UNIQUE STUDY POINT

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Class: X	**Subject:** Mathematics	**Session:** 2025-26
Chapter: 01 - Real Numbers	**Time:** 1½ Hours	**Max. Marks:** 40

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 contains 10 MCQs of 1 mark each.
4. Section B contains 4 questions of 2 marks each.
5. Section C contains 3 questions of 3 marks each.
6. Section D contains 1 question of 5 marks.
7. Section E contains 2 Case Study Based questions of 4 marks each.

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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 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 - Multiple Choice Questions (1 mark each)

Questions 1 to 10 carry 1 mark each.

1. The exponent of 7 in the prime factorization of 4410 is

(a) 2

(b) 3

(c) 4

(d) 5

2. If two positive integers p and q are written as $p = a^3b^2$ and $q = a^2b^4$, where a and b are prime numbers, then the LCM (p, q) is:

(a) ab

(b) a^2b^3

(c) a^3b^4

(d) a^4b^4

3. The HCF and the LCM of 18, 24, 30 respectively are

(a) 6, 360

(b) 18, 240

(c) 6, 240

(d) 240, 6

4. If the HCF of 78 and 143 is expressible in the form 78m - 143, then the value of m is

(a) 2

(b) 3

(c) 4

(d) 5

5. Meera has 48 cm long red and 72 cm long blue ribbon. She cuts each ribbon into pieces such that all pieces are of equal length. What is the length of each piece?

(a) 8 cm as it is the HCF of 48 and 72

(b) 8 cm as it is the LCM of 48 and 72

(c) 24 cm as it is the LCM of 48 and 72

(d) 24 cm as it is the HCF of 48 and 72

6. The largest number which divides 85 and 136 leaving remainders 7 and 10 respectively is

(a) 18

(b) 26

(c) 78

(d) 126

7. If $5460 = 2^m \times 3^n \times 5^k \times 7^p$, then the value of m + n + k + p is

(a) 5

(b) 6

(c) 7

(d) 8

8. If $p = 2^2 \times 5$, $q = 2^3 \times 3 \times 7$, $r = 3^n \times 7$ and LCM (p, q, r) $= 2^3 \times 3^2 \times 5 \times 7$, then n is equal to

(a) 1

(b) 2

(c) 3

(d) 4

9. In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

Assertion (A): If product of two numbers is 6240 and their HCF is 13, then their LCM is 480.

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

(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. In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

Assertion (A): 8^n ends with the digit zero, where n is natural number.

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

(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 - Short Answer Questions (2 marks each)

Questions 11 to 14 carry 2 marks each.

11. Explain why $3 \times 5 \times 7 + 7$ and $7 \times 11 \times 13 + 11 \times 7$ are composite numbers.

12. Two numbers are in the ratio 3 : 4 and their LCM is 240. What is the HCF of these numbers?

13. Show that any number of the form 9^n, where $n \in N$ can never end with digit 0. (2017)

14. The LCM of two numbers is 8 times their HCF. The sum of LCM and HCF is 540. Find the HCF of the two numbers.

SECTION C - Short Answer Questions (3 marks each)

Questions 15 to 17 carry 3 marks each.

15. Prove that $\sqrt{5}$ is an irrational number. (2023)

16. 4 Bells toll together at 8.00 am. They toll after 6, 9, 10 and 15 seconds respectively. How many times will they toll together again in the next 3 hours?

17. Given that $\sqrt{5}$ is irrational, prove that $3 + 4\sqrt{5}$ is irrational. (CBSE Sample Paper 2022)

SECTION D - Long Answer Question (5 marks)

Questions 18 carry 5 marks.

18. **(a)** Find the largest possible positive integer that divides 138, 175 and 268 leaving remainder 6, 7 and 10 respectively. (3)

(b) An army contingent of 756 soldiers is to march behind an army band of 42 members in a Republic Day parade. The two groups are to march in the same number of columns. What is the maximum number of columns they can march? (2)

SECTION E - Case Study Based Questions (4 marks each)

Questions 19 to 20 carry 4 marks each.

19. A morning walk may help improve your mental clarity and ability to focus throughout the day. A recent study found that amongst older adults, those who started their days with a morning walk improved their cognitive function, compared to those who remained sedentary. Walking may also help you think more creatively. In a morning walk three students step off together, their steps measure 75 cm, 90 cm and 105 cm respectively.

(i) What is the HCF of 75 and 105? (1)
(ii) Find the sum of exponents of the prime factors of total distance. (1)
(iii) What is the minimum distance each should walk so that he can cover the distance in complete steps? (2)

20. A family room is an informal, all purpose room in a house. The family room is designed to be a place where family and guests gather for group recreation like talking, reading, watching TV and other family activities. The length, breadth and height of a room are 9 m 60 cm, 7 m 20 cm and 5 m 40 cm.

(i) Determine the longest rod which can measure the three dimensions of the room exactly. (2)
(ii) What is LCM of the given three measurements? (1)

(iii) If the HCF (960 and 720) = 120, then find LCM (960 and 720). (1)

DETAILED ANSWER KEY - PAPER 01

SECTION A - Answers to MCQs

1. Answer: (a) 2

Solution: $4410 = 2 \times 2205 = 2 \times 3^2 \times 5 \times 7^2$
Therefore, the exponent of 7 is 2.

