CBSE Test Paper 03
Chapter 1 Real Numbers

1. $7 \times 11 \times 13 + 13$ is a/an: **(1)**
   a. odd number but not composite
   b. Square number
   c. prime number
   d. composite number
2. 0.515115111511115............. is **(1)**
   a. a rational number
   b. a prime number
   c. an integer
   d. an irrational number
3. The LCM of two numbers $a^2b^3c^9d^6e^{11}$ and $g^5f^{21}a^3b^1c^{10}$, where a, b, c, d, e, f, g are prime numbers is: **(1)**
   a. $a^3b^3c^{10}d^6e^{11}f^{21}g^5$
   b. a^2bc^9
   c. g^5f^{21}
   d. $a^2bc^9g^5f^{21}$
4. For any positive integer 'a' and 3, there exist unique integers 'q' and 'r' such that a = 3q + r where 'r' must satisfy **(1)**
   a. $1 < r < 3$
   b. $0 < r \leqslant 3$
   c. $0 \leqslant r < 3$
   d. $0 < r < 3$
5. The HCF of two consecutive numbers is **(1)**
   a. 2
   b. 0
   c. 3
   d. 1
6. Using prime factorisation, find the HCF and LCM of 36, 84. verify that HCF $\times$ LCM = product of given numbers. **(1)**

7. The LCM of two numbers is 64699, their HCF is 97 and one of the numbers is 2231. Find the other. **(1)**

8. Write the exponent of 3 in the prime factorisation of 162. **(1)**

9. If a and b are two positive integers such that a = bq + r. Where q and r are unique integers. a < b, then find the value of q. **(1)**

10. State whether the following rational number will have a terminating decimal expansion or a nonterminating repeating decimal expansion $\frac{17}{8}$. **(1)**

11. Express $0.1\overline{6}$ as a rational number in simplest form. **(2)**

12. Find the value of k, if -1 is a zero of the polynomial p(x) = kx^2 - 4x + k. **(2)**

13. Without actual division, show that $\frac{19}{3125}$ is a terminating decimal number. Express this number in decimal form. **(2)**

14. 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. **(3)**

15. Show that $2\sqrt{3}$ is irrational. **(3)**

16. Find the largest number which divides 546 and 764, leaving remainders 6 and 8 respectively. **(3)**

17. Using Euclid's division algorithm, find whether the pair of numbers 847, 2160 are coprimes or not. **(3)**

18. Find HCF and LCM of 378, 180 and 420 by prime factorization method. Is HCF $\times$ LCM of these numbers is equal to the product of the given three numbers? **(4)**

19. A fruit vendor has 990 apples and 945 oranges. He packs them into baskets. Each basket contains only one of the two fruits but in equal number. Find the number of fruits to be put in each basket in order to have minimum number of baskets. **(4)**

20. If β and $\frac{1}{\beta}$ are zeroes of the polynomial $(\alpha^2 + \alpha)x^2 + 61x + 6\alpha$. Find the values of β and α. **(4)**

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Solution

1. d. composite number

   Explanation: We have 7 $\times$ 11 $\times$ 13 + 13 = 13 (77 + 1) = 13 $\times$ 78. Since the given number has 2 more factors other than 1 and itself, therefore it is a composite number.

2. d. an irrational number

   Explanation: 0.515115111511115 .... is an irrational number because it is non-repeating decimal expansion.

3. a. $a^3b^3c^{10}d^6e^{11}f^{21}g^5$

   Explanation: The LCM of two numbers is their prime factors with greatest power. $\therefore$ LCM of given numbers is

4. c. $0 \leqslant r < 3$

   Explanation: Since a is a positive integer, therefore, r = 0, 1, 2 only.
   So, that a = 3q, 3q + 1, 3q + 2.

5. d. 1

   Explanation: The HCF of two consecutive numbers is always 1. (e.g. HCF of 24, 25 is 1).

