REAL NUMBERS (MCQs) R.D.SHARMA SOLUTIONS

1) The exponent of 2 in the prime factorisation of 144 is

(a) 4 (b) 5 (c) 6 (d) 3

Solution:-

$144 = 2^{4} \times 3^2$

$\underline{4}$ (a) is the exponent of 2.

$$\begin{array}{r|l} 2 & 144 \\ 2 & 72 \\ 2 & 36 \\ 2 & 18 \\ 3 & 9 \\ & 3 \end{array}$$

2) The LCM of two numbers is 1200. Which of the following cannot be their HCF?

(a) 600 (b) 500 (c) 400 (d) 200

Solution:-

we know that HCF must be a factor of LCM for given two numbers. Thus 500 is not a factor of 1200.

Hence 500 (b) cannot be their HCF.

3) If $n = 2^3 \times 3^4 \times 5^4 \times 7$, then the number of consecutive zeroes in n; where n is a natural number, is

(a) 2 (b) 3 (c) 4 (d) 7

Solution:-

$n = 2^3 \times 5^3 \times 5 \times 3^4 \times 7$

$= (10)^3 \times 5 \times 3^4 \times 7$

Hence there are 3 (b) consecutive zeroes in n.

4) The sum of the exponents of the prime factors in the prime factorisation of 196, is

(a) 1 (b) 2 (c) 4 (d) 6

Solution:-

$196 = 2^2 \times 7^2$

$$\begin{array}{r|l} 2 & 196 \\ 2 & 98 \\ 7 & 49 \\ & 7 \end{array}$$

Sum of exponents $= 2+2 = 4$ (c)

5) The number of decimal places after which the decimal expansion of the rational number $\frac{23}{2^2 \times 5}$ will terminate is

(a) 1 (b) 2 (c) 3 (d) 4

Solution:-

$\frac{23}{2^{2} \times 5^1}$

Thus the no. of decimal places after which the decimal expansion of the given number will terminate is 2 (b)

6) If p_1 and p_2 are two odd prime numbers such that $p_1 > p_2$, then $p_1^2 - p_2^2$ is

(a) an even number (b) an odd number

(c) an odd prime number (d) a prime number.

Solution:-

$p_1^2 - p_2^2 = (p_1 + p_2)(p_1 - p_2)$

Sum of two odd numbers, $p_1 + p_2$ will a even number. i.e, divisible by 2. Hence $(p_1+p_2)(p_1-p_2) = p_1^2 - p_2^2$ is an even number (a)

7) If two positive integers a and b are expressible in the form $a = pq^2$ and $b = p^3q$; p, q being prime numbers, then LCM(a, b) is

(a) pq (b) p^3q^3 (c) p^3q^2 (d) p^2q^2

Solution:-

$LCM(a, b) = p^3q^2$ (c)

8) (In the above question Q.7) HCF(a, b) is

(a) pq (b) p^3q^3 (c) p^3q^2 (d) p^2q^2

Solution:-

$HCF(a, b) = pq$ (a)

9) If two positive integers m and n are expressible in the form $m = pq^3$ and $n = p^3q^2$, where p, q are prime numbers, then HCF(m, n) =

(a) pq (b) pq^2 (c) p^3q^3 (d) p^2q^3

Solution:-

$HCF(m, n) = pq^2$ (b)

10) If the LCM of a and 18 is 36 and the HCF of a and 18 is 2, then a =

(a) 2 (b) 3 (c) 4 (d) 1

Solution:-

$$LCM \times HCF = \text{product of numbers}$$

$$36 \times 2 = a \times 18$$

$$a = \frac{2 \times \cancel{36}^{2}}{\cancel{18}_{1}} = 2 \times 2 = 4 \text{ (c)}$$

11) The HCF of 95 and 152 is

(a) 57 (b) 1 (c) 19 (d) 38

Solution:-

HCF(95, 152) = 19 (c)

95) 152 (1
 95
 57) 95 (1
 57
 38) 57 (1
 38
 19) 38 (2
 38
 0

12) If HCF (26, 169) = 13, then LCM (26, 169) =

(a) 26 (b) 52 (c) 338 (d) 13

Solution:-

$$LCM \times HCF = \text{product of numbers}$$
$$LCM \times 13 = 26 \times 169$$
$$LCM = \frac{26 \times \cancel{169}^{13}}{\cancel{13}_1} = 26 \times 13 = 338 \text{ (c)}$$

