MIND CURVE · INFINITY THINK BEYOND

Real Numbers

Chapter 1 · Previous Year Questions with Answers · Class X Mathematics Standard (041)

01 TOPIC 1 HCF, LCM & Prime Factorisation

QUICK RECAP

- **Fundamental Theorem of Arithmetic:** every composite number can be written as a product of primes in exactly one way (apart from order). Example: $1232 = 2^4 \times 7 \times 11$.
- **HCF** = product of the *smallest* power of each *common* prime. **LCM** = product of the *greatest* power of *every* prime involved.
- For two positive integers only: $\text{HCF}(a,b) \times \text{LCM}(a,b) = a \times b$. (This does **not** hold for three numbers.)
- Recall from Class VI: two consecutive natural numbers are always co-prime, so their HCF is 1.

Q1 MCQ · 1 mark — **2026 (II)** – 30/7/1, 30/7/3

If a and b are any two positive integers, then :

(A) $\text{HCF}(a,b) + \text{LCM}(a,b) = a + b$
(B) $\text{HCF}(a,b) + \text{LCM}(a,b) = a \times b$
(C) $\text{HCF}(a,b) \times \text{LCM}(a,b) = a \times b$
(D) $\text{HCF}(a,b) = \text{LCM}(a,b)$

ANSWER (C) $\text{HCF}(a,b) \times \text{LCM}(a,b) = a \times b$

Q2 MCQ · 1 mark — **2024** – 30/S/1, 30/S/2, 30/S/3

Two positive integers m and n are expressed as $m = p^5q^2$ and $n = p^3q^4$, where p and q are prime numbers. The LCM of m and n is :

(A) p^8q^6
(B) p^3q^2
(C) p^5q^4
(D) $p^5q^2 + p^3q^4$

ANSWER (C) p^5q^4

Q3 MCQ · 1 mark — **2026 (II)** – 30/7/1, 30/7/2, 30/7/3

If two positive integers a and b are written as $a = x^3y^2$ and $b = xy^3$, where x and y are prime numbers, then $\text{LCM}(a,b)$ is :

(A) xy
(B) xy^2
(C) x^3y^3
(D) x^2y^2

ANSWER (C) x^3y^3

Q4 MCQ · 1 mark — **2024** – 30(B)/S

If $a = 2^4 \times 3^3$, $b = 2^3 \times 3^2 \times 5$, $c = 3^n \times 5^2$ and $\text{LCM}(a,b,c) = 5^2 \times 3^4 \times 2^4$, then n is :

(A) 1
(B) 2

(C) 3 (D) 4

ANSWER (D) 4

Q5 MCQ · 1 mark **2025** – 30(B)/S

The ratio of the HCF to the LCM of 7, 21 and 28 is :

(A) 1 : 4 (B) 3 : 4
(C) 1 : 8 (D) 1 : 12

ANSWER **(D) 1 : 12**

Q6 MCQ · 1 mark **2025** – 30/S/1, 30/S/2, 30/S/3

The total number of factors of the square of a prime number is :

(A) 1 (B) 2
(C) 3 (D) 4

ANSWER **(C) 3**

Q7 MCQ · 1 mark **2026 (II)** – 30/7/2

The least number that is divisible by all the natural numbers from 1 to 10 (both inclusive) is :

(A) 10 (B) 100
(C) 504 (D) 2520

ANSWER **(D) 2520**

Q8 MCQ · 1 mark **2026 (II)** – 30(B)

If x and y are two odd prime numbers, such that $x > y$, then $x^2 - y^2$ is :

(A) an odd number (B) an even number
(C) a prime number (D) an odd prime number

ANSWER **(B) an even number**

Q9 MCQ · 1 mark **2023** – 30/C/B

The greatest number which divides both 83 and 138, leaving remainders 5 and 8 respectively, is :

(A) 13 (B) 65
(C) 26 (D) 39

ANSWER **(C) 26**

Q10 MCQ · 1 mark **2025** – 30/1/1, 30/1/2, 30/1/3

If $\text{HCF}(98, 28) = m$ and $\text{LCM}(98, 28) = n$, then the value of $n - 7m$ is :

(A) 0 (B) 28
(C) 98 (D) 198

ANSWER *

HCF $= 14$, LCM $= 196$; $196 - 7 \times 14 = 98$

(C) 98

Q11 MCQ · 1 mark **2025** – 30/1/2

The greatest number which divides 70 and 125, leaving remainders 5 and 8 respectively, is :

(A) 13 (B) 65
(C) 875 (D) 1750

ANSWER *

$\text{HCF}(65, 117) = 13$

(A) 13

Q12 MCQ · 1 mark **2025** – 30/2/1, 30/2/2, 30/2/3

The least number which is a perfect square and is divisible by each of 16, 20 and 50, is :

(A) 1200 (B) 100
(C) 3600 (D) 2400

ANSWER *

$\text{LCM}(16, 20, 50) = 2^4 \times 5^2 = 400 = 20^2$, which is not among the options. Of the options, only 3600 is a perfect square divisible by 16, 20 and 50.

(C) 3600 (nearest option; see note)

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Q13 MCQ · 1 mark **2025** – 30/2/1, 30/2/3

The sum of the exponents of prime factors in the prime factorisation of 4004 is :

(A) 5 (B) 4
(C) 3 (D) 2

ANSWER *

$4004 = 2^2 \times 7 \times 11 \times 13$; $2 + 1 + 1 + 1 = 5$

(A) 5

Q14 MCQ · 1 mark **2025** – 30/2/1, 30/2/2

The HCF of 40, 110 and 360 is :

(A) 40 (B) 110
(C) 360 (D) 10

ANSWER * **(D) 10**

Q15 MCQ · 1 mark **2025** – 30/2/3

If $a^b = 32$, where 'a' and 'b' are positive integers, then the value of b^{ab} is :

(A) 72 (B) 5^{10}

(C) 2^{10}
(D) 5^{12}

ANSWER *
$a = 2,\ b = 5; b^{ab} = 5^{10}$
(B) 5^{10}

Q16 MCQ · 1 mark **2025** – 30/3/1, 30/3/2, 30/3/3

If x is the LCM of 4, 6, 8 and y is the LCM of 3, 5, 7 and p is the LCM of x and y, then which of the following is true ?

(A) p = 35x
(B) p = 4y
(C) p = 8x
(D) p = 16y

ANSWER *
$x = 24,\ y = 105,\ p = 840 = 35x$
(A) p = 35x

Q17 MCQ · 1 mark **2025** – 30/4/1, 30/4/2, 30/4/3

If $x = ab^3$ and $y = a^3b$, where a and b are prime numbers, then [HCF(x, y) − LCM(x, y)] is equal to :

(A) $1 - a^3b^3$
(B) $ab(1 - ab)$
(C) $ab - a^4b^4$
(D) $ab(1 - ab)(1 + ab)$

ANSWER *
HCF $= ab$, LCM $= a^3b^3$; $ab - a^3b^3 = ab(1 - ab)(1 + ab)$
(d) $ab(1 - ab)(1 + ab)$

Q18 MCQ · 1 mark **2025** – 30/5/1

Let $x = a^2b^3c^n$ and $y = a^3b^mc^2$, where a, b, c are prime numbers. If LCM of x and y is $a^3b^4c^3$, then the value of $m + n$ is

(A) 10
(B) 7
(C) 6
(D) 5

ANSWER *
$m = 4,\ n = 3$
(B) 7

Q19 MCQ · 1 mark **2025** – 30/5/2

Let $a = p^2q^3r^n$ and $b = p^3q^mr^2$, where p, q, r are prime numbers. If LCM of a and b is $p^3q^4r^3$, then the value of $3n - 2m$ is

(A) −1
(B) 1
(C) 3
(D) −3

ANSWER *

$m = 4,\ n = 3; 9 - 8 = 1$

(B) 1

Q20 MCQ · 1 mark **2025** – 30/5/3

Let $p = x^2y^3z^n$ and $q = x^3y^mz^2$, where x, y, z are prime numbers. If LCM$(p, q) = x^3y^4z^3$, then the value of $(2m + 3n)$ is

