## **Geometric Series MCQs - Exercises 6.8 and 6.9 (Class 11 Mathematics)**

Prepared for Entry Test Preparation

## **Multiple Choice Questions**

- **1.** The sum of the first 10 terms of the geometric series  $2, 6, 18, \ldots$  is:
  - (a) 59048
  - **(b)** 59049
  - (c) 59050
  - (d) 59051
- **2.** The sum of the first 6 terms of the series  $0.3 + 0.33 + 0.333 + \dots$  is:
  - (a)  $\frac{10}{3} \frac{1}{9} \cdot \frac{1 10^{-6}}{9}$
  - (b)  $\frac{2}{3} \cdot \left(6 \frac{1 10^{-6}}{9}\right)$
  - (c)  $\frac{1}{3} \cdot \left(6 \frac{1 10^{-6}}{9}\right)$
  - (d)  $\frac{4}{3} \cdot \left(6 \frac{1-10^{-6}}{9}\right)$
- **3.** The sum to *n* terms of  $1 + (a+b) + (a^2 + ab + b^2) + \dots$  is:
  - (a)  $\frac{1}{a-b} \left( \frac{a(a^n-1)}{a-1} \frac{b(b^n-1)}{b-1} \right)$
  - (b)  $\frac{1}{a+b} \left( \frac{a(a^n-1)}{a-1} + \frac{b(b^n-1)}{b-1} \right)$
  - (c)  $\frac{a(a^n-1)}{a-1} \frac{b(b^n-1)}{b-1}$
  - (d)  $\frac{a(a^n-1)}{a-1} + \frac{b(b^n-1)}{b-1}$
- **4.** The sum of the first 5 terms of the series  $r + (1+k)r^2 + (1+k+k^2)r^3 + \dots$  is:
  - (a)  $\frac{r(r^5-1)}{r-1} \frac{rk((rk)^5-1)}{rk-1}$
  - (b)  $\frac{1}{1-k} \left( \frac{r(r^5-1)}{r-1} \frac{rk((rk)^5-1)}{rk-1} \right)$
  - (c)  $\frac{r(r^5-1)}{r-1} + \frac{rk((rk)^5-1)}{rk-1}$
  - (d)  $\frac{1}{1-k} \left( \frac{r(r^5-1)}{r-1} + \frac{rk((rk)^5-1)}{rk-1} \right)$
- **5.** The sum of the first 6 terms of the series  $3 + (1 i) + \frac{1}{i} + \dots$  is:
  - (a)  $\frac{9}{4}(1-i)$
  - (b)  $\frac{9}{4}(1+i)$
  - (c)  $\frac{3}{2}(1-i)$

- (d)  $\frac{3}{2}(1+i)$
- **6.** The sum to infinity of the series  $\frac{1}{4} + \frac{1}{16} + \frac{1}{64} + \dots$  is:
  - (a)  $\frac{1}{3}$
  - (b)  $\frac{1}{4}$
  - (c)  $\frac{1}{5}$
  - (d)  $\frac{1}{6}$
- **7.** The vulgar fraction equivalent to  $2.\overline{45}$  is:
  - (a)  $\frac{223}{99}$
  - (b)  $\frac{245}{99}$
  - (c)  $\frac{223}{90}$
  - (d)  $\frac{245}{90}$
- **8.** The vulgar fraction equivalent to  $0.\overline{123}$  is:
  - (a)  $\frac{123}{999}$
  - (b)  $\frac{123}{990}$
  - (c)  $\frac{41}{333}$
  - (d)  $\frac{41}{330}$
- **9.** A man deposits Rs. 5, 15, 45, ... in a bank. The total amount after 6 years is:
  - (a) Rs. 1820
  - **(b)** Rs. 1825
  - (c) Rs. 1830
  - (d) Rs. 1835
- **10.** A loan of Rs. 21845 is repaid in installments, each double the previous one, starting with Rs. 5. The last installment is:
  - (a) Rs. 5120
  - **(b)** Rs. 10240
  - (c) Rs. 20480
  - (d) Rs. 40960
- **11.** A population of 10000 increases at 5% annually. The population after 4 years is:
  - (a) 12155
  - **(b)** 12156
  - (c) 12157
  - (d) 12158