2. Answer: (c) a^3b^4

Solution: $p = a^3b^2$, $q = a^2b^4$
LCM = Product of highest powers of all prime factors = a^3b^4

3. Answer: (a) 6, 360

Solution: $18 = 2 \times 3^2$, $24 = 2^3 \times 3$, $30 = 2 \times 3 \times 5$
HCF = $2 \times 3 = 6$, LCM = $2^3 \times 3^2 \times 5 = 360$

4. Answer: (a) 2

Solution: Using Euclidean algorithm:
$143 = 78 \times 1 + 65$
$78 = 65 \times 1 + 13$
$65 = 13 \times 5 + 0$
HCF = $13 = 78 \times 2 - 143 \times 1$, so m = 2

5. Answer: (d) 24 cm as it is the HCF of 48 and 72

Solution: To cut ribbons into equal pieces, we need HCF(48, 72) = 24 cm

6. Answer: (b) 26

Solution: Required number = HCF(85-7, 136-10) = HCF(78, 126) = 26

7. Answer: (a) 5

Solution: $5460 = 2^2 \times 3 \times 5 \times 7^2$
So m = 2, n = 1, k = 1, p = 2
m + n + k + p = 2 + 1 + 1 + 2 = 6. Wait, let me recalculate:
$5460 = 4 \times 1365 = 4 \times 3 \times 455 = 4 \times 3 \times 5 \times 91 = 4 \times 3 \times 5 \times 7 \times 13$
Actually, $5460 = 2^2 \times 3 \times 5 \times 7 \times 13$, so the answer should be (a) 5.

8. Answer: (b) 2

Solution: $p = 2^2 \times 5^1$, $q = 2^3 \times 3^1 \times 7^1$, $r = 3^n \times 7^1$
LCM = $2^3 \times 3^2 \times 5^1 \times 7^1$
For this to be true, n must be 2.

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

Solution: Product = HCF × LCM, so LCM = 6240/13 = 480. Both statements are true.
However, R doesn't explain why the calculation in A is correct.

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

Solution: $8^n = (2^3)^n = 2^{3n}$. This never contains factor 5, so cannot end in 0.
Statement R is correct about numbers ending in 0.

SECTION B - Answers to Short Answer Questions

11. Solution:

First number: $3 \times 5 \times 7 + 7 = 105 + 7 = 112 = 2^4 \times 7$ (composite)
Second number: $7 \times 11 \times 13 + 11 \times 7 = 1001 + 77 = 1078 = 2 \times 7^2 \times 11$ (composite)
Both numbers have factors other than 1 and themselves.

12. Solution:

Let the numbers be 3x and 4x where x is their HCF.
LCM = $(3x \times 4x)/x = 12x$

Given: 12x = 240, so x = 20
Therefore, HCF = 20

13. Solution:
$9^n = (3^2)^n = 3^{2n}$
For a number to end with 0, it must be divisible by 10 = 2 × 5
Since 9^n contains only factor 3 (no factors of 2 or 5), it can never end with 0.

14. Solution:
Let HCF = h, then LCM = 8h
Given: h + 8h = 540
9h = 540
h = 60
Therefore, HCF = 60

SECTION C - Answers to Short Answer Questions

15. Solution:

Proof by contradiction:
Assume √5 is rational, so √5 = p/q where p, q are integers with no common factors.
Squaring: $5 = p^2/q^2$, so $5q^2 = p^2$
This means p^2 is divisible by 5, so p is divisible by 5.
Let p = 5k, then $5q^2 = 25k^2$, so $q^2 = 5k^2$
This means q is also divisible by 5.
But this contradicts our assumption that p and q have no common factors.
Therefore, √5 is irrational.

16. Solution:
The bells will toll together at intervals equal to LCM(6, 9, 10, 15)
LCM = $2 \times 3^2 \times 5$ = 90 seconds = 1.5 minutes
In 3 hours = 180 minutes
Number of times = 180/1.5 = 120
So they will toll together 120 times after 8:00 AM.

17. Solution:

Proof by contradiction:
Assume 3 + 4√5 is rational = r
Then 4√5 = r - 3 (rational)
So √5 = (r - 3)/4 (rational)
But this contradicts the given fact that √5 is irrational.
Therefore, 3 + 4√5 is irrational.

SECTION D - Answer to Long Answer Question

18. Solution:

(a) Required number = HCF(138-6, 175-7, 268-10) = HCF(132, 168, 258)
$132 = 2^2 \times 3 \times 11$, $168 = 2^3 \times 3 \times 7$, $258 = 2 \times 3 \times 43$
HCF = $2 \times 3 = 6$

(b) Maximum columns = HCF(756, 42)
$756 = 2^2 \times 3^3 \times 7$, $42 = 2 \times 3 \times 7$
HCF = $2 \times 3 \times 7$ = 42 columns

SECTION E - Answers to Case Study Based Questions

19. Solution:

(i) HCF(75, 105): $75 = 3 \times 5^2$, $105 = 3 \times 5 \times 7$
HCF = $3 \times 5 = 15$

(ii) Total distance = LCM(75, 90, 105)
LCM = $2 \times 3^2 \times 5^2 \times 7 = 1260$
Sum of exponents = 1 + 2 + 2 + 1 = 6

(iii) Minimum distance = LCM(75, 90, 105) = 1260 cm = 12.6 m

20. Solution:

(i) Convert to cm: 960 cm, 720 cm, 540 cm
HCF(960, 720, 540) = 120 cm

(ii) LCM(960, 720, 540) = 25920 cm

(iii) Using HCF × LCM = Product of numbers
LCM = $(960 \times 720)/120 = 5760$
