MATHEMATICS

WORKSHEET_110925

CHAPTER 03 THE STORY OF NUMBERS (Ganita Prakashan)

(ANSWERS)

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

CLASS : VIII **DURATION : 1½ hr**

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. The oldest known mathematical artifact, the Lebombo bone, has how many notches?
(a) 15 (b) 29 (c) 44 (d) 60
Ans. (b) 29
The **Lebombo bone** has **29** notches, believed to relate to a lunar cycle.

2. The system of numerals used throughout the world today is the:
(a) Roman number system. (b) Egyptian number system.
(c) Hindu number system. (d) Mayan number system.
Ans. (c) Hindu number system.
The Hindu system (with digits 0-9) is the global standard for math and science.

3. What is the Roman numeral for 1000?
(a) D (b) C (c) M (d) L
Ans. (c) M
M is the Roman symbol for 1000.

4. A number system that uses the position of a symbol to determine its value is called a:
(a) Subtractive system (b) Additive system (c) Place value system (d) Tally system
Ans. (c) Place value system
The value of a symbol depending on its position is the definition of a **place value system**.

5. In the Hindu number 7,082, the value of the digit 0 is:
(a) 0 (b) 10 (c) 100 (d) 1000
Ans. (a) 0
The actual value of the digit 0 in any position is always 0.

6. The Babylonian system is called a sexagesimal system because its base is:
(a) 10 (b) 50 (c) 60 (d) 100
Ans. (c) 60
Sexagesimal means the system has a base of **60**.

7. Which of the following is an example of the Subtractive Principle in Roman numerals?
(a) VI (b) CV (c) CD (d) CL
Ans. (c) CD
CD is 500 − 100 = 400. The smaller value (C) precedes the larger (D), indicating subtraction.

8. A number system whose landmark numbers are 1, 3, 9, 27, etc., is a base:
(a) 1 system (b) 3 system (c) 9 system (d) 27 system
Ans. (b) 3 system
The landmark numbers (1, 3, 9, 27) are all powers of 3.

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.
(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.

9. **Assertion (A):** The Roman numeral XC is 90.
Reason (R): The XC uses the subtractive principle, 100−10=90.
Ans. (a) Both A and R are true, and R is the correct explanation of A.
XC = 90 is true, and the reason correctly explains the subtractive rule used to get that value.

10. **Assertion (A):** The Hindu number system enables efficient computation.
Reason (R): The Hindu system uses a place value system and a symbol for zero.
Ans. (a) Both A and R are true, and R is the correct explanation of A.
The place value system and zero are the core features that enable the efficient, standard computation algorithms we use today.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Convert the Roman numeral CD to its equivalent in the Hindu number system.
Ans. CD is 500 − 100 = 400.

12. Convert the binary number 1111 to its decimal (Hindu) equivalent. Show your working.
Ans. To convert 1111 to decimal:
$(1 \times 8) + (1 \times 4) + (1 \times 2) + (1 \times 1) = 8 + 4 + 2 + 1 = 15$.

13. Convert the Hindu number 63 into its Roman numeral equivalent.
Ans. The Hindu number 63 is converted as: 50 + 10 + 3 = LXIII.

14. In a base-10 number system, what would be the value of the landmark number 10^5?
Ans. The value of the landmark number 10^5 is 100,000 (One Hundred Thousand).

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Calculate the difference between the Roman numerals L and XXX. Write the answer in Roman numerals and Hindu numerals.
Ans. The difference is 50 − 30 = 20.
Answer in Roman numerals: XX
Answer in Hindu numerals: 20

16. An Egyptian scribe adds two groups: Group 1 has 5 symbols for 10, and Group 2 has 6 symbols for 10 and 3 symbols for 1. What is the total sum in the Hindu number system?
Ans. The total sum is calculated by adding the Hindu values:
Group 1: $5 \times 10 = 50$
Group 2: $6 \times 10 + 3 \times 1 = 60 + 3 = 63$
Total Sum: 50 + 63 = 113

17. Convert the Hindu number 13 into the base-4 number system.

Ans. To convert 13 to base-4 (powers of 4: 16, 4, 1):
$13=(3\times4)+(1\times1)$
The base-4 equivalent is 314 .

SECTION – D

Questions 18 carry 5 marks each.

18. A farmer counts DCL chickens and CX ducks. How many total animals does the farmer have? Write your final answer in both Roman and Hindu numerals, showing the addition process in Hindu numerals.
Ans. The problem is DCL + CX.
Convert to Hindu numerals: DCL = 500 + 100 + 50 = 650 (Chickens).
Convert to Hindu numerals: CX = 100 + 10 = 110 (Ducks).
Addition: 650 + 110 = 760.
Final answer in Hindu numerals: 760
Final answer in Roman numerals: DCCLX

SECTION – E (Case Study Based Question)

Question 19 to 20 carry 4 mark

19. Case Study-1: The Place Value Problem

Dr. Sunita Verma was explaining the elegance of the Hindu number system to her students, noting that the same numeral can hold vastly different values depending on its position. She wrote a seemingly simple number on the board: 5,005. She challenged the class to analyze this number, highlighting how the placeholders (the zeros) and the position of the two fives showcase the system's efficiency. Understanding this fundamental concept is crucial, she stressed, because it is the key reason why this system is considered one of history's greatest mathematical inventions and why it enables unambiguous writing and easy computation.

Consider the Hindu number 5,005.
(i) What is the place value of the leftmost digit 5? (1)
(ii) What is the actual value of the rightmost digit 5? (1)
(iii) What is the actual value of the digit 0? (1)
(iv) How many times greater is the value of the leftmost 5 than the value of the rightmost 5? (2)
Ans. (i) The leftmost digit 5 is in the Thousands place.
(ii) The rightmost digit 5 is in the ones place, so its actual value is 5.
(iii) The digits 0 are in the hundreds and tens place, but their actual value is 0.
(iv) The value of the leftmost 5 is 5,000. The value of the rightmost 5 is 5.
5000/5=1000 times greater.

20. Case Study-2: Base-8 Number System

Dr. Arjun then introduced the concept of different counting bases, shifting the focus from the familiar decimal system. He noted that while their everyday mathematics was in base-10, ancient systems often used other bases. To illustrate this, he proposed a thought experiment involving a base-8 system. He explained that any base system must define its landmark numbers and the digits it uses. He challenged the students to convert a regular number, 20 apples, into this new base by grouping them into powers of eight, thereby demonstrating the flexible nature of positional number systems.

A new base system is created with a base of 8.

(i) What is the value of the landmark number 82? (1)

(ii) Which digits would be used in a base-8 system to represent all numbers? (1)

(iii) Convert the Hindu number 20 into this base-8 system. (2)

Ans. (i) The value of the landmark number 8^2 is $8 \times 8 = 64$.

(ii) A base-8 system uses digits from 0 up to $8 - 1$. The digits used are 0,1,2,3,4,5,6,and 7.

(iii) To convert 20 to base-8 (powers of 8: 64, 8, 1): $20 = (2 \times 8) + (4 \times 1)$

The base-8 equivalent is 24_8.