PRACTICE PAPER 01
CHAPTER 01 REAL NUMBERS

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

CLASS : X **DURATION : 1½ hrs**

General Instructions:

(i). **All** questions are compulsory.
(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.
(iii). **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.
(iv). There is no overall choice.
(v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. If two positive integers a and b are written as $a = x^3y^2$ and $b = xy^3$, where x and y are prime numbers, then the HCF (a, b) is:
(a) xy (b) xy^2 (c) x^3y^3 (d) x^2y^2

2. Find the greatest number of 5 digits, that will give us remainder of 5, when divided by 8 and 9 respectively.
(a) 99921 (b) 99931 (c) 99941 (d) 99951

3. The ratio between the LCM and HCF of 5, 15, 20 is:
(a) 9 : 1 (b) 4 : 3 (c) 11 : 1 (d) 12 : 1

4. Two alarm clocks ring their alarms at regular intervals of 50 seconds and 48 seconds. If they first beep together at 12 noon, at what time will they beep again for the first time?
(a) 12.20 pm (b) 12.12 pm (c) 12.11 pm (d) none of these

5. The HCF of 2472, 1284 and a third number N is 12. If their LCM is $2^3 \times 3^2 \times 5 \times 103 \times 107$, then the number N is :
(a) $2^2 \times 3^2 \times 7$ (b) $2^2 \times 3^3 \times 103$ (c) $2^2 \times 3^2 \times 5$ (d) $2^4 \times 3^2 \times 11$

6. Two natural numbers whose difference is 66 and the least common multiple is 360, are:
(a) 120 and 54 (b) 90 and 24 (c) 180 and 114 (d) 130 and 64

7. HCF of $5^2 \times 3^2$ and $3^5 \times 5^3$ is:
(a) $5^3 \times 3^5$ (b) 5×3^3 (c) $5^3 \times 3^2$ (d) $5^2 \times 3^2$

8. The HCF and the LCM of 12, 21, 15 respectively are
(a) 3, 140 (b) 12, 420 (c) 3, 420 (d) 420, 3

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): For no value of n, where n is a natural number, the number 6^n ends with the digit zero.
Reason (R): For a number to end with digit zero, its prime factors should have 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.

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): If LCM of two numbers is 2475 and their product is 12375, then their HCF is 5.
Reason (R): 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.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Find the HCF and LCM of 6, 72 and 120 using fundamental theorem of arithmetic.

12. Find the largest number that divides 2053 and 967 and leaves a remainder of 5 and 7 respectively.

13. Two numbers are in the ratio 21 : 17. If their HCF is 5, find the numbers.

14. Can we have any $n \in N$, where 12^n ends with the digit zero?

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Prove that $\sqrt{5}$ is and irrational number.

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

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

SECTION – D

Questions 18 carry 5 marks.

18. (a) On a morning walk three persons step off together and their steps measure 40 cm, 42 cm, 45 cm, what is the minimum distance each should walk so that each can cover the same distance in complete steps?
(b) There are 576 boys and 448 girls in a school that are to be divided into equal sections of either boys or girls alone. Find the total number of sections thus formed.

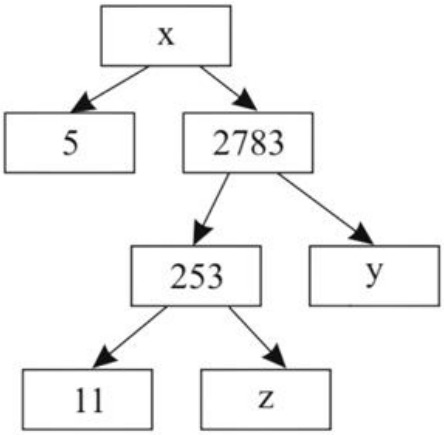
SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. Ravish runs a book shop at school of Math, Gurgaon.
He received 480 chemistry books, 192 physics books and 672 Mathematics books of class XI.
He wishes to average these books in minimum numbers of stacks such that each stack consists of the books on only one subject and the number of books in each stack is the same.

