For the 1st Time ever
3 Level Division of Qns.

27

New Syllabus

Chapter-wise,

Topic-wise & Skill-wise

Class 10

Mathematics

(Standard)

Previous Year Solved Papers (2013 - 2024)
with Value Added Notes

14 Chapter | **3** Topics | **8** Questions

- 24 Regular Papers (2013 - 2019)
- Past 3 Yrs CBSE Sample Papers (2022 - 2024)
- Trend Analysis of Past 5 Yrs (2019)
- CBSE Competency Based Questions
- All Variety of Qns. MCQs/ SAQs/ LAQs/ Case based
- Solutions with Marking Scheme

DISHA™ Publication Inc

As Per Latest CBSE Syllabus

2nd Edition

DISHA Publication Inc.

A-23 FIEE Complex, Okhla Phase II

New Delhi-110020

Tel: 49842349/ 49842350

Edited By
Tanu Maurya
Amit Maurya
Jitendra Kumar Rajput

Typeset By
DISHA DTP Team

Write To Us At

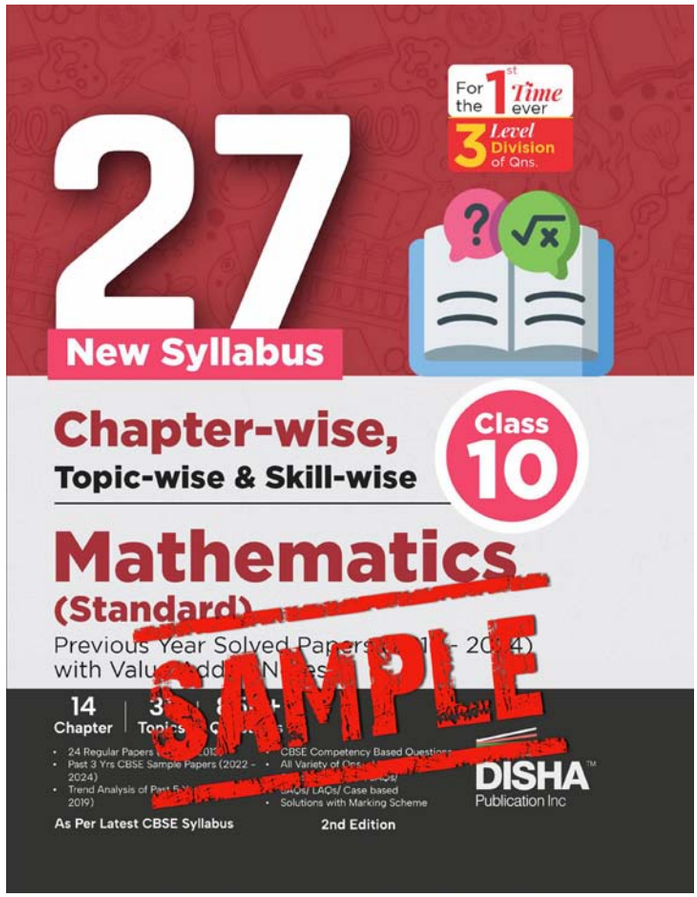
feedback_disha@aiets.co.in

www.dishapublication.com

DISHA™ Publication Inc

CONTENTS OF FREE SAMPLE BOOK

This sample book is prepared from the book **"27 New Syllabus Chapter-wise, Topic-wise & Skill-wise CBSE Class 10 Mathematics (Standard) Previous Year Solved Papers (2013 - 2024) with Value Added Notes 2nd Edition".**



ISBN - 9789362257123

MRP-350/-

In case you like this content, you can buy the **Physical Book** or **E-book** using the ISBN provided above.

The book & e-book are available on all leading online stores.

CONTENTS

3rd Level of Division : Skillwise Division

Each Question in the topic has been further divided skillwise using following codes:

K Knowledge **U** Understanding **Ap** Application **A** Analysis

Chapter

1 Real Numbers

Topic-1.1: The Fundamental Theorem of Arithmetic

1 Multiple Choice Questions

1. The greatest number which divides 281 and 1249, leaving remainder 5 and 7 respectively, is: **[All India 2024, U]**

(a) 23 (b) 276
(c) 138 (d) 69

2. The LCM of three numbers 28, 44, 132 is: **[All India 2024, K]**

(a) 258 (b) 231
(c) 462 (d) 924

3. If the product of two co-prime numbers is 553, then their HCF is: **[All India 2024, AP]**

(a) 1 (b) 553
(c) 7 (d) 79

4. If two positive integers p and q can be expressed as $p = 18\ a^2\ b^4$ and $q = 20\ a^3b^2$, where a and b are prime numbers then LCM (p, q) is: **[Delhi 2024, U]**

(a) $2\ a^2\ b^2$ (b) $180\ a^2\ b^2$
(c) $12\ a^2\ b^2$ (d) $180\ a^3b^4$

5. If two positive integers a and b are written as $a = x^3y^2$ and $b = xy^3$, where x, y are prime numbers, then the result obtained by dividing the product of the positive integers by the LCM (a, b) is **[CBSE Sample Paper 2023-24, K]**