(A) 18
(B) 17
(C) 15
(D) 14

ANSWER *

$m = 4,\ n = 3; 8 + 9 = 17$

(B) 17

Q21 MCQ · 1 mark **2025** – 30/5/1, 30/5/2, 30/5/3

For any prime number p, if p divides a^2, where a is any real number then p also divides

(A) a
(B) $a^{1/2}$
(C) $a^{3/2}$
(D) $a^{1/8}$

ANSWER * **(A) a**

Q22 MCQ · 1 mark **2025** – 30(B)

The HCF and the LCM of 14, 21 and 77 respectively are

(A) 7, 77
(B) 14, 462
(C) 7, 462
(D) 21, 77

ANSWER * **(C) 7, 462**

Q23 MCQ · 1 mark **2023** – 30/4/1, 30/4/2, 30/4/3

The ratio of HCF to LCM of the least composite number and the least prime number is :

(A) 1 : 2
(B) 2 : 1
(C) 1 : 1
(D) 1 : 3

ANSWER *

Numbers 4 and 2: HCF 2, LCM 4

(a) 1 : 2

Q24 MCQ · 1 mark **2023** – 30(B)

The ratio of HCF and LCM of the least prime number and the least composite number, is :

(A) 1 : 2
(B) 2 : 1
(C) 1 : 3
(D) 1 : 1

ANSWER * **(a) 1 : 2**

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Q25 MCQ · 1 mark — **2023** – 30(B)

The greatest number which divides both 30 and 80, leaving remainder 2 and 3 respectively, is :

(A) 10 (B) 7
(C) 11 (D) 14

ANSWER *
$\text{HCF}(28, 77) = 7$

(b) 7

Q26 MCQ · 1 mark — **2023** – 30/6/2

The LCM of smallest 2-digit number and smallest composite number is

(A) 12 (B) 4
(C) 20 (D) 40

ANSWER * **(C) 20**

Q27 MCQ · 1 mark — **2024** – 30/1/1, 30/1/2, 30/1/3

If two positive integers p and q can be expressed as $p = 18a^2b^4$ and $q = 20a^3b^2$, where a and b are prime numbers, then $\text{LCM}(p, q)$ is :

(A) $2a^2b^2$ (B) $180a^2b^2$
(C) $12a^2b^2$ (D) $180a^3b^4$

ANSWER * **(d) $180a^3b^4$**

Q28 MCQ · 1 mark — **2024** – 30/2/2, 30/2/3, 30/3/1, 30/3/2, 30/3/3

If the $\text{HCF}(2520, 6600) = 40$ and $\text{LCM}(2520, 6600) = 252 \times k$, then the value of k is

(A) 1650 (B) 1600
(C) 165 (D) 1625

ANSWER *
$$\text{LCM} = \frac{2520 \times 6600}{40} = 415800 = 252 \times 1650$$

(A) 1650

Q29 MCQ · 1 mark — **2024** – 30/3/2

If $a = 2^2 \times 3^x$, $b = 2^2 \times 3 \times 5$, $c = 2^2 \times 3 \times 7$ and $\text{LCM}(a, b, c) = 3780$, then x is equal to

(A) 1 (B) 2
(C) 3 (D) 0

ANSWER *
$3780 = 2^2 \times 3^3 \times 5 \times 7$

(C) 3

Q30 MCQ · 1 mark — **2024** – 30/4/1, 30/4/3

The HCF of two numbers 65 and 104 is 13. If LCM of 65 and 104 is 40x, then the value of x is :

(A) 5
(B) 13
(C) 40
(D) 8

ANSWER *

$\text{LCM} = \frac{65 \times 104}{13} = 520 = 40 \times 13$

(B) 13

Q31 MCQ · 1 mark — **2024** – 30/5/1, 30/5/3

The greatest number which divides 281 and 1249, leaving remainder 5 and 7 respectively, is :

(A) 23
(B) 276
(C) 138
(D) 69

ANSWER *

$\text{HCF}(276, 1242) = 138$

(C) 138

Q32 MCQ · 1 mark — **2024** – 30/5/1, 30/5/2, 30/5/3

The LCM of three numbers 28, 44, 132 is :

(A) 258
(B) 231
(C) 462
(D) 924

ANSWER * **(D) 924**

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Q33 MCQ · 1 mark — **2024** – 30/5/1, 30/5/2

If the product of two co-prime numbers is 553, then their HCF is :

(A) 1
(B) 553
(C) 7
(D) 79

ANSWER * **(A) 1**

Q34 MCQ · 1 mark — **2024** – 30/5/2

If the prime factorisation of 2520 is $2^3 \times 3^a \times b \times 7$, then the value of $a + 2b$ is :

(A) 12
(B) 10
(C) 9
(D) 7

ANSWER *

$2520 = 2^3 \times 3^2 \times 5 \times 7; a = 2,\ b = 5$

(A) 12

Q35 MCQ · 1 mark — **2024** – 30/5/3

The LCM of the smallest prime number and the smallest odd composite number is :

(A) 10 (B) 6
(C) 9 (D) 18

ANSWER *
$\text{LCM}(2, 9) = 18$
(D) 18

Q36 MCQ · 1 mark — **2024** – 30(B)

The LCM of 24, 36 and 60 in terms of their prime factors is :

(A) $2^2 \times 3 \times 5$ (B) $2^3 \times 3^2$
(C) $2^3 \times 3^2 \times 5$ (D) $2^3 \times 3^3 \times 5$

ANSWER * **(C) $2^3 \times 3^2 \times 5$**

Q37 MCQ · 1 mark — **2026 (I)** – 30/1/1, 30/1/2, 30/1/3

The HCF of 960 and 432 is

(A) 48 (B) 54
(C) 72 (D) 36

ANSWER * **(a) 48**

Q38 MCQ · 1 mark — **2026 (I)** – 30/2/1, 30/2/3

The LCM of 960 and 240 is :

(A) 960 (B) 240
(C) 60 (D) 15

ANSWER * **(A) 960**

Q39 MCQ · 1 mark — **2026 (I)** – 30(B)

If HCF of 66 and 99 is expressible in the form of 55m − 132, then the value of m is :

(A) 4 (B) 2
(C) 1 (D) 3

ANSWER *
$\text{HCF} = 33 = 55m - 132 \Rightarrow m = 3$
(D) 3

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Q40 Very Short Answer · 2 marks | Internal choice (OR) part | **2026 (II)** – 30/8/1, 30/8/2, 30/8/3

Find the greatest number which divides 37, 66, 89, leaving remainder 2, 3, 5 respectively.

ANSWER

$37 - 2 = 35 = 5 \times 7$ ½

$66 - 3 = 63 = 3^2 \times 7$ ½

$89 - 5 = 84 = 2^2 \times 3 \times 7$ ½

$\text{HCF}(35, 63, 84) = 7$ ½

$\therefore$ required number is 7.

Required number is 7.

Q41 Very Short Answer · 2 marks | Internal choice (OR) part | **2026 (II)** – 30/8/1, 30/8/2, 30/8/3

Sum and difference of two numbers is 256 and 224 respectively. Find their HCF and LCM.

ANSWER

Let two numbers be x and y where $x > y$. According to question, $x + y = 256$ --- (i), $x - y = 224$ --- (ii) ½

Solving (i) and (ii), we get $x = 240$ and $y = 16$ ½

$\text{HCF}(240, 16) = 16$ ½

and $\text{LCM}(240, 16) = 240$ ½

HCF = 16, LCM = 240

Q42 Very Short Answer · 2 marks | **2025** – 30/S/1

If LCM of 51 and 85 can be expressed in the form of $6z - 9$, then find the value of z.

ANSWER

$51 = 3 \times 17, \quad 85 = 5 \times 17$

$\text{LCM}(51, 85) = 3 \times 5 \times 17 = 255$ 1

Now, $6z - 9 = 255$ ½

$\Rightarrow z = 44$ ½

z = 44

Q43 Very Short Answer · 2 marks | **2023** – 30/C/B

Find the HCF and LCM of 84, 90 and 120 by prime factorization method.

