CHAPTERWISE QUESTION ANSWERS

Class X **MATHEMATICS**

REAL NUMBERS

SET A

SECTION - A

1. b) xy^2
2. a) always irrational
3. c) 87
4. c) 338
5. b) 1

OR

b) 33

6. a) x = 21 and y = 84
7. d) 12 : 1
8. b) only (i) and (ii)
9. d) Assertion (A) is false but reason (R) is true.
10. c) Assertion (A) is true but reason (R) is false.

SECTION - B

11. 2^7 3^2

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

That is, we can find integers a and b such that $\sqrt{3} = \frac{a}{b}$

Suppose a and b have a common factor other than 1, then we can divide by the common factor and assume that a and b are coprime.

So, $b\sqrt{3}$ = a.

OR

LCM HCF = 420 × 12 = 5040

60 × 84 = 5040.

SECTION - C

13. To find the time after which they meet again at the starting point, we have to find LCM of 18 and 12 minutes. We have 18 = 2 × 3^2 and 12 = 2^2 × 3

Therefore, LCM of 18 and 12 = $2^2 \times 3^2 = 36$

So, they will meet again at the starting point after 36 minutes.

14. $z = 2 \times 17 = 34$; $y = 34 \times 2 = 68$ and $x = 2 \times 68 = 136$

Yes, value of x can be found without finding value of y or z as

$x = 2 \times 2 \times 2 \times 17$ which are prime factors of x.

OR

Here, to find the required smallest number we will find LCM of 306 and 657.

$306 = 2 \times 3^2 \times 17$

$657 = 3^2 \times 73$

LCM = $2 \times 3^2 \times 17 \times 73 = 22338$

15. The greatest number of cartons is the HCF of 144 and 90

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

$90 = 2 \times 3^2 \times 5$

HCF = $2 \times 3^2 = 18$

The greatest number of cartons = 18.

16. Assume the pair of numbers to be x and y. Writes that, since HCF (x, y) = 13, x and y will be of the form.

$x = 13\,p$

$y = 13\,q$

Where, p and q are co-primes.

Uses the given information and writes.

$x + y = 91$

$\Rightarrow 13p + 13q = 91$

$\Rightarrow p + q = 7$

Finds all possible values of x and y as :

1 and 6

2 and 5

3 and 4

Finds all possible values of x and y as :

13 and 78

26 and 65

39 and 52

SECTION - D

17. Given numbers = 30, 72, 432

    $30 = 2 \times 3 \times 5$; $72 = 2^3 \times 3^2$ and $432 = 2^4 \times 3^3$

    Here, 2^1 and 3^1 are the smallest powers of the common factors 2 and 3 respectively.

    So, HCF (30, 72, 432) = $2^1 \times 3^1 = 2 \times 3 = 6$

    Again, 2^4, 3^3 and 5^1 are the greatest powers of the prime factors 2, 3 and 5 respectively.

    So, LCM (30, 72, 432) = $2^4 \times 3^3 \times 5^1 = 2160$

    HCF × LCM = 6 × 2160 = 12960

    Product of numbers = 30 × 72 × 432 = 933120

    Therefore, HCF × LCM $\neq$ Product of the numbers

18. $378 = 3^3 \times 2 \times 7$

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

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

    HCF = 3 × 2 = 6

    LCM = $3^3 \times 2^2 \times 5 \times 7 = 3780$

    HCF × LCM = 3780 × 6 = 22,680

    Product of numbers = 378 × 180 × 420 = 28576800

    No HCF × LCM is not equal to product of three numbers.

SECTION - E

CASE STUDY

19. i) HCF of (15, 40) = 5

    Fruits will be distributed equally among 5 guests.

    ii) Out of 15 apples each guest will get 15/5 = 3 apples

    Out of 40 banana each guest will get 40/5 = 8 bananas.

SET B

1. d) $2^3 \times 3^3$
2. c) 2×7^2
3. a) $2^3 \times 3 \times 5$
4. c) irrational number

5. c) $a^3 b^2$

6. b) 500

OR

a) 3024

7. a) $3 \times 13 \times 11$

8. c) only k, 7 k and k^3

9. a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)

10. d) Assertion (A) is false but reason (R) is true.

SECTION - B

11. $(15)^n$ can end with the digit 0 only if $(15)^n$ is divisible by 2 and 5.