(a) xy (b) xy^2
(c) x^3y^3 (d) x^2y^2

6. The ratio of HCF to LCM of the least composite number and the least prime number is: **[Delhi 2023, Set-I, K]**

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

7. Let a and b be two positive integers such that $a = p^3q^4$ and $b = p^2q^3$, where p and q are prime numbers. If HCF(a,b) $= p^mq^n$ and LCM(a,b) $= p^rq^s$, then (m + n) (r + s) = **[CBSE Sample Paper 2022-23, U]**

(a) 15 (b) 30 (c) 35 (d) 72

8. The exponent of 5 in the prime factorisation of 3750 is **[All India 2022, Term-I, U]**

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

9. What is the greatest possible speed at which a girl can walk 95 m and 171 m in an exact number of minutes ? **[All India 2022, Term-I, Ap]**

(a) 17 m/min (b) 19 m/min
(c) 23 m/min (d) 13 m/min

10. Three alarm clocks ring their alarms at regular intervals of 20 min, 25 min and 30 min respectively. If they first beep together at 12 noon, at what time will they beep again for the first time ? **[All India 2022, Term-I, Ap]**

(a) 4 : 00 pm (b) 4 : 30 pm
(c) 5 : 00 pm (d) 5 : 30 pm

11. The greatest number which when divides 1251, 9377 and 15628 leaves remainder 1, 2 and 3 respectively is **[All India 2022, Term-I, A]**

(a) 575 (b) 450
(c) 750 (d) 625

12. If *a* and *b* are two coprime numbers, then a^3 and b^3 are **[All India 2022, Term-I, K]**

(a) Coprime (b) Not coprime
(c) Even (d) Odd

13. If *n* is a natural number, then $2(5^n + 6^n)$ always ends with **[All India 2022, Term-I, K]**

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

14. The LCM of two numbers is 2400. Which of the following cannot be their HCF ? **[All India 2022, Term-I, U]**

(a) 300 (b) 400 (c) 500 (d) 600

15. $\sqrt{n}$ is a natural number such that n > 1.

Which of these can DEFINITELY be expressed as a product of primes? **[CBSE CFPQ 2022, A]**

(i) $\sqrt{n}$ (ii) n (iii) $\frac{\sqrt{n}}{2}$

(a) only (ii)

(b) only (i) and (ii)

(c) all (i), (ii) and (iii)

(d) (cannot be datermined without knowing *n*)

16. The HCF of k and 93 is 31, where k is a natural number. Which of these CAN be true for SOME VALUES of k?

(i) *k* is a multiple of 31. **[CBSE CFPQ 2022, A]**

(ii) *k* is a multiple of 93.

(iii) *k* is an even number.

(iv) *k* is an odd number.

(a) only (ii) and(iii)

(b) only (i), (ii) and (iii)

(c) only (i), (iii) and (iv)

(d) all (i), (ii), (iii) and (iv)

17. The ratio of LCM and HCF of the least composite and the least prime numbers is

[CBSE Sample Paper 2021-22, Term-I, U]

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

18. If LCM(x, 18) = 36 and HCF(x, 18) = 2 then x is

[CBSE Sample Paper 2021-22, Term-I, K]

(a) 2 (b) 3 (c) 4 (d) 5

19. If sum of two numbers is 1215 and their HCF is 81, then the possible number of pairs of such numbers are

[CBSE Sample Paper 2021-22, Term-I, K]

(a) 2 (b) 3 (c) 4 (d) 5

20. The LCM of two prime numbers *p* and *q*($p > q$) is 221. Find the value of $3p - q$.

[CBSE Sample Paper 2021-22, Term-I, K]

(a) 4 (b) 28 (c) 38 (d) 48

21. The sum of exponents of prime factors in the prime-factorisation of 196 is **[All India 2020, K]**

(a) 3 (b) 4 (c) 5 (d) 2

22. The total number of factors of a prime number is

[Delhi 2020, K]

(a) 1 (b) 0 (c) 2 (d) 3

23. The HCF and the LCM of 12, 21, 15 respectively are

[All India 2023, Set-II(s), Delhi 2020, K]

(a) 3, 140 (b) 12, 420 (c) 3, 420 (d) 420, 3

2 *Assertion Reason/Two Statement Type Questions*

DIRECTIONS : *Each of these questions contains an Assertion followed by Reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.*

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(b) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true but Reason (R) is false.

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

24. **Assertion (A) :** The number 5^{th} 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. **[All India 2023, A]**

25. **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. **[All India 2023, A]**

26. **Assertion (A):** If product of two numbers is 5780 and their HCF is 17, then their LCM is 340

Reason (R): HCF is always a factor of LCM

[CBSE Sample Paper 2022-23, A]

3 *Very Short Answer Questions (1 Mark)*

27. Show that the number $5 \times 11 \times 17 + 3 \times 11$ is a composite number. **[Delhi 2024, U]**

28. Using prime factorisation, find HCF and LCM of 96 and 120. **[All India 2023, K]**

29. Using prime factorisation, find HCF and LCM of 96 and 120. **[All India 2023, K]**

30. Two numbers are in the ratio 2 : 3 and their LCM is 180. What is the HCF of these numbers? **[Delhi 2023, K]**

31. If HCF (336, 54) = 6, find LCM (336, 54).

[All India 2019, K]

32. What is the HCF of smallest prime number and the smallest composite number? **[All India 2018, K]**

4 *Short Answer Questions (2 or 3 Marks)*

33. 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.