(a) Find the number of books in each stack.
(b) Find the Number of stacks of Mathematics books are
(c) Find the Minimum number of stacks of all the books.
(d) Find the Difference in number of stacks of Mathematics books and sum of stacks of Physics and Chemistry books is

20. A Mathematics Exhibition is being conducted in your School and one of your friends is making a model of a factor tree. He has some difficulty and asks for your help in completing a quiz for the audience.
Observe the following factor tree and answer the following:



(i) What will be the value of x?
(ii) What will be the value of y?
(iii) What will be the value of z?
(iv) Write the prime factorisation of 13915.

PRACTICE PAPER 01
CHAPTER 01 REAL NUMBERS (ANSWERS)

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

CLASS : X **DURATION : 1½ hrs**

General Instructions:

(i). **All** questions are compulsory.

(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.

(iii). **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.

(iv). There is no overall choice.

(v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. If two positive integers a and b are written as $a = x^3y^2$ and $b = xy^3$, where x and y are prime numbers, then the HCF (a, b) is:

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

Ans: (b) Here, $a = x^3y^2$ and $b = xy^3$

$\Rightarrow a = x \times x \times x \times y \times y$ and $b = xy \times y \times y$

$\therefore$ HCF(a, b) $= x \times y \times y = x \times y^2 = xy^2$

2. Find the greatest number of 5 digits, that will give us remainder of 5, when divided by 8 and 9 respectively.

(a) 99921 (b) 99931 (c) 99941 (d) 99951

Ans : (c) The greatest number will be multiple of LCM (8, 9)

LCM of 8 and 9 = 72

On verification we find that 99941 when divided by 72 leaves remainder 5.

3. The ratio between the LCM and HCF of 5, 15, 20 is:

(a) 9 : 1 (b) 4 : 3 (c) 11 : 1 (d) 12 : 1

Ans: (d) $5, 15 = 5 \times 3, 20 = 2 \times 2 \times 5$

LCM(5, 15, 20) $= 5 \times 3 \times 2 \times 2 = 60$

HCF(5, 15, 20) = 5

Ratio = LCM/HCF = 60/5 = 12/1 = 12 : 1

4. Two alarm clocks ring their alarms at regular intervals of 50 seconds and 48 seconds. If they first beep together at 12 noon, at what time will they beep again for the first time?

(a) 12.20 pm (b) 12.12 pm (c) 12.11 pm (d) none of these

Ans : (a) LCM of 50 and 48 = 1200

$\therefore$ 1200 sec = 20 min

Hence at 12.20 pm they will beep again for the first time.

5. The HCF of 2472, 1284 and a third number N is 12. If their LCM is $2^3 \times 3^2 \times 5 \times 103 \times 107$, then the number N is :

(a) $2^2 \times 3^2 \times 7$ (b) $2^2 \times 3^3 \times 103$ (c) $2^2 \times 3^2 \times 5$ (d) $2^4 \times 3^2 \times 11$

Ans : (c) $2472 = 2^3 \times 3 \times 103$

$1284 = 2^2 \times 3 \times 107$

$\because$ LCM $= 2^3 \times 3^2 \times 5 \times 103 \times 107$

$\therefore N = 2^2 \times 3^2 \times 5 = 180$

6. Two natural numbers whose difference is 66 and the least common multiple is 360, are:
(a) 120 and 54 (b) 90 and 24 (c) 180 and 114 (d) 130 and 64
Ans : (b) Difference of 90 and 24 = 66 and LCM of 90 and 24 = 360
∴ Numbers are 90 and 24

7. HCF of $5^2 \times 3^2$ and $3^5 \times 5^3$ is:
(a) $5^3 \times 3^5$ (b) 5×3^3 (c) $5^3 \times 3^2$ (d) $5^2 \times 3^2$
Ans : (d) HCF of $5^2 \times 3^2$ and $3^5 \times 5^3 = 5^2 \times 3^2$

8. The HCF and the LCM of 12, 21, 15 respectively are
(a) 3, 140 (b) 12, 420 (c) 3, 420 (d) 420, 3
Ans : (c), as $12 = 2^2 \times 3$
$21 = 3 \times 7$
$15 = 3 \times 5$
HCF = 3
LCM = $2^2 \times 3 \times 7 \times 5 = 420$

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): For no value of n, where n is a natural number, the number 6^n ends with the digit zero.
Reason (R): For a number to end with digit zero, its prime factors should have 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.
Ans: (a) Both A and R are true and R is the correct explanation of A.