ANSWER

$84 = 2^2 \times 3 \times 7, 90 = 2 \times 3^2 \times 5, 120 = 2^3 \times 3 \times 5$ 1

$\text{HCF} = 6$ ½

$\text{LCM} = 2520$ ½

HCF = 6, LCM = 2520

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Q44 Very Short Answer · 2 marks — **2023** – 30/1/1, 30/1/3

Find the greatest number which divides 85 and 72 leaving remainders 1 and 2 respectively.

ANSWER *

$85 - 1 = 84 = 2^2 \times 3 \times 7, 72 - 2 = 70 = 2 \times 5 \times 7$

Required number $= \text{HCF}(84, 70) = 14$

14

Q45 Very Short Answer · 2 marks — **2023** – 30/1/2

Find the least number which when divided by 12, 16 and 24 leaves remainder 7 in each case.

ANSWER *

$\text{LCM}(12, 16, 24) = 48$

Required number $= 48 + 7 = 55$

55

Q46 Very Short Answer · 2 marks — **2023** – 30/5/1, 30/5/2

Using prime factorisation, find HCF and LCM of 96 and 120.

ANSWER *

$96 = 2^5 \times 3, 120 = 2^3 \times 3 \times 5$

$\text{HCF} = 2^3 \times 3 = 24, \text{LCM} = 2^5 \times 3 \times 5 = 480$

HCF = 24, LCM = 480

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Q47 Very Short Answer · 2 marks — **2025** – 30(B)

Find HCF and LCM of 35 and 55 and verify your answer.

ANSWER *

$35 = 5 \times 7, 55 = 5 \times 11$; $\text{HCF} = 5, \text{LCM} = 385$

Verification: $5 \times 385 = 1925 = 35 \times 55$

HCF = 5, LCM = 385

Q48 Very Short Answer · 2 marks — **2023** – 30/4/1, 30/4/2, 30/4/3

Two numbers are in the ratio 2 : 3 and their LCM is 180. What is the HCF of these numbers ?

ANSWER *

Let the numbers be $2x$ and $3x$; $\text{LCM} = 6x = 180 \Rightarrow x = 30$

$\text{HCF} = x = 30$

HCF = 30

Q49 Very Short Answer · 2 marks — **2026 (I)** – 30(B)

Two numbers are in the ratio 3 : 5 and their LCM is 180. Find the HCF of these two numbers.

ANSWER *

Let the numbers be $3x$ and $5x$; LCM $= 15x = 180 \Rightarrow x = 12$

HCF $= x = 12$

HCF = 12

Q50 Very Short Answer · 2 marks — **2025** – 30/3/1, 30/3/2, 30/3/3

(a) Find the smallest number which is divisible by both 644 and 462.
OR
(b) Two numbers are in the ratio 4 : 5 and their HCF is 11. Find the LCM of these numbers.

ANSWER *

(a) $644 = 2^2 \times 7 \times 23$, $462 = 2 \times 3 \times 7 \times 11$; LCM $= 2^2 \times 3 \times 7 \times 11 \times 23 = 21252$

(b) Numbers $= 44$ and 55; LCM $= 2^2 \times 5 \times 11 = 220$

(a) 21252 OR (b) 220

Q51 Very Short Answer · 2 marks — **2024** – 30(B)

Find the smallest number that is divisible by each of 8, 9 and 10.

ANSWER *

LCM$(8, 9, 10) = 2^3 \times 3^2 \times 5 = 360$

360

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Q52 Short Answer · 3 marks — **2023** – 30/2/1, 30/2/2, 30/2/3

(a) Find by prime factorisation the LCM of the numbers 18180 and 7575. Also, find the HCF of the two numbers.
OR
(b) Three bells ring at intervals of 6, 12 and 18 minutes. If all the three bells rang at 6 a.m., when will they ring together again ?

ANSWER *

(a) $18180 = 2^2 \times 3^2 \times 5 \times 101$, $7575 = 3 \times 5^2 \times 101$

LCM $= 2^2 \times 3^2 \times 5^2 \times 101 = 90900$; HCF $= 3 \times 5 \times 101 = 1515$

(b) LCM$(6, 12, 18) = 36$ minutes, so they ring together again at 6:36 a.m.

(a) LCM = 90900, HCF = 1515 OR (b) 6:36 a.m.

Q53 Short Answer · 3 marks — **2023** – 30/6/1, 30/6/2, 30/6/3

(A) Find the HCF and LCM of 26, 65 and 117, using prime factorisation.
OR

(B) Prove that $\sqrt{2}$ is an irrational number.

ANSWER *

$26 = 2 \times 13$, $65 = 5 \times 13$, $117 = 3^2 \times 13$

HCF $= 13$; LCM $= 2 \times 3^2 \times 5 \times 13 = 1170$

(B) Proof as for $\sqrt{2}$ under "Proving Irrationality of $\sqrt{p}$".

(A) HCF = 13, LCM = 1170

Q54 Short Answer · 3 marks — **2025** – 30/4/1, 30/4/2, 30/4/3

(A) Prove that $\sqrt{2}$ is an irrational number.

OR

(B) Let x and y be two distinct prime numbers and $p = x^2y^3$, $q = xy^4$, $r = x^5y^2$. Find the HCF and LCM of p, q and r. Further check if HCF$(p, q, r) \times$ LCM$(p, q, r) = p \times q \times r$ or not.

ANSWER *

(B) HCF $= xy^2$, LCM $= x^5y^4$

HCF $\times$ LCM $= x^6y^6$ while $p \times q \times r = x^8y^9$, so they are not equal.

(B) HCF $= xy^2$, LCM $= x^5y^4$; not equal

02 TOPIC 2 Prime & Composite Numbers

QUICK RECAP

- A **prime** has exactly two factors (1 and itself); 2 is the only even prime. 1 is **neither prime nor composite**.
- To show an expression like $7 \times 11 \times 13 + 13$ is composite, take out the common factor: $13(7 \times 11 + 1) = 13 \times 78$.
- Odd prime $\times$ odd prime is odd; odd $\pm$ odd is even.

Q55 MCQ · 1 mark — **2026 (I)** – 30/1/1, 30/1/2, 30/1/3

The natural number 2 is :

(A) a prime number
(B) a composite number
(C) prime as well as composite
(D) neither prime nor composite

ANSWER * **(a) a prime number**

Q56 MCQ · 1 mark — **2026 (I)** – 30/2/1, 30/2/2, 30/2/3

The natural number 1 is :

(A) a prime number.
(B) a composite number.
(C) prime as well as composite.
(D) neither prime nor composite.

ANSWER * **(D) neither prime nor composite**

Q57 MCQ · 1 mark — **2026 (I)** – 30/3/1, 30/3/2, 30/3/3

$(3 \times 11 \times 13 + 3)$ is :

(A) a prime number
(B) divisible by 13

(C) a composite number (D) an odd number

ANSWER *

$= 3(143 + 1) = 432$

(C) a composite number

Q58 Assertion–Reason · 1 mark **2025** – 30/6/1

Assertion (A): For any two prime numbers p and q, their HCF is 1 and LCM is p + q.
Reason (R): For any two natural numbers, HCF × LCM = product of numbers.

(A) Both true, R explains A · (B) Both true, R does not explain A · (C) A true, R false · (D) A false, R true

ANSWER * **(D) Assertion (A) is false, but Reason (R) is true.**

Q59 Assertion–Reason · 1 mark **2025** – 30/6/2

Assertion (A): For two prime numbers x and y $(x < y)$, $\text{HCF}(x, y) = x$ and $\text{LCM}(x, y) = y$.
Reason (R): $\text{HCF}(x, y) \leq \text{LCM}(x, y)$, where x, y are any two natural numbers.

(A) Both true, R explains A · (B) Both true, R does not explain A · (C) A true, R false · (D) A false, R true

ANSWER * **(D) Assertion (A) is false, but Reason (R) is true.**

Q60 Assertion–Reason · 1 mark **2025** – 30/6/3

Assertion (A): For two odd prime numbers x and y $(x \neq y)$, $\text{LCM}(2x, 4y) = 4xy$.
Reason (R): $\text{LCM}(x, y)$ is a multiple of $\text{HCF}(x, y)$.