But prime factors of $(15)^n$ are $3^n \times 5^n$

By fundamental theorem of Arithmetic, there is no natural number n for which $(15)^n$ ends with the digit zero.

12. HCF = 23

OR

Since a is odd, it is not divisible by 2 (so we need to multiply (from 2b) with LCM of a and b) since b is not divisible by 3 we need to multiply 3 from 3a with LCM of a, b.

Hence, LCM (3a and 2b) = 6P.

SECTION - C

13. To find LCM (9, 12, 15)

$9 = 3 \times 3$

$12 = 2 \times 2 \times 3$

$15 = 3 \times 5$

LCM (9, 12, 15) = $3 \times 3 \times 2 \times 2 \times 5 = 180$ minutes

The bells will toll together after 180 minutes.

14. $16 = 2 \times 2 \times 2 \times 2 = 2^4$

$36 = 2 \times 2 \times 3 \times 3 = 2^2 \times 3^2$

HCF (16, 36) = $2 \times 2 = 4$

LCM (16, 36) = $2^4 \times 3^2 = 16 \times 9 = 144$

We can check HCF and LCM are correct or wrong by using formula

HCF (a, b) × LCM (a, b) = Product of the numbers = a × b

Product of the HCF and LCM should be equal to product of the numbers.

$\Rightarrow \quad 4 \times 144 = 16 \times 36$

$\Rightarrow \quad 576 = 576$

$\Rightarrow \quad$ LHS = RHS

Hence our answer is correct.

15. Let us suppose that $\sqrt{3} + \sqrt{5}$ is rational.

Let $\sqrt{3} + \sqrt{5}$ = a, where a is rational.

Therefore, $\sqrt{3} = a - \sqrt{5}$

On squaring both sides, we get $\left(\sqrt{3}\right)^2 = \left(a - \sqrt{5}\right)^2$

$3 = a^2 + 5 - 2a\sqrt{5} \qquad [\because (a - b)^2 = a^2 + b^2 - 2ab]$

$2a\sqrt{5}\ \ a^2 + 2$

Therefore, $\sqrt{5} = \dfrac{a^2 + 2}{2a}$ which is contradiction.

As the right hand side is rational number while $\sqrt{5}$ is irrational. Since, 3 and 5 are prime numbers. Hence $\sqrt{3} + \sqrt{5}$ is irrational.

OR

HCF = x

LCM = 14 × HCF = 14x

LCM + HCF = 600

14x + x = 500

15x = 600

x = 40

HCF = 40 and LCM = 14 × 40 = 560

Since, LCM × HCF = product of the numbers

560 × 40 = 280 × second number

Second number = 80.

16. Finds the HCF of 210 and 55 using Euclid's division algorithm as :

210 = (55 × 3) + 45

55 = (45 × 1) + 10

45 = (10 × 4) + 5

10 = (5 × 2) + 0

Concludes that HCF of β, 630, α and 110 is 5.

SECTION - D

17. If the number 6^n, for any n, were to end with the digit zero, then it would be divisible by 5. That is, the prime factorization of 6^n would contain the prime 5. But $6 = (2 \times 3)^n = 2^n \times 3^n$ so the primes in factorization of 6n are 2 and 3. So the uniqueness of the Fundamental Theorem of Arithmetic guarantees that there are no other primes except 2 and 3 in the factorization of $6^{n.}$ So there is no natural number n for which 6^n ends with digit zero.

18. Let us assume that $5-\sqrt{3}$ is a rational number.

So, $5-\sqrt{3}$ may be written as

$5-\sqrt{3} = \frac{p}{q}$, where p and q are integers, having no common factor except 1 and q $\neq$ 0.

$\Rightarrow 5-\frac{p}{q} = \sqrt{3} \quad \Rightarrow \sqrt{3} = \frac{5q-p}{q}$

Since $\frac{5q-p}{q}$ is a rational number as p and q are integers.

$\therefore \sqrt{3}$ is also a rational number which is a contradiction.

Thus, our assumption is wrong.

Hence, $5-\sqrt{3}$ is and irrational number.

SECTION - E

CASE STUDY

19. i) HCF of 825 and 675

825 = 3 × 5 × 5 × 11

675 = 3 × 3 × 3 × 5 × 5

HCF = 3 × 5 × 5 = 75

Maximum capacity required is 75 litres

ii) The first tanker will require 875/75 = 11 times to fill

The second tanker will require 675/75 = 9 times to fill