6. 36, 84

   Prime factorisation:
   $36 = 2^2 \times 3^2$
   $84 = 2^2 \times 3 \times 7$
   HCF = product of smallest power of each common prime factor in the numbers
   $= 2^2 \times 3 = 12$
   LCM = product of greatest power of each prime factor involved in the numbers
   $= 2^2 \times 3^2 \times 7 = 252$
   HCF $\times$ LCM = 12 $\times$252 = 3024.......... (i)
   Product of given numbers= 36 $\times$ 84= 3024 .... (ii)
   From (i) and (ii)
   HCF $\times$ LCM = product of given numbers.

7. As we know that HCF * LCM = Product of two numbers

   Let the other number be x. Then,

   $2231x = 97 \times 64699$

   $\Rightarrow x = \frac{97 \times 64699}{2231}$

   $\Rightarrow x = 2813$

   Therefore, the other number is 2813.

8. $162 = 2 \times 3^4$

   $\therefore$ Exponent of 3 = 4

9. Euclid's Division Lemma states that for given positive integer a and b, there exist unique integers q and r satisfying

   a = bq + r; $0 \leqslant r < b$.

   Here b > 0 and b > a (given)

   So b > a > 0

   b > bq+r > 0

   b-bq > r > 0

   b(1-q) > r >0

   Dividing by b we get

   $1 - q > \frac{r}{b} > 0$

   On subtraction of 1 from all we get

   $-\mathrm{q} > \frac{\mathrm{r}}{\mathrm{b}} - 1 > -1$

   or q $< \frac{\mathrm{r}}{\mathrm{b}} - 1 \ldots\ldots. (1)$

   Also a > 0

   or bq + r > 0

   or q $> -\frac{\mathrm{r}}{\mathrm{b}} \ldots\ldots.. (2)$

   From (1) and (2) we can say that

   Value of q is dependent on r and b

   Hence q = f(r,b)

10. $\frac{17}{8} = \frac{17}{2^3}$ Here, $q = 2^3$

    which is of the form.$2^n 5^m (n = 3, m = 0)$

    So, the rational number $\frac{17}{8}$ has a terminating decimal expansion.

11. Let $x = 0.1\overline{6}$. Then,

x = 0.1666 .... (i)

$\therefore$ 10x = 1.6666 .... (ii)

And, 100x = 16.6666.................. (iii)

On subtracting (ii) from (iii), we get

100x - 10x = 16.666.... - 1.666.....

90x = 15

$\Rightarrow x = \frac{15}{90} = \frac{1}{6}$.

$\therefore \quad 0.1\overline{6} = \frac{1}{6}$.

12. It is given that if -1 is a zero of the polynomial p(x) = kx^2 - 4x + k. We have to find the value of k.

Since, - 1 is a zero of the polynomial

p(x) = kx^2 - 4x + k,

then p (-1) = 0

$\therefore k(-1)^2 - 4(-1) + k = 0$

or, k + 4 + k = 0

or, 2k + 4 = 0

or, 2k = - 4

Hence, k = - 2

13. The number = $\frac{19}{3125}$

Here the denominator = $3125 = 5^5$

This can be written as $2^0 \times 5^5$

Clearly, $2^0 \times 5^5$ is in the form of $2^m \times 5^n$.

So, the given number is a terminating decimal.

Now, $\frac{19}{2^0 \times 5^5} = \frac{19 \times 2^5}{2^5 \times 5^5} = \frac{19 \times 32}{100000}$
$= \frac{608}{100000} = 0.00608$

14. 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

7 × 11 × 13 + 13 = 13 × (7 × 11+ 1)

= 13 × (77 + 1)

= 13 ×78

= 13 × 13 × 6

The given expression has 6 and 13 as its factors other than 1 and number itself.

Therefore, it is a composite number.

7 × 6 × 5 × 4 × 3 × 2 × 1 + 5

= 5 × (7 × 6 × 4 × 3 × 2 × 1 + 1)

= 5 × (1008+ 1)

= 5 × 1009

1009 cannot be factorized further

Therefore, the given expression has 5 and 1009 as its factors other than 1 and number itself.

