

NUMBER PATTERNS 9: QUIZ SOLUTIONS

Question 1

If the sum of the first n terms of the geometric series $-2 + 6 - 18 + \dots$ is -122 , what is the value of n ?

- A. 5 B. 6 C. 7 D. 8

Solution

$$a = -2, r = -3 \text{ and } S_n = -122$$

$$\therefore \frac{-2[(-3)^n - 1]}{-3 - 1} = -122$$

$$\therefore (-3)^n - 1 = -244$$

$$\therefore (-3)^n = -243 = (-3)^5$$

$$\therefore n = 5$$

So, the correct answer is A.

Question 2

Evaluate the geometric series $4a + 8a + 16a + \dots$ to six terms.

- A. $32a$ B. $64a$ C. $128a$ D. $252a$

Solution

$$a = 4a, r = 2, n = 6$$

$$S_6 = \frac{4a(2^6 - 1)}{2 - 1}$$

$$= 4a(64 - 1)$$

$$= 252a$$

So, the correct answer is D.

Question 3

The sum of the first four terms of a geometric series is 10 and the common ratio is $\frac{1}{3}$.

What is the first term?

- A. 6 B. $6\frac{3}{4}$ C. 7 D. $7\frac{3}{11}$

Solution

$$S_4 = 10, r = \frac{1}{3}$$

$$\therefore \frac{a[1 - (\frac{1}{3})^4]}{1 - \frac{1}{3}} = 10$$

$$\therefore \frac{a(1 - \frac{1}{81})}{\frac{2}{3}} = 10$$

$$\therefore a(1 - \frac{1}{81}) = \frac{20}{3}$$

$$\therefore a = \frac{20}{3} \times \frac{81}{80} = \frac{27}{4}$$

So, the correct answer is B.

Question 4

The first term of a geometric series is 27, the last term is 8 and the sum of the series is 65. How many terms are there in the series?

- A. 4 B. 5 C. 6 D. 7

Solution

$$T_1 = a = 27, T_n = ar^{n-1} = 8, S_n = 65$$

$$\therefore 27r^{n-1} = 8$$

$$\therefore r^{n-1} = \frac{8}{27} = \left(\frac{2}{3}\right)^3 \quad \text{i.e., } r = \frac{2}{3}$$

$$\therefore n-1 = 3$$

$$\therefore n = 4$$

So, the correct answer is A.

Question 5

Which term of the geometric series $1 + 2 + 4 + 8 + \dots$ will be the first to be greater than 1 000?

- A. T_9 B. T_{10} C. T_{11} D. T_{12}

Solution

$$a = 1, r = 2$$

$$ar^{n-1} > 1000$$

$$\therefore 1 \cdot 2^{n-1} > 1000$$

$$\therefore 2^{n-1} > 1000$$

But $2^9 = 512$ and $2^{10} = 1024$

$$\therefore n-1 = 10$$

$$\text{So } n = 11$$

So, the correct answer is C.