13) If $a = 2^3 \times 3$; $b = 2 \times 3 \times 5$; $c = 3^n \times 5$ and $LCM(a, b, c) = 2^3 \times 3^2 \times 5$, then $n =$

(a) 1 (b) 2 (c) 3 (d) 4

Solution:-

$$LCM(a, b, c) = 2^3 \times 3^{2} \times 5$$
$$n = 2 \text{ (b)}$$

14) The decimal expansion of the rational number $\frac{14587}{1250}$ will terminate after

(a) one decimal place (b) two decimal places
(c) three decimal places (d) four decimal places

Solution:-

$$\frac{14587}{1250} = \frac{14587}{5^4 \times 2}$$

5 | 1250
5 | 250
5 | 50
5 | 10
  2

Thus the decimal expansion terminates after 4 decimal places (d)

15) If p and q are co-prime numbers, then p^2 and q^2 are

(a) coprime (b) not coprime (c) even (d) odd.

Solution:- coprime (a) [eg:- 4 and 9 are co-primes, $4^2 = 16$; $9^2 = 81$ are also coprime numbers)

16) Which of the following rational numbers have terminating decimal?

(i) $\frac{16}{25}$ (ii) $\frac{5}{18}$ (iii) $\frac{2}{21}$ (iv) $\frac{7}{250}$

(a) (i) and (ii) (b) (ii) and (iii) (c) (i) and (iii) (d) (i) and (iv)

Solution:-

(i) $\frac{16}{25} = \frac{16}{5^2 \times 2^0}$

(ii) $\frac{5}{18} = \frac{5}{2 \times 3^2}$

(iii) $\frac{2}{21} = \frac{2}{7 \times 3}$

(iv) $\frac{7}{250} = \frac{7}{5^3 \times 2}$

Thus the denominator is of the form $2^m \times 5^n$; where m and n are non-negative integers for $16/25$ and $7/250$

(i) and (iv) (d)

17) If 3 is the least prime factor of number a and 7 is the least prime factor of number b, then the least prime factor of a+b is

(a) 2 (b) 3 (c) 5 (d) 10

Solution:-

Since a and b are odd numbers, a+b is even.

Hence the least prime factor of a+b is 2 (a)

18) $3.\overline{27}$ is (a) an integer (b) a rational number (c) a natural number (d) an irrational number

Solution:-

$3.\overline{27} = 3.272727\cdots$, a rational number with non-terminating repeating decimal expansion (b)

19) The smallest number by which $\sqrt{27}$ should be multiplied so as to get a rational number is

(a) $\sqrt{27}$ (b) $3\sqrt{3}$ (c) $\sqrt{3}$ (d) 3

Solution:-

$$\begin{array}{r|l} 3 & 27 \\ \hline 3 & 9 \\ \hline & 3 \end{array}$$

$\sqrt{27} = 3\sqrt{3}$

$\sqrt{27} \times \sqrt{3} = 3\sqrt{3} \times \sqrt{3}$

$= 3 \times 3 = 9$

Thus the required smallest number is $\sqrt{3}$ (c)

20) The smallest rational number by which $\frac{1}{3}$ should be multiplied so that its decimal expansion terminates after one place of decimal, is

(a) $\frac{3}{10}$ (b) $\frac{1}{10}$ (c) 3 (d) $\frac{3}{100}$

Solution:-

$\frac{1}{3} \times \frac{3}{10}$ (a)

$= \frac{1}{10} = 0.1$

21) If n is a natural number, then $9^{2n} - 4^{2n}$ is always divisible by

(a) 5 (b) 13 (c) both 5 and 13 (d) none of these

Solution:-

When $n = 1$, $9^2 - 4^2 = 81 - 16 = 65$, which is divisible by both 5 and 13 (c)

ie, $a^{2n} - b^{2n}$ is always divisible by $a-b$ and $a+b$.