[Delhi 2024, U]

34. National art convention got registrations from students from all parts of the country, of which 60 are interested in music, 84 are interested in dance and 108 students are interested in handicrafts. For optimum cultural exchange, organisers wish to keep them in minimum number of groups such that each group consists of students interested in the same artform and the number of students in each group is the same. Find the number of students in each group. Find the number of groups in each art form. How many rooms are required if each group will be allotted a room?

[CBSE Sample Paper 2023-24, Ap]

35. Show that 6^n can not end with digit 0 for any natural number 'n'. **[All India 2023 Set-II, U]**

36. Find the HCF and LCM of 72 and 120.

[All India 2023 Set-II, U]

37. 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?

[All India 2023, Ap]

38. M and N are positive integers such that $M = p^2q^3 r$ and $N = p^3q^2$ where, p, q, r are prime numbers.

Find LCM (M, N) and HCF (M, N). **[CBSE CFPQ]**

39. Write the smallest number which is divisible by both 306 and 657. **[All India 2019, V]**

40. Find HCF and LCM of 404 and 96 and verify that HCF × LCM = Product of the two given numbers.

[All India 2018, K]

41. Find the greatest number of six digits exactly divisible by 18, 24 and 36. **[All India 2017, Term-I, K]**

42. Is it possible that HCF and LCM of two numbers be 24 and 540 respectively. Justify your answer.

[Delhi 2016, Term-I, K]

43. Show that numbers 8^n can never end with digit 0 for any natural number *n*. **[Delhi 2016, Term-I, K]**

44. Can be number 6^n, *n* being a natural number, end with the digit 5? Give reasons. **[All India 2015, Term-I, K]**

Topic-1.2: Revisiting Irrational Numbers

1 *Multiple Choice Questions*

1. If $p^2 = \frac{32}{50}$, then p is a/an **[All India 2023 Set-II, K]**

(a) whole number (b) integer

(c) rational number (d) irrational number

2. If $a^2 = 23/25$, then a is

[CBSE Sample Paper 2021-22, Term-I, K]

(a) rational (b) irrational

(c) whole number (d) integer

2 *Assertion Reason/Two Statement Type Questions*

DIRECTIONS : *Each of these questions contains an Assertion followed by Reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.*

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(b) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true but Reason (R) is false.

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

3. **Statement A (Assertion):** If $5+\sqrt{7}$ is a root of a quadratic equation with rational coefficient, then its other root is $5-\sqrt{7}$.

Statement R (Reason) : Surd roots of a quadratic equation with rational coefficients occur in conjugate pairs.

[All India 2023 Set-II, U]

3 *Very Short Answer Questions (1 Mark)*

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

5. Find a rational number between $\sqrt{2}$ and $\sqrt{3}$.

[Delhi 2019, K]

4 *Short Answer Questions (2 or 3 Marks)*

6. Prove that $\left(\sqrt{2}+\sqrt{3}\right)^2$ is an irrational number, given that $\sqrt{6}$ is an irrational number. **[All India 2024, A]**

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

[All India 2024, 2023, A]

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

[Delhi 2019, CBSE Sample Paper 2023-24, K]

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

[All India 215, Term-I, Delhi 2023, All India 2023, K]

10. Show that $5 + 2\sqrt{7}$ is a irrational number, $\sqrt{7}$ is given to be an irrational number. **[All India 2020]**

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

[CBSE Sampe Paper 2022-23(s), All India 2019, K]

12. Given that $\sqrt{2}$ is irrational, prove that $\left(5+3\sqrt{2}\right)$ is an irrational number. **[All India 2018, K]**

5 *Long Answer Question (4 or 5 Marks)*

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

[All India 2020, K]

Hints & Solutions

Topic-1.1: The Fundamental Theorem of Arithmetic

1. **(c)** Since, the number divides 281 an 1249 and leaves the reminder 5 and 7 respectively. So, 281–5 = 276 and 1249 – 7 = 1242 is completely divided by the required number.
∴ The greatest such number = H.C.F (276, 1242) = 138.
[1 Mark]

2. **(d)** $28 = \boxed{2} \times \boxed{2} \times 7$
$44 = 2 \times 2 \times 11$
$132 = 2 \times 2 \times 3 \times 11$
∴ LCM (28, 44, 132) = $2 \times 2 \times 3 \times 7 \times 11 = 924$
[1 Mark]

3. **(a)** Since, the numbers are co-prime. So, there will not be any common factor.
∴ HCF = 1 **[1 Mark]**

Note

HCF of prime number is 1.