- **12.** A school's enrollment triples every 10 years. If it was 9000 in 2000, the enrollment in 1970 was:
  - (a) 1000
  - **(b)** 1111
  - (c) 3333
  - (d) 3000
- **13.** A bacteria colony doubles every half-hour. Starting with 1 bacterium, the number after 3 hours is:
  - (a) 64
  - **(b)** 128
  - (c) 256
  - (d) 4096
- **14.** The total perimeter of nested equilateral triangles with the first perimeter 6 and each subsequent triangle half the previous is:
  - (a) 9
  - **(b)** 10
  - (c) 12
  - (d) 15
- **15.** For the series  $y = \frac{x}{3} + \frac{x^2}{9} + \frac{x^3}{27} + \dots$ , the value of x is:
  - (a)  $\frac{3y}{1+y}$
  - (b)  $\frac{3y}{2(1+y)}$
  - (c)  $\frac{2y}{1+y}$
  - (d)  $\frac{y}{1+y}$
- **16.** The convergence interval for the series  $y = 1 + 3x + 9x^2 + 27x^3 + \dots$  is:
  - (a)  $|x| < \frac{1}{3}$
  - (b)  $|x| < \frac{1}{2}$
  - (c) |x| < 1
  - (d) |x| < 2
- **17.** A ball dropped from 40 meters rebounds  $\frac{3}{5}$  of the distance each time. The total distance traveled is:
  - (a) 100 m
  - (b) 112 m
  - (c) 120 m

- (d) 128 m
- **18.** An infinite geometric series has sum 6 and the sum of the squares of its terms is  $\frac{72}{5}$ . The first term is:
  - (a) 2
  - **(b)** 3
  - (c) 4
  - (d) 5
- **19.** The sum to infinity of  $r + (1+k)r^2 + (1+k+k^2)r^3 + \dots$  is:
  - (a)  $\frac{r}{(1-r)(1-rk)}$
  - (b)  $\frac{r}{1-r}$
  - (c)  $\frac{r}{1-rk}$
  - (d)  $\frac{r(1-k)}{(1-r)(1-rk)}$
- **20.** The sum of the first 8 terms of the series  $4+2+1+\ldots$  is:
  - (a)  $\frac{255}{32}$
  - (b)  $\frac{255}{64}$
  - (c)  $\frac{511}{64}$
  - (d)  $\frac{511}{32}$

## **Solutions and Explanations**

- **1. Answer: a** 59048 *Explanation*:  $a_1=2$ , r=3, n=10.  $S_{10}=\frac{2(3^{10}-1)}{3-1}=2\cdot \frac{59049-1}{2}=59048$ . (Ex. 6.8, Q1).
- **2. Answer:** b  $\frac{2}{3} \cdot \left(6 \frac{1 10^{-6}}{9}\right)$  Explanation:  $S_n = \frac{2}{9} \left(n \frac{1}{9}(1 10^{-n})\right)$ . For n = 6,  $S_6 = \frac{2}{9} \left(6 \frac{1 10^{-6}}{9}\right)$ . (Ex. 6.8, Q2(i)).
- **3. Answer:** a  $\frac{1}{a-b} \left( \frac{a(a^n-1)}{a-1} \frac{b(b^n-1)}{b-1} \right)$  Explanation:  $(a-b)S_n = \frac{a(a^n-1)}{a-1} \frac{b(b^n-1)}{b-1}$ . Divide by a-b. (Ex. 6.8, Q3(i)).
- **4. Answer: b**  $\frac{1}{1-k}\left(\frac{r(r^5-1)}{r-1}-\frac{rk((rk)^5-1)}{rk-1}\right)$  *Explanation*:  $(1-k)S_n=\frac{r(r^n-1)}{r-1}-\frac{rk((rk)^n-1)}{rk-1}$ . For n=5, divide by 1-k. (Ex. 6.8, Q3(ii)).
- **5. Answer:**  $\mathbf{c} \ \frac{3}{2}(1-i)$  *Explanation*:  $a_1 = 3$ ,  $r = \frac{1-i}{3}$ , n = 6.  $S_6 = \frac{3\left(1-\left(\frac{1-i}{3}\right)^6\right)}{1-\frac{1-i}{3}} = \frac{3}{2}(1-i)$ . (Ex. 6.8, Q4).
- **6.** Answer: a  $\frac{1}{3}$  Explanation:  $a_1 = \frac{1}{4}$ ,  $r = \frac{1}{4}$ .  $S_{\infty} = \frac{\frac{1}{4}}{1 \frac{1}{4}} = \frac{1}{3}$ . (Ex. 6.8, Q5(i)).
- **7. Answer:** a  $\frac{223}{99}$  Explanation:  $2.\overline{45} = 2 + \frac{0.45}{1-0.01} = 2 + \frac{45}{99} = \frac{223}{99}$ . (Ex. 6.8, Q6(i)).