Hence, it is a composite number.

15. Let us assume, to the contrary, that $2\sqrt{3}$ is rational number.

Then, there must exist co-primes number between a and b $(b \neq 0)$ such that $2\sqrt{3} = \frac{a}{b} \Rightarrow \sqrt{3} = \frac{a}{2b}$.

Since a and b are integers, so $\frac{a}{2b}$ is rational number because division of two rational number is always a rational number .

Thus, $\sqrt{3}$ is also rational.

But, this contradicts the fact that $\sqrt{3}$ is irrational.

So, our assumption is incorrect.

Hence, $2\sqrt{3}$ is irrational.

16. 546 and 764 are divided by the largest number leaving remainders 6 and 8 respectively.

So,

$546 - 6 = 540$

$764 - 8 = 756$

So, 540 and 756 are exactly divisible by the required number.

Thus, the required number is the HCF of 540 and 756.

$540 = 2^2 \times 3^3 \times 5$

$756 = 2^2 \times 3^3 \times 7$

HCF (540, 756) $= 2^2 \times 3^3$ = 108

Hence the largest number which divides 546 and 764, leaving remainders 6 and 8 respectively is 108.

17. Here we have to find out HCF of 2160 and 847 by Using Euclid's division Lemma, we get

$2160 = 847 \times 2 + 466$

Also $847 = 466 \times 1 + 381$

$466 = 381 \times 1 + 85$

$381 = 85 \times 4 + 41$

$85 = 41 \times 2 + 3$

$41 = 3 \times 13 + 2$

$3 = 2 \times 1 + 1$

$2 = 1 \times 2 + 0$

$\therefore$ HCF = 1.

Hence the numbers are co-prime.

18. The prime factors of:

$378 = 2 \times 3^3 \times 7$

$180 = 2^3 \times 3^2 \times 5$

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

HCF = $2 \times 3 = 6$

and LCM(378, 180, 420) = $2^2 \times 3^3 \times 5 \times 7 = 3780$

HCF $\times$ LCM = $6 \times 3780 = 22680$

Product of given numbers is = $378 \times 180 \times 420 = 28576800$

Hence, HCF $\times$ LCM $\neq$ Product of three numbers.

19. HCF of 990 and 945

$990 = 945 \times 1 + 45$

$945 = 45 \times 21 + 0$

HCF of 990 and 945 is 45.

As 45 is the maximum number which can divide both type of fruits.

The fruit vendor should put 45 fruits in each basket to have a minimum number of baskets.

20. Given, β and $\frac{1}{\beta}$ are zeroes of the polynomial $(\alpha^2 + \alpha)x^2 + 61x + 6\alpha$.

$\therefore \quad \beta + \frac{1}{\beta} = -\frac{61}{\alpha^2+\alpha}$

or, $\frac{\beta^2+1}{\beta} = \frac{-61}{\alpha^2+\alpha}$ ...... (i)

and $\beta \cdot \frac{1}{\beta} = \frac{6\alpha}{\alpha^2+\alpha}$

or, $1 = \frac{6}{\alpha+1}$

$\alpha + 1 = 6$

$\alpha = 5$

Substituting this value of α in (i), we get

$\frac{\beta^2+1}{\beta} = \frac{-61}{5^2+5} = -\frac{61}{30}$

$30\beta^2 + 30 = -61\beta$

$30\beta^2 + 61\beta + 30 = 0$

or, $\frac{-61\pm\sqrt{(-61)^2\times4\times30\times30}}{2\times30}$

$= \frac{-61\pm\sqrt{3721-3600}}{60} = \frac{-61\pm11}{60}$

$\beta = \frac{-5}{6}$ or $\frac{-6}{5}$

Hence, $\alpha = 5, \beta = \frac{-5}{6}, \frac{-6}{5}$