(A) Both true, R explains A · (B) Both true, R does not explain A · (C) A true, R false · (D) A false, R true

ANSWER * **(B) Both A and R are true, but R is not the correct explanation of A.**

Q61 Assertion–Reason · 1 mark **2026 (I)** – 30/5/1, 30/5/2, 30/5/3

Assertion (A): $\text{H.C.F.}(36m^2, 18m) = 18m$, where m is a prime number.
Reason (R): H.C.F. of two numbers is always less than or equal to the smaller number.

(A) Both true, R explains A · (B) Both true, R does not explain A · (C) A true, R false · (D) A false, R true

ANSWER * **(B) Both A and R are true, but R is not the correct explanation of A.**

Q62 Very Short Answer · 2 marks **2024** – 30/2/2

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.

ANSWER *

$7 \times 11 \times 13 + 13 = 13(77 + 1) = 13 \times 78$

$7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5 = 5(7 \times 6 \times 4 \times 3 \times 2 \times 1 + 1) = 5 \times 1009$

Both are composite.

Q63 Short Answer · 3 marks **2025** – 30/5/1, 30/5/2, 30/5/3

(a) Prove that $\sqrt{3}$ is an irrational number.
OR

(b) State true or false for each of the following statements and justify in each case :
(i) $2 \times 3 \times 5 \times 7 + 7$ is a composite number.
(ii) $2 \times 3 \times 5 \times 7 + 1$ is a composite number.

ANSWER *
(i) $7(2 \times 3 \times 5 + 1) = 7 \times 31 = 217$: composite, so True.
(ii) 211 has no prime factor up to $\sqrt{211} \approx 14.5$, so it is prime: False.

(b) (i) True (ii) False

Q64 Short Answer · 3 marks — **2025** – 30/6/1, 30/6/2, 30/6/3

(a) Prove that $\sqrt{5}$ is an irrational number.
OR
(b) Let p, q and r be three distinct prime numbers. Check whether $p \cdot q \cdot r + q$ is a composite number or not. Further, give an example for 3 distinct primes p, q, r such that (i) $p \cdot q \cdot r + 1$ is a composite number. (ii) $p \cdot q \cdot r + 1$ is a prime number.

ANSWER *
$pqr + q = q(pr + 1)$ has factor q, so it is composite.
(i) $3 \times 5 \times 7 + 1 = 106$ (composite) (ii) $2 \times 3 \times 5 + 1 = 31$ (prime)

(b) Composite; e.g. (i) 3, 5, 7 (ii) 2, 3, 5

03 TOPIC 3 HCF & LCM in Real-Life Situations

QUICK RECAP
- **Use HCF** when you are *dividing* things into equal groups, the largest possible size: stacks, tables, rooms, strips of cloth.
- **Use LCM** when events *repeat* and you want them to happen together again: bells, lights, people meeting, finishing a task.
- Number of groups = (each quantity ÷ HCF), added up. Example: 42, 56, 70 with HCF 14 give $3 + 4 + 5 = 12$ groups.

Q65 Very Short Answer · 2 marks — **2026 (II)** – 30(B)

Three bells toll at intervals of 48 seconds, 72 seconds and 108 seconds, respectively. If they start tolling together, after how many seconds will they toll together next ?

ANSWER
$48 = 2 \times 2 \times 2 \times 2 \times 3 = 2^4 \times 3$ ½
$72 = 2 \times 2 \times 2 \times 3 \times 3 = 2^3 \times 3^2$ ½
$108 = 2 \times 2 \times 3 \times 3 \times 3 = 2^2 \times 3^3$ ½
LCM $= 2^4 \times 3^3 = 432$ ½
$\therefore$ The bells will toll together after 432 seconds.

The bells will toll together after 432 seconds.

Q66 Very Short Answer · 2 marks | Internal choice (OR) part | **2024** – 30(B)/S

Find the smallest 4-digit number exactly divisible by 15, 24 and 36.

ANSWER

$\text{LCM}(15, 24, 36) = 360$ 1

Therefore, the smallest 4-digit number which is a multiple of 360 is $360 \times 3 = 1080$ which is divisible by 15, 24 & 36. 1

1080

Q67 Very Short Answer · 2 marks | **2024** – 30/4/1, 30/4/3

Three bells toll at intervals of 9, 12 and 15 minutes respectively. If they start tolling together, after what time will they next toll together ?

ANSWER *

$\text{LCM}(9, 12, 15) = 180$ minutes

After 180 minutes (3 hours)

Q68 Short Answer · 3 marks | **2024** – 30/S/1, 30/S/2, 30/S/3

A school has invited 42 Mathematics teachers, 56 Physics teachers and 70 Chemistry teachers to attend a Science workshop. Find the minimum number of tables required, if the same number of teachers are to sit at a table and each table is occupied by teachers of the same subject.

ANSWER

$\text{HCF}(42, 56, 70) = 14$ 1½

Minimum number of tables required $= \frac{42}{14} + \frac{56}{14} + \frac{70}{14}$ 1

$= 12$ ½

Minimum number of tables required = 12

Q69 Short Answer · 3 marks | **2025** – 30/S/1, 30/S/2, 30/S/3

Ranjita, Neha and Salma start weaving sweaters at the same time for the children of an orphan home. They need 15, 18 and 20 days, respectively, to complete a sweater. After how many days will all of them start making a new sweater again ? By that time how many sweaters will have been completed by them ?

ANSWER

$\text{LCM}(15, 18, 20) = 180$ 1

They will start new sweater again after 180 days.

Total number of sweaters completed in 180 days $= \frac{180}{15} + \frac{180}{18} + \frac{180}{20}$ 1½

$= 31$ ½

After 180 days; 31 sweaters

Q70 Short Answer · 3 marks | Internal choice (OR) part | **2026 (II)** – 30/8/1, 30/8/2, 30/8/3

Sandhya has two pieces of cloth – one 144 cm wide and the other 96 cm wide. She wants to cut both the cloth pieces into equal sized strips such that one is as wide as possible with none left over. What is the

width she can cut ? How many pieces will she get in all ?

ANSWER

$144 = 2^4 \times 3^2$ ½

$96 = 2^5 \times 3$ ½

$\therefore$ HCF $= 2^4 \times 3 = 48$ 1

$\therefore$ required width of cloth piece is 48 cm. Number of pieces $= \frac{144}{48} + \frac{96}{48} = 5$ 1

Width = 48 cm; Number of pieces = 5

Q71 Short Answer · 3 marks **2023** – 30/5/1, 30/5/2, 30/5/3

(a) Prove that $\sqrt{3}$ is an irrational number.

OR

(b) The traffic lights at three different road crossings change after every 48 seconds, 72 seconds and 108 seconds respectively. If they change simultaneously at 7 a.m., at what time will they change together next ?

ANSWER *

(b) LCM$(48, 72, 108) = 2^4 \times 3^3 = 432$ s $= 7$ min 12 s

They change together next at 7:07:12 a.m.

(b) 7:07:12 a.m.

Q72 Short Answer · 3 marks **2024** – 30/1/1, 30/1/2, 30/1/3

In a teachers' workshop, the number of teachers teaching French, Hindi and English are 48, 80 and 144 respectively. Find the minimum number of rooms required if in each room the same number of teachers are seated and all of them are of the same subject.

ANSWER *

HCF$(48, 80, 144) = 16$

Minimum rooms $= \frac{48}{16} + \frac{80}{16} + \frac{144}{16} = 3 + 5 + 9 = 17$

17 rooms

Q73 Short Answer · 3 marks **2026 (I)** – 30/4/1

Find the greatest number less than 10,000 which is exactly divisible by 48, 60 and 65.

ANSWER *

LCM$(48, 60, 65) = 2^4 \times 3 \times 5 \times 13 = 3120$

Multiples: 3120, 6240, 9360, 12480; greatest below 10,000 is 9360

9360

Q74 Short Answer · 3 marks **2026 (I)** – 30/4/2

A trader has three different types of oils of volume 870 l, 812 l and 638 l. Find the least number of

containers of equal size required to store all the oil without getting mixed.

