UNIQUE STUDY POINT

By Sumeet Sahu | Made with ❤ for Students

SAMPLE PAPER 01 - 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 decimal expansion of 147/120 will terminate after:

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

2. The LCM of smallest two digit composite number and smallest composite number is:

(a) 12 (b) 4 (c) 20 (d) 40

3. If HCF(336, 54) = 6, then LCM(336, 54) is:

(a) 2016 (b) 3024 (c) 6048 (d) 1512

4. The largest number which divides 615 and 963 leaving remainder 6 in each case is:

(a) 87 (b) 203 (c) 29 (d) 261

5. The sum of exponents of prime factors in the prime factorization of 196 is:

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

6. If $a = 2^3 \times 3^2$ and $b = 2^2 \times 3^3 \times 5$, then HCF(a, b) is:

(a) 108 (b) 36 (c) 12 (d) 18

7. The value of n for which 7^n ends with digit 7 is:

(a) $n = 2k$, where $k \in N$ (b) $n = 2k + 1$, where $k \in N$ (c) $n = 4k$, where $k \in N$

(d) None of these

8. The HCF of two numbers is 23 and their LCM is 1449. If one number is 161, then the other number is:

(a) 207 (b) 299 (c) 322 (d) 345

9. **Assertion (A):** The HCF of two numbers is 5 and their product is 150. Then their LCM is 30.
Reason (R): For any two positive integers a and b, HCF(a,b) × LCM(a,b) = a × b.

(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 2^n cannot end with digit 0 for any natural number n.
Reason (R): A number ending in 0 must be divisible by both 2 and 5.

(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. Find the HCF of 96 and 404 using Euclid's division algorithm.

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

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

14. If the HCF of 210 and 55 is expressible in the form $210 \times 5 + 55y$, find y.

SECTION - C

Questions 15 to 17 carry 3 marks each.

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

16. Three alarm clocks ring their alarms at regular intervals of 20 minutes, 25 minutes and 30 minutes respectively. If they first beep together at 12 noon, at what time will they beep together again?

17. Given that $\sqrt{3}$ is irrational, prove that $2\sqrt{3} - 5$ is an irrational number.

SECTION - D

Question 18 carries 5 marks.

18. (a) Find the largest number that divides 2053 and 967 leaving remainders 5 and 7 respectively. (3 marks)

(b) Find the least number which when divided by 12, 16, 24 and 36 leaves a remainder 7 in each case. (2 marks)

SECTION - E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. A school is organizing a sports day event. For the march past, there are 616 students of class X and 32 teachers. They are to be arranged in rows such that each row consists of either students or teachers only and the number of students/teachers in each row is the same.

(i) Find the prime factorization of 616. (1 mark)

(ii) What is the HCF of 616 and 32? (1 mark)

(iii) What is the maximum number of students/teachers that can be placed in each row? (2 marks)

20. A charitable trust donates 28 different books of Maths, 16 different books of Science and 12 different books of Social Science to a school library. The trust wants to divide the books into maximum number of groups so that each group has the same number of books of each subject.

(i) Find the HCF of 28, 16 and 12. (2 marks)

(ii) How many books of each subject will be in each group? (1 mark)

(iii) How many groups can be formed? (1 mark)

✓ DETAILED SOLUTIONS - SAMPLE PAPER 01

SECTION - A (SOLUTIONS)

Solution 1:

$147/120 = 147/(2^3 \times 3 \times 5)$

Denominator = $2^3 \times 3 \times 5$ (has factors other than 2 and 5, i.e., 3)

However, simplifying: $147/120 = 49/40 = 49/(2^3 \times 5)$

Now denominator is of the form $2^m \times 5^n$

Maximum of m and n = max(3,1) = 3

Answer: (c) three decimal places (1.225)

Solution 2:

Smallest two-digit composite number = 10

Smallest composite number = 4

$10 = 2 \times 5$

$4 = 2^2$

LCM = $2^2 \times 5 = 20$

Answer: (c) 20

Solution 3:

Formula: HCF × LCM = Product of two numbers

$6 \times LCM = 336 \times 54$

$LCM = (336 \times 54)/6 = 18144/6 = 3024$

Answer: (b) 3024

Solution 4:

Required number divides (615 - 6) and (963 - 6)

= HCF(609, 957)

$609 = 3 \times 7 \times 29$

$957 = 3 \times 11 \times 29$

$HCF = 3 \times 29 = 87$

Answer: (a) 87

Solution 5:

$196 = 4 \times 49 = 2^2 \times 7^2$

Sum of exponents = 2 + 2 = 4

Answer: (c) 4

Solution 6:

a = $2^3 \times 3^2$

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

HCF = Product of smallest powers of common factors

HCF = $2^2 \times 3^2 = 4 \times 9 = 36$

Answer: (b) 36

Solution 7:

$7^1 = 7$ (ends with 7)

$7^2 = 49$ (ends with 9)

$7^3 = 343$ (ends with 3)

$7^4 = 2401$ (ends with 1)

$7^5 = 16807$ (ends with 7)

Pattern: For odd powers (n = 2k + 1), it ends with 7 or 3

More specifically, 7^{4k+1} ends with 7

Answer: (b) n = 2k + 1, where k ∈ N (odd powers)

Solution 8:

HCF × LCM = Product of two numbers

23 × 1449 = 161 × other number

Other number = (23 × 1449)/161 = 33327/161 = 207

Answer: (a) 207

Solution 9:

Given: HCF = 5, Product = 150

Using formula: 5 × LCM = 150

LCM = 150/5 = 30 ✓ (Assertion is TRUE)

Reason states the correct formula. (Reason is TRUE)

R correctly explains A.

