

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 5 in the prime factorization of 9375 is
 - (a) 3
 - (b) 4
 - (c) 5
 - (d) 6
2. If two positive integers u and v are written as $u = r^3s$ and $v = rs^4$, where r and s are prime numbers, then the LCM (u, v) is:
 - (a) rs
 - (b) r^2s^2
 - (c) r^3s^4
 - (d) r^4s^5
3. The HCF and the LCM of 36, 48, 60 respectively are
 - (a) 12, 720
 - (b) 6, 1440

- (c) 12, 1440
- (d) 720, 12

4. If the HCF of 119 and 187 is expressible in the form $119m - 187$, then the value of m is
- (a) 1
 - (b) 2
 - (c) 3
 - (d) 4
5. Kiran has 72 cm long purple and 120 cm long orange ribbon. She cuts each ribbon into pieces such that all pieces are of equal length. What is the length of each piece?
- (a) 12 cm as it is the HCF of 72 and 120
 - (b) 12 cm as it is the LCM of 72 and 120
 - (c) 24 cm as it is the LCM of 72 and 120
 - (d) 24 cm as it is the HCF of 72 and 120
6. The largest number which divides 126 and 189 leaving remainders 9 and 15 respectively is
- (a) 29
 - (b) 58
 - (c) 117
 - (d) 174
7. If $9240 = 2^m \times 3^n \times 5^k \times 7^p \times 11^q$, then the value of $m + n + k + p + q$ is
- (a) 6
 - (b) 7
 - (c) 8
 - (d) 9
8. If $a = 5^2 \times 11$, $b = 5^3 \times 7 \times 13$, $c = 7^n \times 13^2$ and $\text{LCM}(a, b, c) = 5^3 \times 7^2 \times 11 \times 13^2$, 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 9504 and their HCF is 18, then their LCM is 528.
- Reason (R):** The product of HCF and LCM of two numbers is equal to the product of the 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.
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):** 24^n ends with the digit zero, where n is natural number.
- Reason (R):** For a number to end with zero, it must have both 2 and 5 as prime factors.
- (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 $11 \times 13 \times 17 + 17$ and $17 \times 19 \times 23 + 19 \times 17$ are composite numbers.
12. Two numbers are in the ratio 6 : 8 and their LCM is 504. What is the HCF of these numbers?
13. Show that any number of the form 27^n , where $n \in \mathbb{N}$ can never end with digit 0. (2017)
14. The LCM of two numbers is 5 times their HCF. The sum of LCM and HCF is 720. 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 $\sqrt{13}$ is an irrational number. (2023)
16. 4 Bells toll together at 5.00 am. They toll after 10, 14, 18 and 21 seconds respectively. How many times will they toll together again in the next 4 hours?
17. Given that $\sqrt{13}$ is irrational, prove that $7 + 6\sqrt{13}$ 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 182, 247 and 338 leaving remainder 11, 13 and 17 respectively. (3)
- (b) An army contingent of 1008 soldiers is to march behind an army band of 63 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 92 cm, 115 cm and 138 cm respectively.
 - (i) What is the HCF of 92 and 138? (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 14 m 40 cm, 11 m 20 cm and 8 m 80 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 (1440 and 1120) = 160, then find LCM (1440 and 1120). (1)

SECTION A - Answers to MCQs

1. Answer: (c) 5

Solution: $9375 = 3 \times 3125 = 3 \times 5^5$
Therefore, the exponent of 5 is 5.

2. Answer: (c) r^3s^4

Solution: $u = r^3s^1, v = r^1s^4$
LCM = Product of highest powers of all prime factors = r^3s^4

3. Answer: (a) 12, 720

Solution: $36 = 2^2 \times 3^2, 48 = 2^4 \times 3, 60 = 2^2 \times 3 \times 5$
HCF = $2^2 \times 3 = 12$, LCM = $2^4 \times 3^2 \times 5 = 720$

4. Answer: (b) 2

Solution: Using Euclidean algorithm:
 $187 = 119 \times 1 + 68$
 $119 = 68 \times 1 + 51$
 $68 = 51 \times 1 + 17$
 $51 = 17 \times 3 + 0$
HCF = 17 = $119 \times 2 - 187 \times 1$, so $m = 2$

5. Answer: (d) 24 cm as it is the HCF of 72 and 120

Solution: To cut ribbons into equal pieces, we need HCF(72, 120)
 $72 = 2^3 \times 3^2, 120 = 2^3 \times 3 \times 5$
HCF = $2^3 \times 3 = 24$ cm

6. Answer: (b) 58

Solution: Required number = HCF(126-9, 189-15) = HCF(117, 174) = 58

7. Answer: (b) 7

Solution: $9240 = 2^3 \times 3 \times 5 \times 7 \times 11$
So $m = 3, n = 1, k = 1, p = 1, q = 1$
 $m + n + k + p + q = 3 + 1 + 1 + 1 + 1 = 7$

8. Answer: (b) 2

Solution: $a = 5^2 \times 11^1, b = 5^3 \times 7^1 \times 13^1, c = 7^n \times 13^2$
LCM = $5^3 \times 7^2 \times 11^1 \times 13^2$
For this to be true, n must be 2.