ANSWER *

$\text{HCF}(870, 812, 638) = 58$ l

Containers $= 15 + 14 + 11 = 40$

40 containers (58 l each)

Q75 Short Answer · 3 marks — **2026 (I)** – 30/4/3

Find the greatest number which divides 764 and 1198, leaving remainders 8 and 10 respectively.

ANSWER *

$764 - 8 = 756 = 2^2 \times 3^3 \times 7, 1198 - 10 = 1188 = 2^2 \times 3^3 \times 11$

$\text{HCF} = 2^2 \times 3^3 = 108$

108

04 TOPIC 4 Can the Number End in 0? (Using Prime Factors)

QUICK RECAP

- A number ends in 0 only if it is divisible by 10, that is, its prime factorisation contains **both 2 and 5**.
- A number ends in 5 only if its prime factorisation contains **5** (and it is odd).
- By the Fundamental Theorem of Arithmetic, a^n has exactly the same primes as a. So if 5 is not a factor of a, no power of a can end in 0 or 5.

Q76 MCQ · 1 mark — **2025** – 30/6/1, 30/6/2, 30/6/3

Which of the following cannot be the unit digit of 8^n, where n is a natural number ?

(A) 4 (B) 2
(C) 0 (D) 6

ANSWER * **(C) 0**

Q77 MCQ · 1 mark — **2026 (I)** – 30/1/1, 30/1/2, 30/1/3

For any natural number n, 6^n ends with the digit :

(A) 0 (B) 6
(C) 3 (D) 2

ANSWER * **(b) 6**

Q78 MCQ · 1 mark — **2026 (I)** – 30/2/1, 30/2/2, 30/2/3

For any natural number n, 5^n ends with the digit :

(A) 0 (B) 5
(C) 3 (D) 2

ANSWER * **(B) 5**

Q79 Assertion–Reason · 1 mark — **2026 (II)** – 30/8/1, 30/8/2, 30/8/3

Assertion (A): The number 12^n ends with digit 0 where n is a natural number.
Reason (R): Any number ends with digit 0 if its prime factor is of the form $2^m \times 5^n$, where m and n are natural numbers.

(A) Both true, R explains A · (B) Both true, R does not explain A · (C) A true, R false · (D) A false, R true

ANSWER **(D) Assertion (A) is false, but Reason (R) is true.**

Q80 Assertion–Reason · 1 mark — **2025** – 30/4/1, 30/4/2

Assertion (A): 4^n ends with digit 0 for some natural number n.
Reason (R): For a number 'x' having 2 and 5 as its prime factors, x^n always ends with digit 0 for every natural number n.

(A) Both true, R explains A · (B) Both true, R does not explain A · (C) A true, R false · (D) A false, R true

ANSWER * **(d) Assertion (A) is false, but Reason (R) is true.**

Q81 Assertion–Reason · 1 mark — **2025** – 30/4/3

Assertion (A): Unit digit of 3^n cannot be an even number for any natural number n.
Reason (R): 2 is not a prime factor of 3^n for any natural number n.

(A) Both true, R explains A · (B) Both true, R does not explain A · (C) A true, R false · (D) A false, R true

ANSWER * **(a) Both A and R are true and R is the correct explanation of A.**

Q82 Assertion–Reason · 1 mark — **2023** – 30/5/1, 30/5/2, 30/5/3

Assertion (A): The number 5^n cannot end with the digit 0, where n is a natural number.
Reason (R): Prime factorisation of 5 has only two factors, 1 and 5.

(A) Both true, R explains A · (B) Both true, R does not explain A · (C) A true, R false · (D) A false, R true

ANSWER * **(A) Both A and R are true and R is the correct explanation of A.**

Q83 Very Short Answer · 2 marks · Internal choice (OR) part — **2023** – 30/C/1, 30/C/2, 30/C/3

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

ANSWER

If the number 6^n ends with the digit 0, then it should be divisible by 2 and 5. But prime factorisation of 6^n is $(2 \times 3)^n$. 1

$\therefore$ Prime factorisation of 6^n does not contain prime number 5. Hence, 6^n can't end with the digit 0. 1

Hence, 6^n can't end with the digit 0.

Q84 Very Short Answer · 2 marks — **2024** – 30/S/3; **2025** – 30/S/3

Check whether there is any natural number n for which $(14)^n$ ends with the digit '0' or '5'.

> Asked in 2025 as: "Show that 14^n cannot end with the digit 0 or 5 for any natural number n."

ANSWER

$(14)^n = 2^n 7^n$ 1

as it does not have 5 as the prime factor. Hence, it cannot end with the digit 0 or 5. 1

Hence, it cannot end with the digit 0 or 5.

Q85 Very Short Answer · 2 marks **2023** – 30/2/2

Prove that 4^n can never end with digit 0, where n is a natural number.

ANSWER *

$4^n = 2^{2n}$; for ending with 0 the number must have both 2 and 5 as prime factors.

4^n has no prime factor 5, so it can never end with 0.

4^n can never end with 0.

Q86 Very Short Answer · 2 marks **2023** – 30/6/1, 30/6/2, 30/6/3

(A) Show that 6^n can not end with digit 0 for any natural number 'n'.

OR

(B) Find the HCF and LCM of 72 and 120.

ANSWER *

(A) $6^n = 2^n \times 3^n$ has no prime factor 5, so it cannot end with 0.

(B) $72 = 2^3 \times 3^2$, $120 = 2^3 \times 3 \times 5$; HCF $= 24$, LCM $= 360$

(B) HCF = 24, LCM = 360

Q87 Very Short Answer · 2 marks **2024** – 30/2/1

Can the number $(15)^n$, n being a natural number, end with the digit 0 ? Give reasons.

ANSWER *

$15^n = 3^n \times 5^n$ has no prime factor 2, so it cannot end with 0.

No

Q88 Very Short Answer · 2 marks **2024** – 30/2/3

Can the number 8^n, n being a natural number, end with the digit 0 ? Give reasons.

ANSWER *

$8^n = 2^{3n}$ has no prime factor 5, so it cannot end with 0.

No

05 TOPIC 5 Rational & Irrational Numbers

QUICK RECAP

- **Rational:** can be written as $\frac{p}{q}$ (p, q integers, $q \neq 0$). Terminating and non-terminating *recurring* decimals are rational, e.g. $2.\overline{35} = \frac{233}{99}$.
- **Irrational:** non-terminating, non-recurring decimals, e.g. $\sqrt{2} = 1.41421\ldots$, $\sqrt{3} = 1.73205\ldots$
- rational $\pm$ irrational = irrational; non-zero rational $\times$ irrational = irrational. But irrational $\pm$ / $\times$ irrational can be either.

Q89 MCQ · 1 mark — **2025** – 30(B)/S

$2.\overline{35}$ is :

(A) an integer
(B) a rational number
(C) an irrational number
(D) a natural number

ANSWER **(B) a rational number**

Q90 MCQ · 1 mark — **2026 (II)** – 30/7/1, 30/7/2, 30/7/3

A rational number between $\sqrt{2}$ and $\sqrt{3}$ is :

(A) $\frac{\sqrt{2}+\sqrt{3}}{2}$
(B) $\frac{\sqrt{2}-\sqrt{3}}{2}$
(C) 1·3
(D) 1·8

ANSWER **As correct option is not there, so 1 mark to be given to all.**

Q91 MCQ · 1 mark — **2025** – 30/1/1, 30/1/2, 30/1/3

Which of the following is a rational number between $\sqrt{3}$ and $\sqrt{5}$?