4. **(d)** p and q can be written as,
$p = 18\ a^2\ b^4 = 2 \times 3 \times 3 \times a \times a \times b \times b \times b \times b$
and $q = 20\ a^3\ b^2 = 2 \times 2 \times 5 \times a \times a \times a \times b \times b$
Hence LCM = $2 \times 2 \times 3 \times 3 \times 5 \times a \times a \times a \times b \times b \times b \times b$
LCM = $180\ a^3\ b^4$ **[1 Mark]**

5. **(b)** xy^2 **(1 Mark)**

6. **(a)** $\dfrac{\text{HCF(least composite no, Least prime no.)}}{\text{LCM(least composite no, Least prime no.)}}$

$\Rightarrow \dfrac{\text{HCF}(4, 2)}{\text{LCM}(4, 2)} = \dfrac{2}{4} = \dfrac{1}{2}$ **(1 Mark)**

7. **(c)** 35 **(1 Mark)**

8. **(b)** Given number is 3750.

Prime factorisation of 3750 = $5 \times 5 \times 5 \times 5 \times 2 \times 3$
$= 5^4 \times 2^1 \times 3^1$

5	3750
5	750
5	150
5	30
2	6
3	3
	1

Exponent of 5 = 4. **(1 Mark)**

Note

a^m, *a = base*
m = exponent

9. **(b)** Given, distances covered by girl are 95m and 171m.

$95 = 5 \times 19$

$171 = 3 \times 3 \times 19$

H.C.F of (95, 171) = 19

Girl can cover maximum distance 19m in 1 min. Therefore, the speed is 19m/min. **(1 Mark)**

10. **(c)** Given, regular intervals are 20 min, 25 min and 30 min.

L.C.M of (20, 25, 30) = $2 \times 5 \times 2 \times 3 \times 5$
= 300 min.

2	20, 25, 30
5	10, 25, 15
2	2, 5, 3
3	1, 5, 3
5	1, 5, 2
	1, 1, 1

They beep together at 12 noon, then they beep after 300 minutes again.

300 min = $\dfrac{300}{60}$ = 5 h

All clocks will beep again together at 5 : 00 pm.

(1 Mark)

11. **(d)** Three numbers are 1251, 9377, 15628 and the respective remainders are 1, 2 & 3.

(1251 – 1) = 1250
(9377 – 2) = 9375
(15628 – 3) = 15625
H.C.F of (1250, 9375, 15625) is shown below.
$1250 = 2 \times 5 \times 5 \times 5 \times 5$
$9375 = 3 \times 5 \times 5 \times 5 \times 5 \times 5$
$15625 = 5 \times 5 \times 5 \times 5 \times 5 \times 5$
H.C.F of (1250, 9375, 15625) = $5 \times 5 \times 5 \times 5 = 625$
Therefore, the greatest no. is 625. **(1 Mark)**

12. **(a)** Given a and b are coprime, whose H.C.F is 1.

Then, a^3 & b^3 also the coprime numbers.

Whose H.C.F is 1. **(1 Mark)**

13. **(d)** Number $2(5^n + 6^n)$ contains power n to the base 5 and 6.

For every $n \in N$ 5^n ends with 5 and 6^n ends with 6.

Sum of 5 & 6 is 11, then $2 \times 11 = 22$.

Therefore, the number always ends with 2. **(1 Mark)**

14. **(c)** LCM = 2400

HCF of two numbers will always divide the LCM of two numbers.

Factors of $2400 = 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 5 \times 5$

$2 \times 2 \times 5 \times 5 \times 3 = 300$

$2 \times 2 \times 5 \times 5 \times 3 \times 2 = 600$

$2 \times 2 \times 5 \times 5 \times 2 \times 2 = 400$

As per options, it will give all numbers except 500.

(1 Mark)

15. **(b)** **(1 Mark)**

16. **(c)** **(1 Mark)**

17. **(b)** Least composite number is 4 and the least prime number is 2. LCM (4, 2) : HCF(4, 2) = 4 : 2 = 2 : 1

(1 Mark)

18. **(c)** LCM × HCF = Product of two numbers

$36 \times 2 = 18 \times x$

$72 = 18x$

$4 = x$

$x = 4$ **(1 Mark)**

19. **(c)** Since HCF = 81, two numbers can be taken as 81x and 81y,

ATQ

$81x + 81y = 1215$

or $x + y = 15$

which gives four co prime pairs-

1, 14

2, 13

4, 11

7, 8

Such pair of numbers are, (81, 1134) (162, 1053) (324, 891) and (567, 648) **(1 Mark)**

20. **(c)** LCM of two prime numbers = product of the numbers

$221 = 13 \times 17$.

So p = 17 & q = 13

$\therefore$ $3p - q = 51 - 13 = 38$ **(1 Mark)**

21. **(b)** $196 = 2^2 \cdot 7^2$, sum of exponents = 2 + 2 = 4

(1 Mark)

22. **(c)** Prime number have two factor 1 and itself.

(1 Mark)

23. **(c)** $12 = 2^2 \times 3$; $21 = 3 \times 7$; $15 = 3 \times 5$

HCF = 3

LCM = $2^2 \times 3 \times 5 \times 7 = 420$ **(1 Mark)**

24.