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): If LCM of two numbers is 2475 and their product is 12375, then their HCF is 5.
Reason (R): 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.
Ans: (a) Both A and R are true and R is the correct explanation of A.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Find the HCF and LCM of 6, 72 and 120 using fundamental theorem of arithmetic.
Ans : $6 = 2 \times 3$
$72 = 2 \times 2 \times 2 \times 3 \times 3$
$120 = 2 \times 2 \times 2 \times 3 \times 5$
Common factors of 6, 72 and 120 are 2 and 3.
HCF = $2 \times 3 = 6$
LCM = $2 \times 2 \times 2 \times 3 \times 3 \times 5$
∴ LCM = 360

12. Find the largest number that divides 2053 and 967 and leaves a remainder of 5 and 7 respectively.
Ans : Required number is HCF of 2053 – 5 and 967 – 7 = HCF of 2048 and 960 = 64

13. Two numbers are in the ratio 21 : 17. If their HCF is 5, find the numbers.

Ans : Let numbers are $21x$ and $17x$.
Now, common factor of $21x$ and $17x = x$
Also HCF = 5
$\Rightarrow$ $x = 5$
$\therefore$ numbers are 21×5 and 17×5 i.e. 105 and 85.

14. Can we have any $n \in N$, where 12^n ends with the digit zero?
Ans : $12^n = (2\times2\times3)^n = 2^n \times 2^n \times 3^n$
For units digit to be 0, 12^n should have 2 and 5 as its prime factors, but 12^n does not contain 5 as its prime factor.
Hence 12^n will not end with digit 0 for $n \in N$.

SECTION – C

Questions 15 to 17 carry 3 marks each.

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

Ans: Let $\sqrt{5}$ is a rational number then we have $\sqrt{5} = \frac{p}{q}$, where p and q are co-primes.

$\Rightarrow p = \sqrt{5}q$
Squaring both sides, we get $p^2 = 5q^2$
$\Rightarrow$ p^2 is divisible by 5 $\Rightarrow$ p is also divisible by 5
So, assume p = 5m where m is any integer.
Squaring both sides, we get $p^2 = 25m^2$
But $p^2 = 5q^2$
Therefore, $5q^2 = 25m^2 \Rightarrow q^2 = 5m^2$
$\Rightarrow$ q^2 is divisible by 5 $\Rightarrow$ q is also divisible by 5
From above we conclude that p and q have one common factor i.e. 5 which contradicts that p and q are co-primes.
Therefore, our assumption is wrong.
Hence, $\sqrt{5}$ is an irrational number.

16. Find HCF and LCM of 404 and 96 and verify that HCF × LCM = Product of the two given numbers
Ans : HCF of 404 and 96
$404 = 2 \times 2 \times 101$
$96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$
Common factor $= 2 \times 2 = 4$
$\therefore$ HCF = 4
LCM of 404 and 96 $= 2 \times 2 \times 101 \times 2 \times 2 \times 2 \times 3 = 9696$
Verification:
HCF × LCM $= 4 \times 9696 = 38784$
Product of two numbers $= 404 \times 96 = 38784$
Clearly, HCF × LCM = Product of two numbers
Hence verified.

17. Given that $\sqrt{2}$ is irrational, prove that $(5 + 3\sqrt{2})$ is an irrational number.
Ans: Let $5+3\sqrt{2}$ be a rational number such that
$5+3\sqrt{2} = a$, where a is a non-zero rational number.

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

Since 5 and 3 are integers and a is a rational number, therefore $\frac{a-5}{3}$ is a rational number

$\Rightarrow \sqrt{2}$ is a rational number which contradicts the fact that $\sqrt{2}$ is an irrational number.

Therefore, our assumption is wrong.

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

SECTION – D

Questions 18 carry 5 marks.

18. (a) On a morning walk three persons step off together and their steps measure 40 cm, 42 cm, 45 cm, what is the minimum distance each should walk so that each can cover the same distance in complete steps?

(b) There are 576 boys and 448 girls in a school that are to be divided into equal sections of either boys or girls alone. Find the total number of sections thus formed.