- **8.** Answer: a  $\frac{123}{999}$  Explanation:  $0.\overline{123} = \frac{0.123}{1-0.001} = \frac{123}{999}$ . (Ex. 6.8, Q6(iii)).
- **9. Answer: c** Rs. 1830 *Explanation*:  $a_1 = 5$ , r = 3, n = 6.  $S_6 = \frac{5(3^6 1)}{3 1} = \frac{5(729 1)}{2} = 1820$ . (Ex. 6.9, Q1).
- **10. Answer: b** Rs. 10240 *Explanation*:  $a_1 = 5$ , r = 2,  $S_n = 21845$ .  $8(2^n 1) = 21845 \implies 2^n = 4097 \implies n = 12$ .  $a_{12} = 5 \cdot 2^{11} = 10240$ . (Ex. 6.9, Q2).
- **11. Answer: a** 12155 *Explanation*:  $P_0 = 10000$ , r = 1.05, n = 4.  $P_4 = 10000 \cdot (1.05)^4 \approx 12155$ . (Ex. 6.9, Q3).
- **12. Answer: b** 1111 *Explanation*:  $a_4 = 9000$ , r = 3,  $a_1 = \frac{9000}{3^3} = \frac{9000}{27} = 1111$ . (Ex. 6.9, Q4).
- **13. Answer:** d 4096 *Explanation*:  $a_1 = 1$ , r = 4, n = 3.  $a_4 = 1 \cdot 4^3 = 4096$ . (Ex. 6.9, Q5).
- **14.** Answer: c 12 Explanation:  $a_1 = 6$ ,  $r = \frac{1}{2}$ .  $S_{\infty} = \frac{6}{1 \frac{1}{2}} = 12$ . (Ex. 6.9, Q6).
- **15. Answer: a**  $\frac{3y}{1+y}$  *Explanation*:  $a_1 = \frac{x}{3}$ ,  $r = \frac{x}{3}$ .  $y = \frac{x}{1-\frac{x}{3}} = \frac{x}{3-x}$ . Solve:  $x = \frac{3y}{1+y}$ . (Ex. 6.9, Q9).
- **16. Answer: a**  $|x|<\frac{1}{3}$  *Explanation*: r=3x. Converges if  $|3x|<1 \implies |x|<\frac{1}{3}$ . (Ex. 6.9, Q12).
- **17. Answer: a** 100 m *Explanation*: Initial fall = 40,  $a_1 = 40 \cdot \frac{3}{5} = 24$ ,  $r = \frac{3}{5}$ . Total =  $40 + 2 \cdot \frac{24}{1 \frac{3}{5}} = 100$ . (Ex. 6.9, Q11).
- **18. Answer: c** 4 Explanation:  $\frac{a}{1-r} = 6$ ,  $\frac{a^2}{1-r^2} = \frac{72}{5}$ . Solve:  $r = \frac{2}{3}$ , a = 4. (Ex. 6.9, Q14).
- **19. Answer: a**  $\frac{r}{(1-r)(1-rk)}$  *Explanation*:  $(1-k)S = \frac{r}{1-r} \frac{rk}{1-rk}$ . Solve:  $S = \frac{r}{(1-r)(1-rk)}$ . (Ex. 6.9, Q7).
- **20.** Answer: c  $\frac{511}{64}$  Explanation:  $a_1=4$ ,  $r=\frac{1}{2}$ , n=8.  $S_8=\frac{4(1-\left(\frac{1}{2}\right)^8)}{1-\frac{1}{2}}=\frac{4\cdot\frac{255}{256}}{\frac{1}{2}}=\frac{511}{64}$ . (Ex. 6.8, Q5(iv)).