UNIQUE STUDY POINT

By Sumeet Sahu | Made with ❤ for Students

SAMPLE PAPER 02 - CHAPTER 01 REAL NUMBERS (2025-26)

SUBJECT: MATHEMATICS　　**MAX. MARKS:** 40

CLASS: X　　**DURATION:** 1½ hrs

General Instructions:

1. All questions are compulsory.
2. This question paper contains 20 questions divided into five Sections A, B, C, D and E.
3. **Section A** comprises of 10 MCQs of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.
4. There is no overall choice.
5. Use of Calculators is not permitted.

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. The product of a non-zero rational and an irrational number is:

(a) always irrational　(b) always rational　(c) rational or irrational　(d) one

2. The decimal expansion of $23/(2^3 \times 5)$ will terminate after:

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

(d) more than 3 decimal places

3. If two positive integers p and q can be expressed as $p = ab^2$ and $q = a^3b$; a, b being prime numbers, then LCM(p, q) is:

(a) ab　(b) a^2b^2　(c) a^3b^2　(d) a^3b^3

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

(a) 10　(b) 100　(c) 504　(d) 2520

5. The largest number which divides 60 and 75, leaving remainders 8 and 10 respectively, is:

(a) 13　(b) 65　(c) 11　(d) 15

6. If $n = 2^3 \times 3^2 \times 5^2 \times 7$, then the number of consecutive zeros in n is:

(a) 2　(b) 3　(c) 4　(d) 7

7. 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) $0 < r \le b$　(c) $0 \le r < b$　(d) $0 < r < b$

8. If HCF(26, 169) = 13, then LCM(26, 169) is:

(a) 26　(b) 52　(c) 338　(d) 13

9. **Assertion (A):** $\sqrt{2} + \sqrt{3}$ is an irrational number.

Reason (R): Sum of two irrational numbers is always irrational.

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

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

(c) A is true but R is false.

(d) A is false but R is true.

10. **Assertion (A):** The number 10^n cannot end with digit 0 for any natural number n.

Reason (R): $10^n = (2 \times 5)^n = 2^n \times 5^n$ always ends with 0.

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

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

(c) A is true but R is false.

(d) A is false but R is true.

SECTION - B

Questions 11 to 14 carry 2 marks each.

11. Express 140 as a product of its prime factors.

12. Find the LCM and HCF of 6 and 20 by the prime factorization method.

13. Explain why $3 \times 5 \times 7 \times 11 + 11$ is a composite number.

14. Two tankers contain 850 litres and 680 litres of kerosene oil respectively. Find the maximum capacity of a container which can measure the kerosene oil of both the tankers when used an exact number of times.

SECTION - C

Questions 15 to 17 carry 3 marks each.

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

16. In a school, there are two sections – section A and section B of Class X. There are 32 students in section A and 36 students in section B. Determine the minimum number of books required for their class library so that they can be distributed equally among students of section A or section B.

17. Given that $\sqrt{5}$ is irrational, prove that $3\sqrt{5} + 7$ is an irrational number.

SECTION - D

Question 18 carries 5 marks.

18. (a) Use Euclid's division algorithm to find the HCF of 867 and 255. (3 marks)

(b) Show that any positive odd integer is of the form $6q + 1$, or $6q + 3$, or $6q + 5$, where q is some integer. (2 marks)

SECTION - E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. Diwali festival is approaching and many sweet shops are preparing different varieties of sweets. A famous sweet shop is preparing ladoos. They have 420 kg of sugar and 130 kg of flour. They want to make packages containing equal quantities of sugar and flour in each package using all the materials.

(i) Find the HCF of 420 and 130. (1 mark)

(ii) How many maximum packages can be made? (1 mark)

(iii) How many kg of sugar and flour will be in each package? (2 marks)

20. A circular garden has a walking track around it. Rahul takes 18 minutes to complete one round, Seema takes 12 minutes, and Deepak takes 20 minutes to complete one round. If they all start from the same point and walk in the same direction:

(i) Find the LCM of 18, 12, and 20. (2 marks)

(ii) After how many minutes will they meet again at the starting point? (1 mark)

(iii) How many rounds will Seema have completed when they meet? (1 mark)

✓ DETAILED SOLUTIONS - SAMPLE PAPER 02

SECTION - A (SOLUTIONS)

Solution 1:

Let r be a non-zero rational number and x be an irrational number.

