

SUBJECT: MATHEMATICS

MAX. MARKS : 40

CLASS : VIII

DURATION : 1½ hr

General Instructions:

- (i). All questions are compulsory.
- (ii). This question paper contains 20 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. What is the value of $(-100)^0 / (-100)^0$?
(a) -1 (b) 0 (c) 1 (d) Undefined
2. The number of seconds in a year is approximately 3.1536×10^7 . What is this number in a more common form?
(a) 3,153,600 (b) 31,536,000 (c) 315,360,000 (d) 31,53,600
3. The value of $\left(\frac{-1}{2}\right)^{-4}$ is:
(a) 16 (b) 1/16 (c) -16 (d) -1/16
4. If $2^x \times 2^{x+1} = 32$, what is the value of x?
(a) 1 (b) 2 (c) 3 (d) 4
5. What is the simplified value of $p^{-2}q^3 / p^3q^{-2}$?
(a) $(q/p)^5$ (b) $(p/q)^5$ (c) p^5q^5 (d) $p^{-5}q^{-5}$
6. A scientist is observing a cell that divides into two new cells every 20 minutes. If the scientist starts with a single cell, how many cells will there be after 2 hours?
(a) 2^6 (b) 2^5 (c) 6^2 (d) 2^{20}
7. A digital storage device has a capacity of 2^{40} bytes. If a single file occupies 2^{10} bytes, how many such files can be stored on the device?
(a) 2^{50} (b) 2^{30} (c) 2^4 (d) 2^{20}
8. Which of the following is equivalent to $10^5 \times 100^5$?
(a) 1000^5 (b) 10^{15} (c) 10^{10} (d) 100^{10}

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 value of $2^3 + 2^4$ is 27.

Reason (R): For any non-zero integer 'n' and integers a and b, $n^a \times n^b = n^{a+b}$.

10. **Assertion (A):** The value of 10^{-3} is 0.001.

Reason (R): A number with a negative exponent is the reciprocal of the number with a positive exponent.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Simplify: $\left(\frac{2}{3}\right)^2 \times \left(\frac{3}{2}\right)^{-3}$

12. If $5^x = 25$ and $3^y = 9^2$, find the value of $2x - y$.

13. Find the reciprocal of $\left(\frac{2}{3}\right)^{-2} + \left(\frac{1}{2}\right)^{-3}$.

14. A particle has a mass of 5.2×10^{-12} kg. Another particle has a mass of 3.5×10^{-12} kg. What is the total mass of the two particles?

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Simplify: $\frac{(2^3)^2 \times 3^{-2} \times 4^0}{12^{-1}}$

16. Find the value of x for which $\left(\frac{1}{5}\right)^{x-1} = 125$

17. By what number should $\left(\frac{1}{3}\right)^{-2}$ be divided to obtain the result 27?

SECTION – D

Questions 18 carry 5 marks each.

18. Find the value of x and y such that $\left(\frac{3}{4}\right)^{-2x} \div \left(\frac{4}{3}\right)^x = \left(\frac{9}{16}\right)^3$.

SECTION – E (Case Study Based Question)

Question 19 to 20 carry 4 mark

19. Case Study-1: The King's Guard

In a kingdom, a king's guard is deployed in a special formation. The number of guards in each row is determined by a power of 2. In the first row, there are 2 guards. In the second row, there are 4, in the third, there are 8, and so on. The king needs to know the total number of guards for different formations.



- (i) How many guards will be in the 6th row? (1)
- (ii) If a new formation requires 2^{10} guards in a single row, which row number is this? (1)
- (iii) The number of guards in a different formation doubles every 2 days, starting with 4 guards. How many guards will there be after 6 days? (1)
- (iv) What is the ratio of the number of guards in the 8th row to the number of guards in the 4th row? (1)

20. Case Study-2 The Virus Spread: The Architect's Blueprint

An architect is designing a large-scale housing project. The design is based on a pattern of blocks. The number of blocks in each layer increases exponentially. The first layer has 5 blocks. Each subsequent layer has 5 times the number of blocks as the previous layer. The total number of blocks in the final building will be 5^{10} .

- (i) Write an expression for the number of blocks in the 4th layer. (1)
- (ii) The total number of blocks in a building is calculated as the sum of blocks in all layers. The architect wants to build a 3-layer building. What is the total number of blocks? (1)
- (iii) If another building has a design where the number of blocks triples each layer, starting with 3 blocks, how many blocks will be in the 4th layer? (1)
- (iv) The architect decides to use smaller blocks, with a volume of 5^{-2} m^3 . How many such smaller blocks are required to construct a structure with a total volume of 5^3 m^3 ? (1)