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

Solution 10:

$2^n = 2 \times 2 \times 2...$ (n times)

Prime factorization contains only 2, no factor of 5

To end with 0, a number must have both 2 and 5 in its prime factorization

Since 2^n has no factor of 5, it cannot end with 0 ✓ (Assertion is TRUE)

Reason correctly explains why numbers ending in 0 need factors of both 2 and 5. (Reason is TRUE)

R correctly explains A.

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

SECTION - B (SOLUTIONS)

Solution 11:

Using Euclid's Division Algorithm:

Step 1: $404 = 96 \times 4 + 20$

Step 2: $96 = 20 \times 4 + 16$

Step 3: $20 = 16 \times 1 + 4$

Step 4: $16 = 4 \times 4 + 0$

Since remainder = 0, HCF = 4

HCF(96, 404) = 4

Solution 12:

$7 \times 11 \times 13 + 13$

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

$= 13(77 + 1)$

$= 13 \times 78$

Since the number can be expressed as a product of 13 and 78 (both greater than 1), it has more than two factors.

Therefore, $7 \times 11 \times 13 + 13$ is a composite number.

Solution 13:

For a number to end with 0, its prime factorization must contain both 2 and 5.

$6^n = (2 \times 3)^n = 2^n \times 3^n$

Prime factorization of 6^n contains only 2 and 3

There is no factor of 5 in the prime factorization

Therefore, 6^n cannot end with digit 0 for any natural number n.

Solution 14:

First, find HCF(210, 55) using Euclid's algorithm:

$210 = 55 \times 3 + 45$

$55 = 45 \times 1 + 10$

$45 = 10 \times 4 + 5$

$10 = 5 \times 2 + 0$

So, HCF = 5

Given: $210 \times 5 + 55y = 5$

$1050 + 55y = 5$

$55y = 5 - 1050 = -1045$

$y = -1045/55 = -19$

$y = -19$

SECTION - C (SOLUTIONS)

Solution 15:

Proof by Contradiction:

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

Then, $\sqrt{7} = p/q$ where p and q are co-prime integers and $q \neq 0$

Squaring both sides: $7 = p^2/q^2$

$\implies p^2 = 7q^2$

$\implies$ 7 divides $p^2 \implies$ 7 divides p ... (1)

Let $p = 7m$ for some integer m

$p^2 = 49m^2$

From above: $7q^2 = 49m^2$

$\implies q^2 = 7m^2$

$\implies$ 7 divides $q^2 \implies$ 7 divides q ... (2)

From (1) and (2), 7 is a common factor of p and q

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

Therefore, $\sqrt{7}$ is irrational.

Solution 16:

To find when they will beep together again, we need LCM(20, 25, 30)

$20 = 2^2 \times 5$

$25 = 5^2$

$30 = 2 \times 3 \times 5$

$LCM = 2^2 \times 3 \times 5^2 = 4 \times 3 \times 25 = 300$ minutes

300 minutes = 5 hours

They first beep together at 12:00 noon

Next time = 12:00 + 5:00 = 5:00 PM

They will beep together again at 5:00 PM

Solution 17:

Proof by Contradiction:

Let us assume, to the contrary, that $2\sqrt{3} - 5$ is rational.

Let $2\sqrt{3} - 5 = r$, where r is rational

⟹ $2\sqrt{3} = r + 5$
⟹ $\sqrt{3} = (r + 5)/2$

Since r is rational, (r + 5) is rational
Therefore, (r + 5)/2 is also rational
This means √3 is rational

But this contradicts the given fact that √3 is irrational.

Therefore, our assumption is wrong. Hence, 2√3 - 5 is irrational.

SECTION - D (SOLUTIONS)

Solution 18(a):

The required number divides (2053 - 5) and (967 - 7)
= HCF(2048, 960)

Using Euclid's Division Algorithm:
$2048 = 960 \times 2 + 128$
$960 = 128 \times 7 + 64$
$128 = 64 \times 2 + 0$

The largest number is 64

Solution 18(b):

Required number = LCM(12, 16, 24, 36) + 7

$12 = 2^2 \times 3$
$16 = 2^4$
$24 = 2^3 \times 3$
$36 = 2^2 \times 3^2$

$LCM = 2^4 \times 3^2 = 16 \times 9 = 144$
Required number = 144 + 7 = 151

The least number is 151

SECTION - E (SOLUTIONS)

Solution 19(i):

$616 = 2 \times 308 = 2 \times 2 \times 154 = 2 \times 2 \times 2 \times 77 = 2 \times 2 \times 2 \times 7 \times 11$

$616 = 2^3 \times 7 \times 11$

Solution 19(ii):

$616 = 2^3 \times 7 \times 11$

$32 = 2^5$

$HCF = 2^3 = 8$

HCF(616, 32) = 8

Solution 19(iii):

Maximum number in each row = HCF(616, 32) = 8

This ensures equal number of students/teachers in each row.

Number of student rows = 616/8 = 77

Number of teacher rows = 32/8 = 4

Maximum 8 students/teachers can be placed in each row

Solution 20(i):

$28 = 2^2 \times 7$

$16 = 2^4$

$12 = 2^2 \times 3$

$HCF = 2^2 = 4$

HCF(28, 16, 12) = 4

Solution 20(ii):

Maths books in each group = 28/4 = 7

Science books in each group = 16/4 = 4

Social Science books in each group = 12/4 = 3

7 Maths, 4 Science, and 3 Social Science books in each group

Solution 20(iii):

Number of groups = HCF = 4

4 groups can be formed