(A) 1·4142387954012 ....
(B) $2 \cdot 3\overline{26}$
(C) π
(D) 1·857142

ANSWER *
$\sqrt{3} \approx 1.732$, $\sqrt{5} \approx 2.236$; 1·857142 is a terminating decimal lying between them.
(D) 1·857142

Q92 MCQ · 1 mark — **2025** – 30/6/1, 30/6/2, 30/6/3

$\sqrt{0 \cdot 4}$ is a/an

(A) natural number
(B) integer
(C) rational number
(D) irrational number

ANSWER *
$\sqrt{0.4} = \sqrt{\frac{2}{5}} = \frac{\sqrt{10}}{5}$
(D) irrational number

Q93 MCQ · 1 mark — **2025** – 30/4/1, 30/4/2, 30/4/3

$(1+\sqrt{3})^2-(1-\sqrt{3})^2$ is :

(A) a positive rational number.
(B) a negative integer.
(C) a positive irrational number.
(D) a negative irrational number.

ANSWER *
$=4\sqrt{3}$

(c) a positive irrational number

Q94 MCQ · 1 mark — **2025** – 30/5/1, 30/5/2, 30/5/3

$(\sqrt{3}+2)^2+(\sqrt{3}-2)^2$ is a/an

(A) positive rational number
(B) negative rational number
(C) positive irrational number
(D) negative irrational number

ANSWER *
$=2(3+4)=14$

(A) positive rational number

Q95 MCQ · 1 mark — **2023** – 30/6/1, 30/6/3

If $p^2=\frac{32}{50}$, then p is a/an

(A) whole number
(B) integer
(C) rational number
(D) irrational number

ANSWER *
$p^2=\frac{16}{25}\Rightarrow p=\pm\frac{4}{5}$

(C) rational number

Q96 MCQ · 1 mark — **2024** – 30/3/1, 30/3/3

A pair of irrational numbers whose product is a rational number is :

(A) $(\sqrt{16},\sqrt{4})$
(B) $(\sqrt{5},\sqrt{2})$
(C) $(\sqrt{3},\sqrt{27})$
(D) $(\sqrt{36},\sqrt{2})$

ANSWER *
$\sqrt{3}\times\sqrt{27}=\sqrt{81}=9$

(C) $(\sqrt{3},\sqrt{27})$

Q97 MCQ · 1 mark — **2024** – 30/3/3

The smallest irrational number by which $\sqrt{20}$ should be multiplied so as to get a rational number, is :

(A) $\sqrt{20}$
(B) $\sqrt{2}$
(C) 5
(D) $\sqrt{5}$

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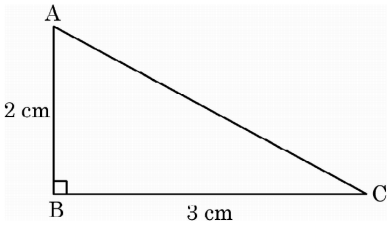
ANSWER *

$\sqrt{20} = 2\sqrt{5}; 2\sqrt{5} \times \sqrt{5} = 10$

(D) $\sqrt{5}$

Q98 Assertion–Reason · 1 mark — **2023** – 30/1/1, 30/1/2, 30/1/3

Assertion (A): The perimeter of $\triangle ABC$ is a rational number.
Reason (R): The sum of the squares of two rational numbers is always rational.



(A) Both true, R explains A · (B) Both true, R does not explain A · (C) A true, R false · (D) A false, R true

ANSWER *

$AC = \sqrt{2^2 + 3^2} = \sqrt{13}$, so perimeter $= 5 + \sqrt{13}$ is irrational.

(D) Assertion (A) is false, but Reason (R) is true.

Q99 Assertion–Reason · 1 mark — **2026 (I)** – 30/4/1, 30/4/2, 30/4/3

Assertion (A): $(\sqrt{3} + \sqrt{5})$ is an irrational number.
Reason (R): Sum of any two irrational numbers is always irrational.

(A) Both true, R explains A · (B) Both true, R does not explain A · (C) A true, R false · (D) A false, R true

ANSWER *

e.g. $\sqrt{2} + (-\sqrt{2}) = 0$ is rational.

(C) Assertion (A) is true, but Reason (R) is false.

Q100 Very Short Answer · 2 marks · Internal choice (OR) part — **2024** – 30(B)/S

Find whether each of the following is an irrational number or a rational number.
(i) $(\sqrt{5} - \sqrt{3})^2$ (ii) $(5 + \sqrt{3})(5 - \sqrt{3})$

ANSWER

(i) $(\sqrt{5} - \sqrt{3})^2 = 8 - 2\sqrt{15}$. So, $(\sqrt{5} - \sqrt{3})^2$ is an irrational number. 1

(ii) $(5 + \sqrt{3})(5 - \sqrt{3}) = 25 - 3 = 22$. So, $(5 + \sqrt{3})(5 - \sqrt{3})$ is a rational number. 1

(i) irrational (ii) rational

TOPIC 6

06 Proving Irrationality of $\sqrt{p}$

QUICK RECAP

- **Method (contradiction):** assume $\sqrt{p} = \frac{a}{b}$ in lowest terms (a, b co-prime, $b \neq 0$). Square: $pb^2 = a^2$, so p divides a^2 and hence a.
- Put $a = pc$: then $b^2 = pc^2$, so p divides b too. Now p is a common factor of a and b, which contradicts "co-prime".
- **Key theorem used:** if a prime p divides a^2, then p divides a.

Q101 Very Short Answer · 2 marks

2023 – 30/5/1, 30/5/2, 30/5/3 (OR); **2024** – 30/S/2, 30/5/1, 30/5/2, 30/5/3 (OR); **2025** – 30/2/1, 30/2/2, 30/2/3, 30/5/1, 30/5/2, 30/5/3 (OR); **2026 (I)** – 30/1/1, 30/1/3, 30/3/2

Prove that $\sqrt{3}$ is an irrational number.

ANSWER

Let $\sqrt{3}$ be a rational number. $\therefore \sqrt{3} = \frac{p}{q}$, where $q \neq 0$ and p & q are coprime. ½

$3q^2 = p^2 \Rightarrow p^2$ is divisible by $3 \Rightarrow p$ is divisible by 3 ----- (i) ½

$\Rightarrow p = 3a$, where a is some integer. $9a^2 = 3q^2 \Rightarrow q^2 = 3a^2 \Rightarrow q^2$ is divisible by $3 \Rightarrow q$ is divisible by 3 ----- (ii) ½

(i) and (ii) leads to contradiction as p and q are coprime. $\therefore \sqrt{3}$ is an irrational number. ½

$\sqrt{3}$ is an irrational number.

Q102 Short Answer · 3 marks

2023 – 30/C/B, 30/1/1, 30/1/2, 30/1/3, 30/4/1, 30/4/2, 30/4/3, 30(B); **2024** – 30(B)/S, 30/2/1, 30/2/2, 30/2/3, 30(B); **2025** – 30/1/3, 30/6/1, 30/6/2, 30/6/3 (OR), 30(B); **2026 (I)** – 30/2/1, 30/2/2, 30/2/3, 30/3/1; **2026 (II)** – 30/7/1, 30/7/2, 30/7/3, 30(B)

Prove that $\sqrt{5}$ is an irrational number.

ANSWER

Let $\sqrt{5}$ be a rational number. $\therefore \sqrt{5} = \frac{p}{q}$, where $q \neq 0$ and let p & q be coprime. ½

$5q^2 = p^2 \Rightarrow p^2$ is divisible by $5 \Rightarrow p$ is divisible by 5 ----- (i) 1

Let $p = 5a$, where a is some integer. $25a^2 = 5q^2 \Rightarrow q^2 = 5a^2 \Rightarrow q^2$ is divisible by $5 \Rightarrow q$ is divisible by 5 ----- (ii) 1

(i) and (ii) leads to a contradiction as p and q are coprime. ½

$\therefore \sqrt{5}$ is an irrational number.

$\sqrt{5}$ is an irrational number.

Q103 Short Answer · 3 marks

2023 – 30/6/1, 30/6/2, 30/6/3 (OR); **2025** – 30/4/1, 30/4/2, 30/4/3 (OR); **2026 (I)** – 30/1/2, 30/3/3

Prove that $\sqrt{2}$ is an irrational number.

ANSWER *

Let $\sqrt{2} = \frac{p}{q}$, p, q co-prime, $q \neq 0$. Then $2q^2 = p^2$, so 2 divides p.

Let $p = 2a$: $q^2 = 2a^2$, so 2 divides q.

