340 \\
 \hline
 2 & 468 \\
 \hline
 2 & 234 \\
 \hline
 3 & 117 \\
 \hline
 3 & 39 \\
 \hline
 13 & 13 \\
 \hline
 & 1
 \end{array}$$

$$58500 = 2 \times 2 \times 3 \times 3 \times 5 \times 5 \times 5 \times 13$$

$$\therefore 58500 = 2^2 \times 3^2 \times 5^3 \times 13$$

(iii) 45470971

Solution:

$$\begin{array}{r}
 7 \overline{)45470971} \\
 \underline{7 \ 6495853} \\
 13 \overline{)927979} \\
 \underline{13 \ 71383} \\
 17 \overline{)5491} \\
 \underline{17 \ 323} \\
 19 \overline{)19} \\
 \underline{19} \\
 1
 \end{array}$$

$$45470971 = 7 \times 7 \times 13 \times 13 \times 17 \times 17 \times 19$$

$$\therefore 45470971 = 7^2 \times 13^2 \times 17^2 \times 19$$

3. 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.

Solution:

So, basically there are two types of numbers i.e., prime numbers and composite numbers.

Understanding that,

Prime numbers are those numbers having 1 and the number itself as factors. And,

Composite numbers are those numbers having factors other than 1 and itself.

It's seen that,

$$\begin{aligned}
 7 \times 11 \times 13 + 13 &= 13 \times (7 \times 11 + 1) \quad [\text{taking 13 out as common}] \\
 &= 13 \times (77 + 1) \\
 &= 13 \times 78 \\
 &= 13 \times 13 \times 6
 \end{aligned}$$

So, the given expression has 6 and 13 as its factors. Therefore, we can conclude that it is a composite number.

Similarly,

$$\begin{aligned}
 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5 &= 5 \times (7 \times 6 \times 4 \times 3 \times 2 \times 1 + 1) \quad [\text{taking 5 out- common}] \\
 &= 5 \times (1008 + 1) \\
 &= 5 \times 1009
 \end{aligned}$$

Since, 1009 is a prime number the given expression has 5 and 1009 as its factors other than 1 and the number itself. Hence, it is also a composite number.

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

Solution:

In order to check whether 6^n can end with the digit 0 for any natural number n , let us find the factors of 6.

It's seen that the factors of 6 are 2 and 3.

$$\text{So, } 6^n = (2 \times 3)^n$$

$$6^n = 2^n \times 3^n$$

Since, the prime factorization of 6 does not contain 5 and 2 as its factor, together. We can thus conclude that 6^n can never end with the digit 0 for any natural number n .

5. Explain why $3 \times 5 \times 7 + 7$ is a composite number.**Solution:**

So, basically there are two types of numbers i.e., prime numbers and composite numbers.

Understanding that,

Prime numbers are those numbers having 1 and the number itself as factors. And,

Composite numbers are those numbers having factors other than 1 and itself.

It's seen that,

$$3 \times 5 \times 7 + 7 = 7 \times (3 \times 5 + 1) = 7 \times (15 + 1) = 7 \times 16$$

Since, the given expression has 7 and 16 as its factors we can conclude that it is a composite number.