Topper's Answer

(c) Assertion (A) is true but Reason (R) is false.
[only 1 prime factor = 5 ∵ prime factorisation of a prime number is the number itself]

25. **(d)** The number 5^n end with multiple of 5 for all $n \in N$

$\Rightarrow$ R : Prime factorisation of 5 are 1, 5 **(1 Mark)**

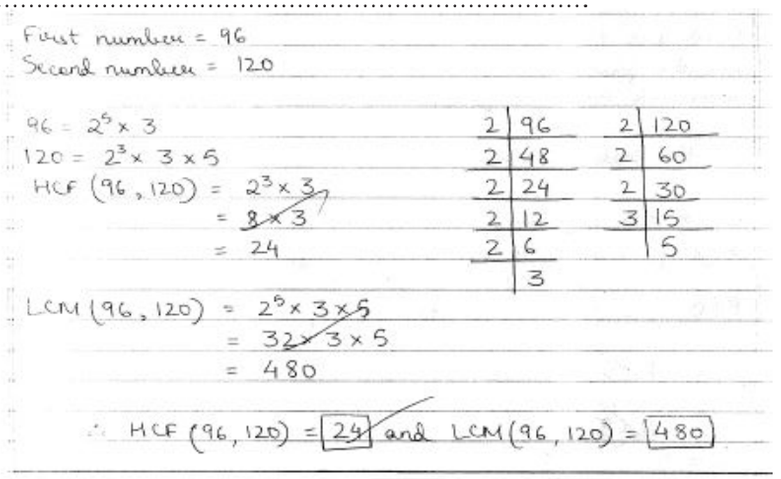
26. **(b)** Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A)

(1 Mark)

27. **(B)** Let $p = 5 \times 11 \times 17 + 3 \times 11 = (5 \times 17 + 3) \times 11$
$= 88 \times 11$
Since given number have more than 2 divisors, Hence it is a composite number. **[2 Marks]**

28.

Topper's Answer



29. $96 = 2^2 \times 3 \times 2^3 = 2^5 \times 3$

$120 = 2^2 \times 3 \times 5 \times 2 = 2^3 \times 3 \times 5$ **(½ Mark)**

HCF $= 2^3 \times 3 = 24$; LCM $= 2^5 \times 3 \times 5 = 480$ **(½ Mark)**

30. Let No. are 2x, 3x

Product of No. = LCM × HCF $\Rightarrow 2x \times 3x = 180 \times x$

$6x^2 = 180\ x \Rightarrow x = 30 \Rightarrow$ HCF $= 30$ **(1 Mark)**

31. Given, HCF (336, 54) = 6

We know,

HCF × LCM = Product of numbers

$\Rightarrow 6 \times$ LCM $= 336 \times 54$

$\Rightarrow$ LCM $= \frac{336 \times 54}{6} = 336 \times 9 = 3024$ **(1 Mark)**

32. As smallest prime number = 2

and smallest composite number = 4 **(½ Mark)**

$\therefore$ HCF of 2 and 4 = 2

Hence HCF of smallest prime number and smallest composite number is 2. **(½ Mark)**

33. Number of students in each group subject to the given condition = HCF (60, 84, 108) **(½ Mark)**

HCF (60, 84, 108) = 12 **(½ Mark)**

Number of groups in music $= \frac{60}{12} = 5$ **(½ Mark)**

Number of groups in dance $= \frac{84}{12} = 7$ **(½ Mark)**

Number of groups in handicrafts $= \frac{108}{12} = 9$ **(½ Mark)**

Total number of rooms required = 5 + 7 + 9 = 21 **(½ Mark)**

34. $48 = 2^4 \times 3$ **[1 Mark]**

$80 = 2^4 \times 5$

$144 = 2^4 \times 3^2$ **[1 Mark]**

$\therefore$ HCF (48, 80, 144) $= 2^4 = 16$ **[1 Mark]**

$\therefore$ Maximum 16 teachers of same subject can be in one room

Hence, required number of rooms $= \frac{48 + 80 + 144}{16} = 17$ **[1 Mark]**

35. If the number 6^n, for any n, were to end with digit zero, then it would be divisible by 5. That is, the prime factorisation of 6^n would contain the prime number 5. **(1 Mark)**

This is not possible because $6^n = (2 \times 3)^n$, so the only prime numbers in the factorisation of 6^n are 2 and 3.

So, the uniqueness of the fundamental theoram of Arithmetic guarantees that there are no other prime number other than 2 and 3 in the factorisation of 6^n so there is no natural "n" for which 6^n ends with digit zero. **(1 Mark)**

36. We have

$72 = 2^3 \times 3^2$ **(1 Mark)**

$120 = 2^3 \times 3 \times 5$ **(1 Mark)**

37. Take the LCM of given time

$48 = 2^4 \times 3$; $72 = 2^3 \times 3^2$; $108 = 2^2 \times 3^3$ **(1 Mark)**

Then, LCM = $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 = 432$

After 432 seconds, they will change simultaneously.

$\Rightarrow$ 432 seconds = 7 min 12 sec

Time = 7 : 07 : 12 am **(1 Mark)**

38. LCM $= p^3q^3r$ **(1 Mark)**

HCF $= p^2q^2$ **(1 Mark)**

39. Smallest number which is divisible by 306 and 657 is,

LCM (657, 306)

$657 = 3 \times 3 \times 73$

$306 = 3 \times 3 \times 2 \times 17$ **(1 Mark)**

LCM = $3 \times 3 \times 73 \times 2 \times 17 = 22338$ **(1 Mark)**

Note

For LCM take each prime factor with highest power in all then multiply it.

