CLASS 8 · MATHEMATICS

A Story of Numbers

Sample paper · 15 questions · 22 marks

10 objective questions × 1 mark. Five written-response questions: 12 marks. Write your working where needed. Suggested time: 45 minutes. Answers and marking guidance follow the questions.

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Section A · Objective questions (10 marks)

1. In standard modern Roman numerals, XL stands for:

A. 40

B. 90

C. 110

D. 60

2. In the number 5,08,274 written in the Indian system, the digit 8 is in which place?

A. Ten-thousands

B. Lakhs

C. Hundreds

D. Thousands

3. The binary number 1011 (base 2) written in base 10 is:

A. 13

B. 9

C. 10

D. 11

4. In the base 5 number system, which set of digits is used?

A. 0, 1, 2, 3, 4

B. 0, 1, 2, 3, 4, 5

C. 0, 1, 2, 3

D. 1, 2, 3, 4, 5

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5. 49 written in standard modern Roman numerals is:

A. XXXIX

B. XXXXIX

C. IL

D. XLIX

6. The ancient Egyptian number system was built on which base?

A. 2

B. 60

C. 10

D. 5

7. The Mesopotamian (Babylonian) number system used which base?

A. 100

B. 20

C. 60

D. 10

8. 25 written in binary (base 2) is:

A. 10101

B. 10011

C. 11001

D. 11100

9. The number 34 written in base 5 equals which base 10 number?

A. 34

B. 19

C. 17

D. 120

10. Which feature of the Hindu-Arabic system makes writing and computing with large numbers easy?

A. Place value together with zero

B. Only addition is possible

C. A different symbol for every number

D. No symbol for zero

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Section B · Written responses (12 marks)

Attempt all five. Use a separate sheet if you need more space. The marks for each question are shown.

11. Write 99 in standard modern Roman notation and explain the subtractive pairs used. [2 marks]

12. Convert the binary number 1101 (base 2) into a base 10 number, showing the place values you used. [2 marks]

13. Why is the base 2 (binary) system convenient for computers? [2 marks]

14. Convert the base 10 number 42 into base 5, showing your working. [3 marks]

15. Describe one difference between the additive Egyptian numeral system and a decimal place-value system. Explain why place value makes multiplication easier. [3 marks]

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Answers & marking guidance

Use these after attempting the paper. Accept equivalent correct reasoning and sensible units. These are Evater model answers, not an official marking scheme.

Section A · 1 mark each

1. A — XL is one of the allowed subtractive forms in standard Roman notation: X before L gives 50 -10 = 40. Subtraction is limited to specific pairs such as IV, IX, XL, XC, CD and CM.

2. D — 5,08,274 is 5 lakh, 8 thousand, 2 hundred and 74, so 8 is in the thousands place.

3. D — 1011 in base 2 = 1 x 8 + 0 x 4 + 1 x 2 + 1 x 1 = 11.

4. A — Base 5 uses exactly five digits, 0 to 4; the digit 5 never appears.

5. D — 49 = 40 + 9 = XL + IX = XLIX, using the subtraction rule for both parts.

6. C — Egyptian numerals used powers of 10, with a new symbol for each power (1, 10, 100 and so on).

7. C — The Babylonians used base 60, which is why we still count 60 seconds in a minute and 60 minutes in an hour.

8. C — 25 = 16 + 8 + 1, so in binary it is 11001.

9. B — 34 in base 5 = 3 x 5 + 4 = 19 in base 10.

10. A — In the Hindu-Arabic system a digit's position gives its value, and zero acts as a placeholder, so any number can be written with just ten digits.

Section B · Model answers

11. 99 =90+9 =XC+IX =XCIX. In these allowed subtractive pairs, X before C means 90 and I before X means 9. Arbitrary smaller-before-larger pairs are not allowed in standard modern notation.

Marking: 1 mark for XCIX; 1 mark for correctly explaining the subtraction rule.

12. 1101 in base 2 = 1 x 8 + 1 x 4 + 0 x 2 + 1 x 1 = 8 + 4 + 0 + 1 = 13.

Marking: 1 mark for the correct powers of 2 as place values; 1 mark for the total 13.

13. Binary uses only two digits, 0 and 1. Electronic circuits naturally have two states (off and on), so each binary digit can be stored and processed as one switch being off or on.

Marking: 1 mark for noting binary has exactly two digits; 1 mark for linking the two digits to two electrical states.

14. The powers of 5 are 1, 5, 25. 42 = 1 x 25 + 17, and 17 = 3 x 5 + 2. So 42 = 1 x 25 + 3 x 5 + 2 x 1, which is 132 in base 5.

Marking: 1 mark for using powers of 5 (1, 5, 25); 1 mark for a correct division/decomposition; 1 mark for the answer 132 (base 5).

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15. In the additive Egyptian system, each symbol has a fixed value and repeated symbols are added. In a decimal place-value system the same digit has different values by position: the 3 in 3, 30 and 300. Zero can hold an empty place. To multiply 23 by 10, each digit moves one place to the left, giving 230; the place-value structure makes this rule work. Roman numerals also use some subtraction, so they are not a purely additive example.

Marking: 1 mark for a correct description of an additive system; 1 mark for place value with zero; 1 mark for a correct explanation or example of easier multiplication.

Topic references

NCERT Class 8 Mathematics, Ganita Prakash, Chapter 3: A Story of Numbers.

https://ncert.nic.in/textbook/pdf/hegp103.pdf

Concept reference only. Questions and model answers are original Evater practice material, not an official NCERT paper.

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