If their product rx is rational, then x = (rx)/r would be rational (ratio of two rationals)

But x is irrational, so this is a contradiction.

Answer: (a) always irrational

Solution 2:

$23/(2^3 \times 5) = 23/40$

Denominator = $2^3 \times 5 = 2^3 \times 5^1$

Maximum of powers = max(3, 1) = 3

23/40 = 0.575

Answer: (c) three decimal places

Solution 3:

$p = ab^2$

$q = a^3b$

LCM = Product of highest powers of all prime factors

LCM = a^3b^2

Answer: (c) a^3b^2

Solution 4:

Required number = LCM(1, 2, 3, 4, 5, 6, 7, 8, 9, 10)

1 = 1

2 = 2

3 = 3

$4 = 2^2$

5 = 5

$6 = 2 \times 3$

7 = 7

$8 = 2^3$

$9 = 3^2$

$10 = 2 \times 5$

LCM = $2^3 \times 3^2 \times 5 \times 7 = 8 \times 9 \times 5 \times 7 = 2520$

Answer: (d) 2520

Solution 5:

Required number divides (60 - 8) and (75 - 10)

= HCF(52, 65)

$52 = 2^2 \times 13$

$65 = 5 \times 13$

HCF = 13

Answer: (a) 13

Solution 6:

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

Consecutive zeros come from pairs of (2 × 5)

Number of pairs = min(3, 2) = 2

Therefore, 2 consecutive zeros

$n = 2^3 \times 3^2 \times 5^2 \times 7 = 8 \times 9 \times 25 \times 7 = 12{,}600$

Answer: (a) 2

Solution 7:

Euclid's Division Lemma: $a = bq + r$, where $0 \leq r < b$

The remainder r must be greater than or equal to 0 and less than b.

Answer: (c) $0 \leq r < b$

Solution 8:

HCF × LCM = Product of two numbers

13 × LCM = 26 × 169

LCM = (26 × 169)/13 = 4394/13 = 338

Answer: (c) 338

Solution 9:

$\sqrt{2} + \sqrt{3}$ is indeed irrational (Assertion is TRUE)

However, the Reason is FALSE because:

Example: $(2 + \sqrt{3}) + (2 - \sqrt{3}) = 4$, which is rational

So sum of two irrationals is NOT always irrational

Answer: (c) A is true but R is false

Solution 10:

Assertion states: 10^n cannot end with 0 (This is FALSE)

$10^n = (2 \times 5)^n$ ALWAYS ends with 0

$10^1 = 10$, $10^2 = 100$, $10^3 = 1000$, etc.

Reason is TRUE (correct explanation that 10^n always ends with 0)

Answer: (d) A is false but R is true

SECTION - B (SOLUTIONS)

Solution 11:

$140 = 2 \times 70$
$= 2 \times 2 \times 35$
$= 2 \times 2 \times 5 \times 7$

$140 = 2^2 \times 5 \times 7$

Solution 12:

Prime Factorization:
$6 = 2 \times 3$
$20 = 2^2 \times 5$

HCF = Product of smallest powers of common prime factors
HCF = $2^1 = 2$

LCM = Product of greatest powers of all prime factors
LCM = $2^2 \times 3 \times 5 = 4 \times 3 \times 5 = 60$

HCF(6, 20) = 2 and LCM(6, 20) = 60

Solution 13:

$3 \times 5 \times 7 \times 11 + 11$
$= 11(3 \times 5 \times 7 + 1)$
$= 11(105 + 1)$
$= 11 \times 106$
Since the number can be expressed as a product of 11 and 106 (both greater than 1), it has more than two factors (1, 11, 106, and 1166).