40.

2	404
2	202
101	101
	1

2	96
2	48
2	24
2	12
2	6
3	3
	1

$\therefore$ $404 = 2 \times 2 \times 101$

$96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$ **(1 Mark)**

HCF of 404 and 96 = $2 \times 2 = 4$

LCM of 404 and 96 = $4 \times 101 \times 2 \times 2 \times 2 \times 3$

$= 9696$

HCF $\times$ LCM = $4 \times 9696 = 38784$

Product of numbers = $404 \times 96 = 38784$

Hence verified that

HCF $\times$ LCM = Product of the two numbers. **(1 Mark)**

41. LCM of 18, 24 and 36 is 72

$$72\overline{)999999}(13888$$
$$\underline{999936}$$
$$63$$

(1 Mark)

$\therefore$ Required number = 9,99,936. **(1 Mark)**

Note

HCF will be find when we have to find greatest (maximum) number wich exactly divide the given number.

42. HCF = 24

LCM = 540

Now, $\frac{\text{LCM}}{\text{HCF}} = \frac{540}{24} = 22.5$ not an integer **(1 Mark)**

Since LCM is always a multiple of HCF, hence two numbers cannot have HCF and LCM as 24 and 540 respectively. **(1 Mark)**

43. If 8^n ends with 0, then it must have 5 as a factor.

But prime factor of 8^n is 2.

$\therefore$ $8^n = 2^n \times 2^n \times 2^n$ **(1 Mark)**

From the fundamental theorem of arithmetic, the prime factorisation of every composite number is unique.

$\therefore$ 8^n can never ends with 0. **(1 Mark)**

44. No, because $6^n = (2 \times 3)^n = 2^n \times 3^n$, so the only primes in the factorisation of 6^n are 2 and 3, and not 5. **(2 Marks)**

Topic-1.2: Revisiting Irrational Numbers

1. **(c)** $p^2 = \frac{32}{50}$

$\Rightarrow p^2 = \frac{16}{25}$

$\Rightarrow p = \pm\frac{4}{5}$

p is in the form of $\frac{a}{b}$, where "a" and "b" are integers having no common factor other than 1, also $q \neq 0$.

(1 Mark)

2. **(b)** $a^2 = \frac{23}{25}$, then $a = \frac{\sqrt{23}}{5}$, which is irrational.

(1 Mark)

3. **(b)** **(1 Mark)**

4. **(A)** If possible, let $5 - 2\sqrt{3}$ is a rational number.

$\therefore$ $5 - 2\sqrt{\ } \quad - \quad$ where $q \neq 0$

$\Rightarrow \sqrt{3} = \frac{(5q - p)}{(2q)}$ **[1 Mark]**

Which means that $\sqrt{3}$ is also a rational number but this is a contradiction because $\sqrt{3}$ is irrational.

Hence $5 - 2\sqrt{3}$ is an irrational number. **[1 Mark]**

Note

Addition, subtraction, multiplication and division of two rational is rational.

5. Since, $\sqrt{2}$ = 1.414.... and $\sqrt{3}$ = 1.732 ... **(½ Mark)**

Hence, the rational number between $\sqrt{2}$ and $\sqrt{3}$ is 1.5 or $\frac{3}{2}$. **(½ Mark)**

Note

There are infinite rational numbers between any two irrational numbers.

6. $(\sqrt{2}+\sqrt{3})^2 = (\sqrt{2})^2 + (\sqrt{3})^2 + 2(\sqrt{2})(\sqrt{3})$ **[1 Mark]**

$= 2 + 3 + 2\sqrt{6}$

$= 5 + 2\sqrt{6}$ **[1 Mark]**

$\because \sqrt{6}$ is an irrational number.

$\Rightarrow 5 + 2\sqrt{6}$ is an irrational number.