Ans : (a) Minimum distance = LCM of 40, 42 and 45

Now $40 = 2^3 \times 5$

$42 = 2 \times 3 \times 7$

$45 = 3^2 \times 5$

$\therefore$ LCM of 40, 42 and $45 = 2^3 \times 3^2 \times 5 \times 7 = 2520$

$\therefore$ They should walk 2520 cm or 25.20 m to cover the distance in complete steps.

(b) $576 = 2^6 \times 3 \times 3$

$448 = 2^6 \times 7$

$\therefore$ HCF of 576 and $448 = 2^6 = 64$

$\therefore$ Number of sections $= \frac{576}{64} + \frac{448}{64} = 9 + 7 = 16$

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. Case Study-1 : Lusitania Bridge

Quadratic polynomial can be used to model the shape of many architectural structures in the world. The Lusitania Bridge is a bridge in Merida, Spain. The bridge was built over the Guadiana River in 1991 by a Spanish consortium to take the road traffic from the Romano bridge. The architect was Santiago Calatrava. The bridge takes its name from the fact that Emerita Augusta (present day Merida) was the former capital of Lusitania, an ancient Roman province.

Based on the above information, answer the following questions.

(i) If the Arch is represented by $10x^2 - x - 3$, then find its zeroes. (2)

(ii) Find the quadratic polynomial whose sum of zeroes is 0 and product of zeroes is 1. (2)

OR

(ii) Find the sum and product of zeroes of the polynomial $\sqrt{3}\,x^2 - 14x + 8\sqrt{3}$ (2)

Ans: (i) Put $10x^2 - x - 3 = 0$

$\Rightarrow 10x^2 - 6x + 5x - 3 = 0$
$\Rightarrow 2x(5x - 3) + 1(5x - 3)$
$\Rightarrow (2x + 1)(5x - 3) = 0$
$\Rightarrow x = -1/2, 3/5$
(ii) Sum of zeroes = 0 and Product of zeroes = 1
Required polynomials = $k[x^2 - (\text{sum})x + \text{Product}]$
$= k(x^2 - 0x + 1)$
$= k(x^2 + 1)$

OR

(ii) Here a = $\sqrt{3}$, b = - 14 and c = $8\sqrt{3}$

Sum of zeroes $= \frac{-b}{a} = \frac{-(-14)}{\sqrt{3}} = \frac{14}{\sqrt{3}}$

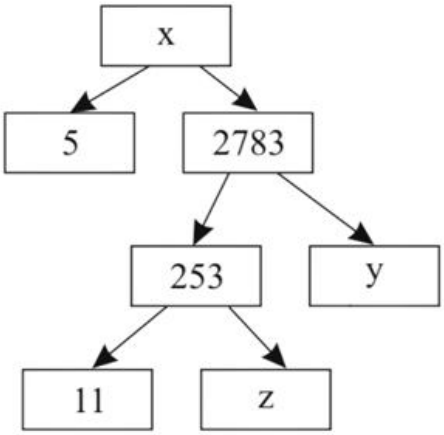
Product of zeroes $= \frac{c}{a} = \frac{8\sqrt{3}}{\sqrt{3}} = 8$

20. Case Study-2 : Library

Ravish runs a book shop at school of Math, Gurgaon.
He received 480 chemistry books, 192 physics books and 672 Mathematics books of class XI.
He wishes to average these books in minimum numbers of stacks such that each stack consists of the books on only one subject and the number of books in each stack is the same.

(a) Find the number of books in each stack.
Ans: 96
(b) Find the Number of stacks of Mathematics books are
Ans: 7
(c) Find the Minimum number of stacks of all the books.
Ans: 14
(d) Find the Difference in number of stacks of Mathematics books and sum of stacks of Physics and Chemistry books is
Ans: 0

21. A Mathematics Exhibition is being conducted in your School and one of your friends is making a model of a factor tree. He has some difficulty and asks for your help in completing a quiz for the audience.
Observe the following factor tree and answer the following:



(i) What will be the value of x?
Ans: 13915

(ii) What will be the value of y?
Ans: 11

(iii) What will be the value of z?
Ans: 23

(iv) Write the prime factorisation of 13915.
Ans: 13915 = 5 x 11 x 11 x 23