22) If n is any natural number, then $6^n - 5^n$ always ends with

(a) 1 (b) 3 (c) 5 (d) 7

Solution:-

6^n ends with 6 for any natural number n.

ie, $6^2 = 36$; $6^3 = 216$

5^n ends with 5 for any natural number n.

ie, $5^2 = 35$; $5^3 = 125$

Thus $6^n - 5^n$ always ends with $6-5 = 1$ (a)

23) The LCM and HCF of two rational numbers are equal, then the numbers must be

(a) prime (b) co-prime (c) compositi (d) equal

Solution:- equal (d)

24) If the sum of LCM and HCF of two numbers is 1260 and their LCM is 900 more than their HCF, then the product of two numbers is

(a) 203400 (b) 194400 (c) 198400 (d) 205400

Solution:-

$$LCM + HCF = 1260 \rightarrow (1)$$
$$LCM = HCF + 900 \rightarrow (2)$$

On substituting eq: (2) in eq: (1), $HCF + 900 + HCF = 1260$

$$2HCF = 1260 - 900$$
$$HCF = \frac{360}{2} = 180$$

From eq: (2), $LCM = 180 + 900 = 1080$

Thus product of two numbers $= HCF \times LCM$

$= 180 \times 1080 = 194400$ (b)

25) The remainder when the square of any prime number greater than 3 is divided by 6 is

(a) 1 (b) 3 (c) 2 (d) 4

Solution:-

eg:- $11^2 \div 6 = 121 \div 6$, remainder $= 1$

$17^2 \div 6 = 289 \div 6$, remainder $= 1$ (a)

ie, any prime number > 3 is of the form $6n \pm 1$; where n is any natural number. Thus $(6n \pm 1)^2 = 36n^2 \pm 12n + 1$

$= 6(6n^2 \pm 2n) + 1$

26) For some integer m, every even integer is of the form
(a) m (b) m+1 (c) 2m (d) 2m+1

Solution:-

All even integers are divisible by 2
Thus 2m (c)

27) For some integer q, every odd integer is of the form
(a) q (b) q+1 (c) 2q (d) 2q+1

Solution:-

All odd integers are of the form 2q+1 (d)

28) n^2-1 is divisible by 8, if n is
(a) an integer (b) a natural number (c) an odd integer
(d) an even integer.

Solution:-

eg:- when $n = 15$, $n^2-1 = 225-1 = 224$, which is divisible by 8
when $n = 11$, $n^2-1 = 121-1 = 120$, which is divisible by 8
Hence an odd integer (c)

29) The decimal expansion of the rational number $\frac{33}{2^2 \times 5}$ will terminate after
(a) one decimal place (b) two decimal places
(c) three decimal places (d) more than 3 decimal places.

Solution:-

$$\frac{33}{2^2 \times 5^1}$$

Hence, terminates after two decimal places (b)

30) If two positive integers a and b are written as $a = x^3y^2$ and $b = xy^3$; x, y are prime numbers, then HCF(a, b) is
(a) xy (b) xy^2 (c) x^3y^3 (d) x^2y^2

Solution:-

HCF(a, b) = xy^2 (b)

31) The largest number which divides 70 and 125, leaving remainders 5 and 8, respectively is
(a) 13 (b) 65 (c) 875 (d) 1750

Solution:-

70 − 5 = 65 ; 125 − 8 = 117
HCF(65, 117) = 13 (a)

65) 117 (1
65
52) 65 (1
52
13) 52 (4
52
0

32) The product of a non-zero rational number and an irrational number is
(a) always irrational (b) always rational
(c) rational or irrational (d) one

Solution:-
eg:- $2 \times \sqrt{5} = 2\sqrt{5}$, irrational always (a)

33) The HCF and LCM of 12, 21, 15 respectively are
(a) 3,140 (b) 12,420 (c) 3,420 (d) 420,3

Solution:-
$12 = 2^2 \times 3$
$21 = 7 \times 3$
$15 = 5 \times 3$
$HCF(12, 21, 15) = 3$
$LCM(12, 21, 15) = 2^2 \times 7 \times 5 \times 3 = 420$
Hence 3, 420 (c)

34) Euclid's division lemma states that for two positive integers a and b, there exist unique integers q and r such that $a = bq + r$, where r must satisfy,
(a) $1 < r < b$ (b) $0 < r \leq b$ (c) $0 \leq r < b$ (d) $0 < r < b$

Solution:-
$0 \leq r < b$ (c)