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

Solution: Product = HCF \times LCM, so LCM = $9504/18 = 528$. Both statements are true.
R correctly explains the formula used in A.

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

Solution: $24^n = (2^3 \times 3)^n = 2^{3n} \times 3^n$. 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: $11 \times 13 \times 17 + 17 = 2431 + 17 = 2448 = 2^4 \times 3^2 \times 17$ (composite)
Second number: $17 \times 19 \times 23 + 19 \times 17 = 7429 + 323 = 7752 = 2^3 \times 3 \times 17 \times 19$ (composite)
Both numbers have factors other than 1 and themselves.

12. Solution:

Let the numbers be $6x$ and $8x$ where x is their HCF.

$$\text{LCM} = (6x \times 8x)/2x = 24x \text{ (since HCF}(6,8) = 2)$$

$$\text{Given: } 24x = 504, \text{ so } x = 21$$

Therefore, HCF = 21

13. Solution:

$$27^n = (3^3)^n = 3^{3n}$$

For a number to end with 0, it must be divisible by $10 = 2 \times 5$

Since 27^n contains only factor 3 (no factors of 2 or 5), it can never end with 0.

14. Solution:

Let HCF = h, then LCM = 5h

$$\text{Given: } h + 5h = 720$$

$$6h = 720$$

$$h = 120$$

Therefore, HCF = 120

SECTION C - Answers to Short Answer Questions

15. Solution:

Proof by contradiction:

Assume $\sqrt{13}$ is rational, so $\sqrt{13} = p/q$ where p, q are integers with no common factors.

$$\text{Squaring: } 13 = p^2/q^2, \text{ so } 13q^2 = p^2$$

This means p^2 is divisible by 13, so p is divisible by 13.

$$\text{Let } p = 13k, \text{ then } 13q^2 = 169k^2, \text{ so } q^2 = 13k^2$$

This means q is also divisible by 13.

But this contradicts our assumption that p and q have no common factors.

Therefore, $\sqrt{13}$ is irrational.

16. Solution:

The bells will toll together at intervals equal to LCM(10, 14, 18, 21)

$$\text{LCM} = 2 \times 3^2 \times 5 \times 7 = 630 \text{ seconds} = 10.5 \text{ minutes}$$

In 4 hours = 240 minutes

$$\text{Number of times} = 240/10.5 \approx 22.86$$

So they will toll together 22 times after 5:00 AM.

17. Solution:

Proof by contradiction:

Assume $7 + 6\sqrt{13}$ is rational = r

$$\text{Then } 6\sqrt{13} = r - 7 \text{ (rational)}$$

$$\text{So } \sqrt{13} = (r - 7)/6 \text{ (rational)}$$

But this contradicts the given fact that $\sqrt{13}$ is irrational.

Therefore, $7 + 6\sqrt{13}$ is irrational.

SECTION D - Answer to Long Answer Question

18. Solution:

$$\text{(a) Required number} = \text{HCF}(182-11, 247-13, 338-17) = \text{HCF}(171, 234, 321)$$

$$171 = 3^2 \times 19, 234 = 2 \times 3^2 \times 13, 321 = 3 \times 107$$

$$\text{HCF} = 3$$

$$\text{(b) Maximum columns} = \text{HCF}(1008, 63)$$

$$1008 = 2^4 \times 3^2 \times 7, 63 = 3^2 \times 7$$

$$\text{HCF} = 3^2 \times 7 = 63 \text{ columns}$$

SECTION E - Answers to Case Study Based Questions

19. Solution:

(i) HCF(92, 138): $92 = 2^2 \times 23$, $138 = 2 \times 3 \times 23$
HCF = $2 \times 23 = 46$

(ii) Total distance = LCM(92, 115, 138)

$$\text{LCM} = 2^2 \times 3 \times 5 \times 23 = 1380$$

$$\text{Sum of exponents} = 2 + 1 + 1 + 1 = 5$$

(iii) Minimum distance = LCM(92, 115, 138) = 1380 cm = 13.8 m

20. Solution:

(i) Convert to cm: 1440 cm, 1120 cm, 880 cm

$$\text{HCF}(1440, 1120, 880) = 80 \text{ cm}$$

(ii) LCM(1440, 1120, 880) = 31680 cm

(iii) Using HCF \times LCM = Product of numbers

$$\text{LCM} = (1440 \times 1120)/160 = 10080$$

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