2 is a common factor of p and q, a contradiction. Hence $\sqrt{2}$ is irrational.

$\sqrt{2}$ is an irrational number.

Q104 Short Answer · 3 marks — **2025** – 30/1/1

Prove that $\frac{1}{\sqrt{5}}$ is an irrational number.

ANSWER *

Let $\frac{1}{\sqrt{5}} = \frac{a}{b}$ (a, b integers, $a, b \neq 0$). Then $\sqrt{5} = \frac{b}{a}$, which is rational.

This contradicts that $\sqrt{5}$ is irrational (proved as above), so $\frac{1}{\sqrt{5}}$ is irrational.

$\frac{1}{\sqrt{5}}$ is irrational.

07 TOPIC 7 Proving Irrationality of $a + b\sqrt{p}$

QUICK RECAP

- Assume the number is rational, $= \frac{x}{y}$. Rearrange to make $\sqrt{p}$ the subject: $\sqrt{p} =$ (an expression in integers).
- The right side is rational, the left side is irrational: contradiction. Always mention the given fact, e.g. "$\sqrt{5}$ is irrational".
- Example: if $7 - 3\sqrt{5} = \frac{a}{b}$, then $\sqrt{5} = \frac{7b-a}{3b}$, which would be rational.

Q105 Very Short Answer · 2 marks · Internal choice (OR) part — **2023** – 30/C/1, 30/C/2, 30/C/3

If $\sqrt{2}$ is given as an irrational number, then prove that $(5 - 2\sqrt{2})$ is an irrational number.

ANSWER

Let us assume that $5 - 2\sqrt{2}$ be a rational number. $\therefore 5 - 2\sqrt{2} = \frac{p}{q}$, where p and q are integers and $q \neq 0$. 1

$\Rightarrow \sqrt{2} = \frac{5q - p}{2q}$ ½

RHS is a rational number. So, LHS is also a rational number which contradict the given fact that $\sqrt{2}$ is an irrational number. So, our assumption is wrong. Hence, $5 - 2\sqrt{2}$ is an irrational number. ½

Hence, $5 - 2\sqrt{2}$ is an irrational number.

Q106 Very Short Answer · 2 marks — **2024** – 30/S/1

Prove that $7 - 3\sqrt{5}$ is an irrational number, given that $\sqrt{5}$ is an irrational number.

ANSWER

Assuming $7 - 3\sqrt{5}$ to be a rational number. Let $7 - 3\sqrt{5} = \frac{a}{b}$ where a and b are integers & $b \neq 0$ ½

$\Rightarrow \sqrt{5} = \frac{7b - a}{3b}$ 1

Here RHS is rational but LHS is irrational. Therefore our assumption is wrong. Hence, $7 - 3\sqrt{5}$ is an irrational number. ½

Hence, $7 - 3\sqrt{5}$ is an irrational number.

Q107 Very Short Answer · 2 marks **2025** – 30/S/2

If $\sqrt{7}$ is an irrational number, then prove that $2\sqrt{7}$ is also an irrational number.

ANSWER

Let $2\sqrt{7}$ be a rational number. Let $2\sqrt{7} = \frac{a}{b}$ where a & b are co-prime. ½

$\Rightarrow \sqrt{7} = \frac{a}{2b}$ ½

RHS is rational which contradicts the fact that $\sqrt{7}$ is irrational. ½

Therefore $2\sqrt{7}$ is an irrational number. ½

Therefore $2\sqrt{7}$ is an irrational number.

Q108 Very Short Answer · 2 marks **2023** – 30/2/1

Prove that $2 + \sqrt{3}$ is an irrational number, given that $\sqrt{3}$ is an irrational number.

ANSWER *

Let us assume that $2 + \sqrt{3}$ is a rational number, say r.

$\Rightarrow \sqrt{3} = r - 2$

RHS is rational but LHS is irrational, which contradicts the fact that $\sqrt{3}$ is irrational. Hence $2 + \sqrt{3}$ is irrational.

$2 + \sqrt{3}$ is irrational.

Q109 Very Short Answer · 2 marks **2023** – 30/2/3

Prove that $6 - \sqrt{7}$ is an irrational number, given that $\sqrt{7}$ is an irrational number.

ANSWER *

Let us assume that $6 - \sqrt{7}$ is a rational number, say r.

$\Rightarrow \sqrt{7} = 6 - r$

RHS is rational but LHS is irrational, which contradicts the fact that $\sqrt{7}$ is irrational. Hence $6 - \sqrt{7}$ is irrational.

$6 - \sqrt{7}$ is irrational.

Q110 Very Short Answer · 2 marks **2026 (I)** – 30/5/1

Prove that $2 - 5\sqrt{3}$ is an irrational number, given that $\sqrt{3}$ is an irrational number.

ANSWER *

Let us assume that $2 - 5\sqrt{3}$ is a rational number, say r.

$\Rightarrow \sqrt{3} = \frac{2 - r}{5}$

RHS is rational but LHS is irrational, which contradicts the fact that $\sqrt{3}$ is irrational. Hence $2 - 5\sqrt{3}$ is irrational.

$2 - 5\sqrt{3}$ is irrational.

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Q111 Very Short Answer · 2 marks — **2026 (I)** – 30/5/2

Prove that $4 - 2\sqrt{5}$ is an irrational number, given that $\sqrt{5}$ is an irrational number.

ANSWER *

Let us assume that $4 - 2\sqrt{5}$ is a rational number, say r.

$\Rightarrow \sqrt{5} = \dfrac{4 - r}{2}$

RHS is rational but LHS is irrational, which contradicts the fact that $\sqrt{5}$ is irrational. Hence $4 - 2\sqrt{5}$ is irrational.

$4 - 2\sqrt{5}$ is irrational.

Q112 Very Short Answer · 2 marks — **2026 (I)** – 30/5/3

Prove that $14 - 2\sqrt{3}$ is an irrational number, given that $\sqrt{3}$ is an irrational number.

ANSWER *

Let us assume that $14 - 2\sqrt{3}$ is a rational number, say r.

$\Rightarrow \sqrt{3} = \dfrac{14 - r}{2}$

RHS is rational but LHS is irrational, which contradicts the fact that $\sqrt{3}$ is irrational. Hence $14 - 2\sqrt{3}$ is irrational.

$14 - 2\sqrt{3}$ is irrational.

Q113 Very Short Answer · 2 marks — **2024** – 30/1/1, 30/1/2, 30/1/3

(A) Prove that $5 - 2\sqrt{3}$ is an irrational number. It is given that $\sqrt{3}$ is an irrational number.

OR

(B) Show that the number $5 \times 11 \times 17 + 3 \times 11$ is a composite number.

ANSWER *

(A) Let $5 - 2\sqrt{3} = r \Rightarrow \sqrt{3} = \dfrac{5 - r}{2}$, rational — contradiction.

(B) $5 \times 11 \times 17 + 3 \times 11 = 11(85 + 3) = 11 \times 88$, which is composite.

(B) $= 11 \times 88$, composite

Q114 Very Short Answer · 2 marks — **2026 (I)** – 30/4/1, 30/4/2, 30/4/3

(a) Prove that $2 + 3\sqrt{5}$ is an irrational number given that $\sqrt{5}$ is irrational number.

OR

(b) If the HCF of 210 and 55 is expressed as $210 \times 5 + 55m$, then find the value of m.

ANSWER *

(a) Let $2 + 3\sqrt{5} = r \Rightarrow \sqrt{5} = \dfrac{r - 2}{3}$, rational — contradiction.

(b) $\text{HCF}(210, 55) = 5$; $1050 + 55m = 5 \Rightarrow m = -19$

(b) m = −19

Q115 Short Answer · 3 marks · Internal choice (OR) part — **2026 (II)** – 30/7/1, 30/7/2, 30/7/3

Show that $\frac{2+3\sqrt{2}}{5}$ is an irrational number.