Therefore, $3 \times 5 \times 7 \times 11 + 11$ is a composite number

Solution 14:

Maximum capacity = HCF(850, 680)

Using Euclid's Division Algorithm:
$850 = 680 \times 1 + 170$
$680 = 170 \times 4 + 0$

HCF = 170 litres

Maximum capacity of container = 170 litres

SECTION - C (SOLUTIONS)

Solution 15:

Proof by Contradiction:

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

Then, $\sqrt{2} = p/q$ where p and q are co-prime integers and $q \neq 0$

Squaring both sides: $2 = p^2/q^2$

$\implies p^2 = 2q^2$

$\implies$ 2 divides $p^2 \implies$ 2 divides p ... (1)

Let $p = 2m$ for some integer m

$p^2 = 4m^2$

From above: $2q^2 = 4m^2$

$\implies q^2 = 2m^2$

$\implies$ 2 divides $q^2 \implies$ 2 divides q ... (2)

From (1) and (2), 2 is a common factor of p and q

This contradicts our assumption that p and q are co-prime.

Therefore, $\sqrt{2}$ is irrational.

Solution 16:

Number of students in section A = 32

Number of students in section B = 36

Minimum number of books required = LCM(32, 36)

$32 = 2^5$

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

LCM = $2^5 \times 3^2 = 32 \times 9 = 288$

Minimum 288 books are required

Each student in section A will get 288/32 = 9 books

Each student in section B will get 288/36 = 8 books

Solution 17:

Proof by Contradiction:

Let us assume, to the contrary, that $3\sqrt{5} + 7$ is rational.

Let $3\sqrt{5} + 7 = r$, where r is rational

$\implies 3\sqrt{5} = r - 7$

$\implies \sqrt{5} = (r - 7)/3$

Since r is rational, (r - 7) is rational
Therefore, (r - 7)/3 is also rational
This means √5 is rational

But this contradicts the given fact that √5 is irrational.

Therefore, our assumption is wrong. Hence, 3√5 + 7 is irrational.

SECTION - D (SOLUTIONS)

Solution 18(a):

Using Euclid's Division Algorithm to find HCF(867, 255):

Step 1: $867 = 255 \times 3 + 102$
Step 2: $255 = 102 \times 2 + 51$
Step 3: $102 = 51 \times 2 + 0$

Since remainder = 0, HCF = 51

HCF(867, 255) = 51

Solution 18(b):

Let a be any positive odd integer.
By Euclid's division lemma: $a = 6q + r$, where $0 \leq r < 6$
So, r can be 0, 1, 2, 3, 4, or 5

If $a = 6q$, then a is even (divisible by 6)
If $a = 6q + 2$, then a is even ($6q + 2 = 2(3q + 1)$)
If $a = 6q + 4$, then a is even ($6q + 4 = 2(3q + 2)$)

Since a is odd, it cannot take the forms 6q, 6q + 2, or 6q + 4
Therefore, a must be of the form:

$a = 6q + 1$, or $a = 6q + 3$, or $a = 6q + 5$

SECTION - E (SOLUTIONS)

Solution 19(i):

Finding HCF(420, 130):
$420 = 2^2 \times 3 \times 5 \times 7$
$130 = 2 \times 5 \times 13$
$HCF = 2 \times 5 = 10$

HCF(420, 130) = 10

Solution 19(ii):

Maximum number of packages = HCF = 10

10 packages can be made

Solution 19(iii):

Sugar in each package = 420/10 = 42 kg
Flour in each package = 130/10 = 13 kg

Each package will contain 42 kg sugar and 13 kg flour

Solution 20(i):

Finding LCM(18, 12, 20):

$18 = 2 \times 3^2$

$12 = 2^2 \times 3$

$20 = 2^2 \times 5$

$\text{LCM} = 2^2 \times 3^2 \times 5 = 4 \times 9 \times 5 = 180$

LCM(18, 12, 20) = 180

Solution 20(ii):

They will meet again after LCM minutes = 180 minutes

They will meet again after 180 minutes (or 3 hours)

Solution 20(iii):

Seema completes one round in 12 minutes
Number of rounds Seema completes = 180/12 = 15 rounds

Seema will complete 15 rounds