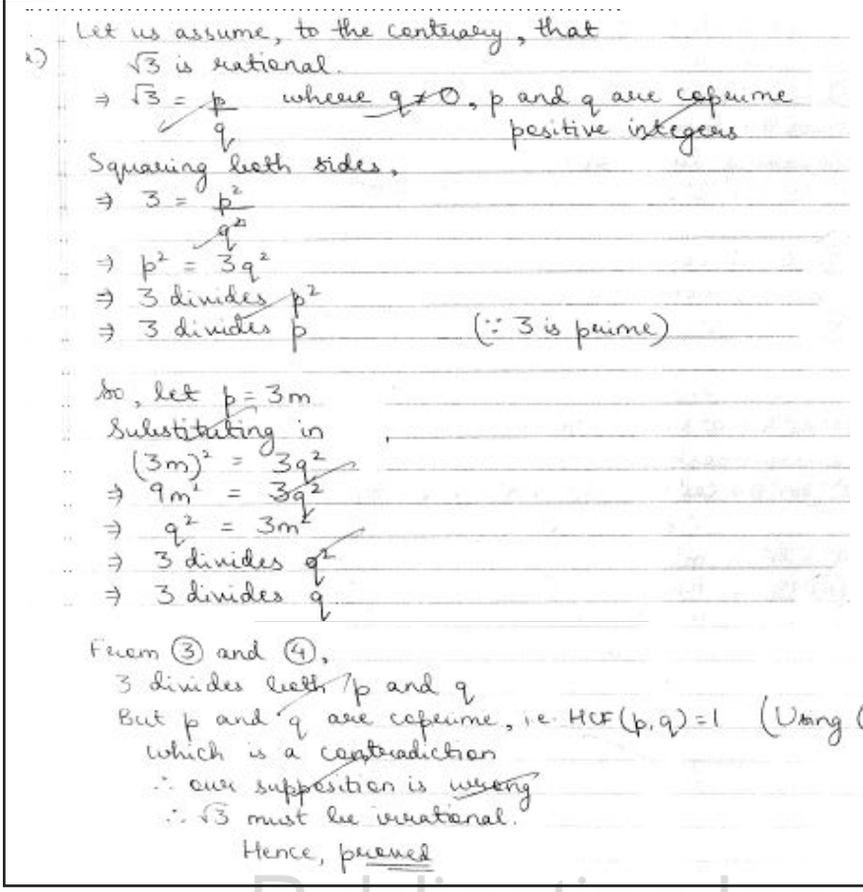
$\Rightarrow \left(\sqrt{2}+\sqrt{3}\right)^2$ is an irrational number. **[1 Mark]**

Note

Product of rational and irrational number is irrational..

7.

Topper's Answer


Let us assume, to the contrary, that
$\sqrt{3}$ is rational.
$\Rightarrow \sqrt{3} = \frac{p}{q}$ where $q \neq 0$, p and q are coprime positive integers
Squaring both sides,
$\Rightarrow 3 = \frac{p^2}{q^2}$
$\Rightarrow p^2 = 3q^2$
$\Rightarrow$ 3 divides p^2
$\Rightarrow$ 3 divides p (∵ 3 is prime)
So, let $p = 3m$
Substituting in
$(3m)^2 = 3q^2$
$\Rightarrow 9m^2 = 3q^2$
$\Rightarrow q^2 = 3m^2$
$\Rightarrow$ 3 divides q^2
$\Rightarrow$ 3 divides q
From ③ and ④,
3 divides both p and q
But p and q are coprime, i.e. HCF (p, q) = 1 (Using ①)
which is a contradiction
∴ our supposition is wrong
∴ $\sqrt{3}$ must be irrational.
Hence, proved

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

So, we can find integers a and b such that $\sqrt{2} = \frac{a}{b}$ where a and b are coprime. **(½ Mark)**

So, $b\sqrt{2} = a$.

Squaring both sides, we get $2b^2 = a^2$.

Therefore, 2 divides a^2 and so 2 divides a. **(½ Mark)**

So, we can write a = 2c for some integer c.

Substituting for a, we get $2b^2 = 4c^2$, that is, $b^2 = 2c^2$.

This means that 2 divides b^2, and so 2 divides b.

(½ Mark)

Therefore, a and b have at least 2 as a common factor.

But this contradicts the fact that a and b have no common factors other than 1. **(½ Mark)**

This contradiction has arisen because of our incorrect assumption that $\sqrt{2}$ is rational.

So, we conclude that $\sqrt{2}$ is irrational.

9. **(a)** Let $\sqrt{3}$ is rational no. So $\sqrt{3}$ can be written as

$\sqrt{3} = \frac{p}{q}$, $q \neq 0$, HCF (p, q) = 1 **(½ Mark)**

i.e. $p \neq q$ are co-prime to each other

Squaring both sides

$3 = \frac{p^2}{q^2} \Rightarrow p^2 = 3q^2$ **(1 Mark)**

$\Rightarrow$ 3 is a factor of p^2…(i)