ANSWER

Let $\frac{2+3\sqrt{2}}{5}$ be a rational number m. $\therefore \frac{2+3\sqrt{2}}{5} = m$ ½

$\Rightarrow \sqrt{2} = \frac{5m-2}{3}$ 1

As m is rational $\Rightarrow \frac{5m-2}{3}$ is rational, but $\sqrt{2}$ is an irrational number $\therefore$ LHS $\neq$ RHS 1

$\therefore \frac{2+3\sqrt{2}}{5}$ is an irrational number. ½

$\boxed{\frac{2+3\sqrt{2}}{5} \text{ is an irrational number.}}$

Q116 Short Answer · 3 marks · Internal choice (OR) part — **2026 (II)** – 30/8/1, 30/8/2, 30/8/3

Show that $\frac{3+\sqrt{3}}{5}$ is an irrational number, given $\sqrt{3}$ is an irrational number. Also, find an irrational number whose sum with given number is an irrational number.

ANSWER

Let us assume that $\frac{3+\sqrt{3}}{5}$ be a rational number. $\therefore \frac{3+\sqrt{3}}{5} = \frac{p}{q}$, where p and q are integers and $q \neq 0$ ½

$\Rightarrow \sqrt{3} = \frac{5p-3q}{q}$ 1

RHS is a rational number. So, LHS is also a rational number i.e. $\sqrt{3}$ is a rational number but this contradicts the fact that $\sqrt{3}$ is an irrational number. $\therefore$ our assumption is wrong. Hence, $\frac{3+\sqrt{3}}{5}$ be an irrational number. 1

Any number except $\frac{-\sqrt{3}}{5}$ ½

$\boxed{\frac{3+\sqrt{3}}{5} \text{ is irrational; any number except } \frac{-\sqrt{3}}{5}}$

Q117 Short Answer · 3 marks — **2025** – 30/3/1, 30/3/3

Prove that $\left(5\sqrt{3}+\frac{2}{3}\right)$ is an irrational number, given that $\sqrt{3}$ is an irrational number.

ANSWER *

Let us assume that $\left(5\sqrt{3}+\frac{2}{3}\right)$ is a rational number, say r.

$\Rightarrow \sqrt{3} = \frac{3r-2}{15}$

RHS is rational but LHS is irrational, which contradicts the fact that $\sqrt{3}$ is irrational. Hence $\left(5\sqrt{3}+\frac{2}{3}\right)$ is irrational.

$\boxed{\left(5\sqrt{3}+\frac{2}{3}\right) \text{ is irrational.}}$

Q118 Short Answer · 3 marks **2025** – 30/3/2

Prove that $\left(4\sqrt{2}+\frac{5}{3}\right)$ is an irrational number, given that $\sqrt{2}$ is an irrational number.

ANSWER *

Let us assume that $\left(4\sqrt{2}+\frac{5}{3}\right)$ is a rational number, say r.

$\Rightarrow \sqrt{2}=\frac{3r-5}{12}$

RHS is rational but LHS is irrational, which contradicts the fact that $\sqrt{2}$ is irrational. Hence $\left(4\sqrt{2}+\frac{5}{3}\right)$ is irrational.

$\left(4\sqrt{2}+\frac{5}{3}\right)$ is irrational.

Q119 Short Answer · 3 marks **2024** – 30/4/1, 30/4/2, 30/4/3

Prove that $\frac{2-\sqrt{3}}{5}$ is an irrational number, given that $\sqrt{3}$ is an irrational number.

ANSWER *

Let us assume that $\frac{2-\sqrt{3}}{5}$ is a rational number, say r.

$\Rightarrow \sqrt{3}=2-5r$

RHS is rational but LHS is irrational, which contradicts the fact that $\sqrt{3}$ is irrational. Hence $\frac{2-\sqrt{3}}{5}$ is irrational.

$\frac{2-\sqrt{3}}{5}$ is irrational.

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Q120 Short Answer · 3 marks **2026 (I)** – 30(B)

Prove that $\frac{2+3\sqrt{5}}{7}$ is an irrational number, given that $\sqrt{5}$ is an irrational number.

ANSWER *

Let us assume that $\frac{2+3\sqrt{5}}{7}$ is a rational number, say r.

$\Rightarrow \sqrt{5}=\frac{7r-2}{3}$

RHS is rational but LHS is irrational, which contradicts the fact that $\sqrt{5}$ is irrational. Hence $\frac{2+3\sqrt{5}}{7}$ is irrational.

$\frac{2+3\sqrt{5}}{7}$ is irrational.

Q121 Short Answer · 3 marks **2024** – 30/5/1, 30/5/2, 30/5/3

(a) Prove that $\sqrt{3}$ is an irrational number.
OR

(b) Prove that $(\sqrt{2}+\sqrt{3})^2$ is an irrational number, given that $\sqrt{6}$ is an irrational number.

ANSWER *

(b) $(\sqrt{2}+\sqrt{3})^2 = 5+2\sqrt{6}$. If it were rational $= r$, then $\sqrt{6} = \dfrac{r-5}{2}$ would be rational — contradiction.

(b) $(\sqrt{2}+\sqrt{3})^2 = 5+2\sqrt{6}$ is irrational.

08 TOPIC 8 Case-Study Questions

QUICK RECAP

- Read the story and decide first: **dividing into equal groups → HCF**; **repeating together → LCM**.
- Show the prime factorisation in part (i) even if only the answer is asked. It carries the method marks.

Q122 Case Study · 4 marks — **2023** – 30/C/1, 30/C/2, 30/C/3

February 14 is celebrated as International Book Giving Day and many countries in the world celebrate this day. Some people in India also started celebrating this day and donated the following number of books of various subjects to a public library:
History = 96, Science = 240, Mathematics = 336.
These books have to be arranged in minimum number of stacks such that each stack contains books of only one subject and the number of books on each stack is the same.
(i) How many books are arranged in each stack ?
(ii) How many stacks are used to arrange all the Mathematics books ?
(iii)(a) Determine the total number of stacks that will be used for arranging all the books.
OR
(iii)(b) If the thickness of each book of History, Science and Mathematics is 1·8 cm, 2·2 cm and 2·5 cm respectively, then find the height of each stack of History, Science and Mathematics books.

ANSWER

(i) $\text{HCF}(96, 240, 336) = 48$ — 1

(ii) Number of stacks $= \dfrac{336}{48} = 7$ — 1

(iii)(a) Total number of stacks $= \dfrac{96}{48} + \dfrac{240}{48} + \dfrac{336}{48} = 14$ — 2

OR (iii)(b) Height of each stack of History $= 48 \times 1.8 = 86.4$ cm; Science $= 48 \times 2.2 = 105.6$ cm; Mathematics $= 48 \times 2.5 = 120$ cm — 2

(i) 48 (ii) 7 (iii)(a) 14 OR (iii)(b) 86.4 cm, 105.6 cm, 120 cm

Q123 Case Study · 4 marks — **2025** – 30(B)/S

The science department of a college is conducting an international seminar in which the number of participants in Physics, Chemistry and Biology are 65, 91 and 117 respectively. The coordinator has made the arrangement such that in each room, the same number of participants are to be seated with all of them being in the same subject.
(i) Find the HCF of 65, 91 and 117.
(ii) Find the LCM of 65, 91 and 117.
(iii)(a) Find the minimum number of rooms required based on the above conditions.

OR

(iii)(b) Find the minimum number of participants to be accommodated in each of the rooms.

ANSWER

(i) $65 = 5 \times 13;\ 91 = 7 \times 13;\ 117 = 3^2 \times 13$ ½

$\text{HCF}(65, 91 \text{ \& } 117) = 13$ ½

(ii) $\text{LCM}(65, 91 \text{ \& } 117) = 3^2 \times 5 \times 7 \times 13 = 4095$ 1

(iii)(a) minimum number of rooms $= \frac{65}{13} + \frac{91}{13} + \frac{117}{13} = 21$ 2

OR (iii)(b) 1 2

(i) 13 (ii) 4095 (iii)(a) 21 OR (iii)(b) 1

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REFERENCES

Questions: CBSE Previous Year Question Papers – www.cbse.gov.in/cbsenew/question-paper.html

Answers: CBSE Marking Schemes – www.cbse.gov.in/cbsenew/marking-scheme.html