$\Rightarrow$ 3 is a factor of p…(ii) **(½ Mark)**

So p = 3 m from (i), where m is any integer. $p^2 = 9m^2$

$3q^2 = 9m^2$

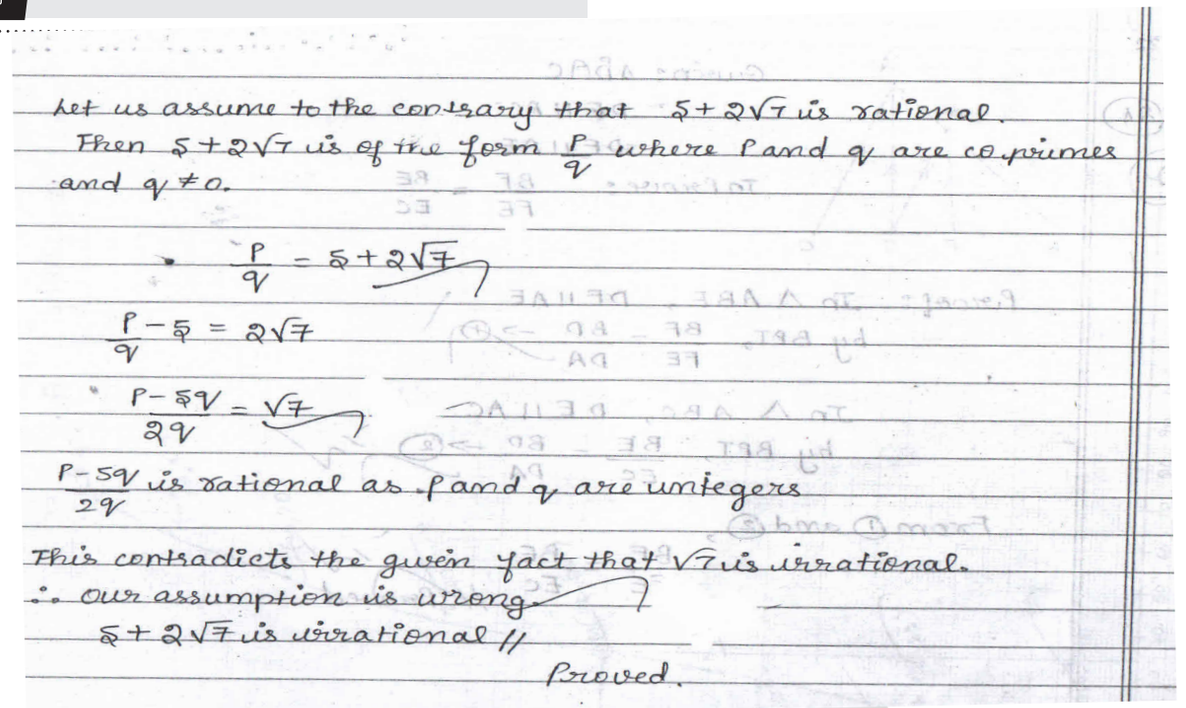
$q^2 = 3m^2$

$\Rightarrow$ 3 is factor of $q^2 \Rightarrow$ 3 is a factor of q

HCF (p,q) $\neq$ 1 contradicts our & supposition. So $\sqrt{3}$ is irrational. **(1 Mark)**

10.

Topper's Answer


Let us assume to the contrary that $5+2\sqrt{7}$ is rational.
Then $5+2\sqrt{7}$ is of the form $\frac{p}{q}$ where p and q are co-primes and $q \neq 0$.

$\frac{p}{q} = 5+2\sqrt{7}$

$\frac{p}{q} - 5 = 2\sqrt{7}$

$\frac{p-5q}{2q} = \sqrt{7}$

$\frac{p-5q}{2q}$ is rational as p and q are integers

This contradicts the given fact that $\sqrt{7}$ is irrational.
∴ our assumption is wrong.
$5+2\sqrt{7}$ is irrational //
Proved.

11. Let $2 + 5\sqrt{3}$ = r, where, r is rational number.

$\Rightarrow (2 + 5\sqrt{3})^2 = r^2$ **(½ Mark)**

$\Rightarrow 4 + 75 + 20\sqrt{3} = r^2$

$\Rightarrow 79 + 20\sqrt{3} = r^2$ **(½ Mark)**

$\Rightarrow 20\sqrt{3} = r^2 - 79$

$\Rightarrow \sqrt{3} = \frac{r^2 - 79}{20}$ **(½ Mark)**

Since r is rational number therefore $r^2 - 79$ is also rational number $\Rightarrow \frac{r^2 - 79}{20}$ is a rational number. So, $\sqrt{3}$ must also be a rational number.

But $\sqrt{3}$ is an irrational number (Given).

So, our assumption is wrong.

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

Hence proved. **(½ Mark)**

12. Let $5+3\sqrt{2}$ be a rational number

$\Rightarrow 5+3\sqrt{2} = \frac{p}{q}$, **(½ Mark)**

where p and q are coprime integers and $q \neq 0$

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

$\Rightarrow \sqrt{2} = \frac{p-5q}{3q}$ **(1 Mark)**

Since p & q are integers

$\Rightarrow \frac{p-5q}{3q}$ is a rational number **(½ Mark)**

But $\sqrt{2}$ is irrational.

We know that an irrational number cannot be equal to a rational number.

$\Rightarrow$ Our supposition is wrong that $5+3\sqrt{2}$ is a rational number.

Hence $5+3\sqrt{2}$ is irrational. **(1 Mark)**

Addition of a rational and an irrational number is an irrational number.

13. Let $\sqrt{5}$ is rational number

$\therefore \quad \sqrt{5} = \frac{p}{q}$, **(1 Mark)**

where p and q are coprime integers and $q \neq 0$.

$\sqrt{5} = \frac{p}{q} \Rightarrow p = \sqrt{5}q$

Squaring both sides

$p^2 = 5q^2$ ...(i) **(1 Mark)**

So, p^2 is divisible by 5

Then, p is also divisible by 5

Let $p = 5$ m **(½ Mark)**

Putting in (i)

$(5m)^2 = 5q^2 \Rightarrow 25m^2 = 5q^2 \Rightarrow q^2 = 5m^2$ **(½ Mark)**

So, q^2 is divisible by 5

Then q is also divisible by 5 **(½ Mark)**

Thus, p and q both divisible by 5 but p and q are coprime integers.

By contradiction.

$\sqrt{5}$ is irrational number.

Hence, proved. **(½ Mark)**