General Sequences

1. If the nth term of a series is $\frac{n(n+1)}{n+2}$, what is the ratio of the $(n-1)$th term to the $(n+1)$th term?

   A. $n(n-1)(n+3) : (n+1)^2(n+2)$
   B. $n(n-1)(n+2) : (n+3)$
   C. $(n+1)^2(n+2) : n(n-1)(n+3)$
   D. $(n+3) : n(n-1)(n+2)$
   E. None of the above

   [1972-CE-MATHS B1-16]

2. In the figure, the 1st pattern consists of 3 dots. For any positive integer n, the $(n+1)$th pattern is formed by adding $(2n+3)$ dots to the nth pattern. Find the number of dots in the 6th pattern.

   A. 35
   B. 37
   C. 48
   D. 50

   [2006-CE-MATHS 2-12]

3. In the figure, the 1st pattern consists of 4 dots. For any positive integer n, the $(n+1)$th pattern is formed by adding 4 dots to the nth pattern. Find the number of dots in the 9th pattern.

   A. 36
   B. 40
   C. 81
   D. 100

   [2007-CE-MATHS 2-9]

4. In the figure, the 1st pattern consists of 10 dots. For any positive integer n, the $(n+1)$th pattern is formed by adding $(2n+5)$ dots to the nth pattern. Find the number of dots in the 7th pattern.

   A. 50
   B. 65
   C. 82
   D. 101

   [2008-CE-MATHS 2-11]

5. In the following sequence, the 1st term, the 2nd term and the 3rd term are 1, 2 and 3 respectively. For any positive integer n, the $(n+3)$th term is the sum of the $(n+2)$th term, the $(n+1)$th term and the nth term. Find the 9th term of the sequence.

   1, 2, 3, 6, 11, ...

   A. 51
   B. 68
   C. 125
   D. 230

   [2009-CE-MATHS 2-12]

6. If the sum of the first n terms of a sequence is $n^2 + 2n$, then the 5th term of the sequence is

   A. 9.
   B. 11.
   C. 13.
   D. 35.

   [2009-CE-MATHS 2-42]

7. Which of the following may represent the nth term of the sequence $0, \frac{-1}{4}, \frac{2}{5}, \frac{-3}{6}, \frac{4}{7}, \ldots$?

   A. $(-1)^n \frac{n-1}{n+1}$
   B. $(-1)^n \frac{n-1}{n+2}$
   C. $(-1)^{n+1} \frac{n}{n+3}$
   D. $(-1)^{n+1} \frac{n-1}{n+2}$

   [2010-CE-MATHS 2-12]

8. In the figure, the 1st pattern consists of 4 dots. For any positive integer n, the $(n+1)$th pattern is formed by adding 3 dots to the nth pattern. Find the number of dots in the 8th pattern.

   A. 22
   B. 25
   C. 28
   D. 31

   [2011-CE-MATHS 2-9]

HKDSE Problems

9. Let a_n be the nth term of a sequence. If $a_1 = 4$, $a_2 = 5$ and $a_{n+2} = a_n + a_{n+1}$ for any positive integer n, then $a_{10} =$

A. 13 .
B. 157 .
C. 254 .
D. 411 .

[SP-DSE-MATHS 2-11]

10. In the figure, the 1st pattern consists of 1 dot. For any positive integer n, the $(n+1)$th pattern is formed by adding n dots to the nth pattern. Find the number of dots in the 8th pattern.

A. 22
B. 29
C. 36
D. 37

[2012-DSE-MATHS 2-12]

11. Let a_n be the nth term of a sequence. If $a_2 = 7$, $a_4 = 63$ and $a_{n+2} = a_{n+1} + a_n$ for any positive integer n, then $a_5 =$

A. 56 .
B. 70 .
C. 91 .
D. 119 .

[2014-DSE-MATHS 2-14]

12. In the figure, the 1st pattern consists of 5 dots. For any positive integer n, the $(n+1)$th pattern is formed by adding 4 dots to the nth pattern. Find the number of dots in the 6th pattern.

A. 21
B. 25
C. 29
D. 33

[2015-DSE-MATHS 2-13]

13. In the figure, the 1st pattern consists of 9 dots. For any positive integer n, the $(n+1)$th pattern is formed by adding 5 dots to the nth pattern. Find the number of dots in the 7th pattern.

A. 29
B. 34
C. 39
D. 44

[2016-DSE-MATHS 2-14]

14. In the figure, the 1st pattern consists of 1 dot. For any positive integer n, the $(n+1)$th pattern is formed by adding $(2n+2)$ dots to the nth pattern. Find the number of dots in the 7th pattern.

A. 29
B. 34
C. 39
D. 44

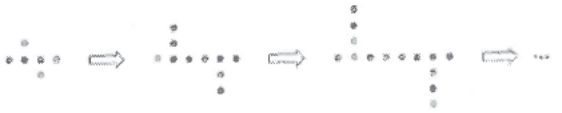
[2017-DSE-MATHS 2-13]

15. Let a_n be the nth term of a sequence. If $a_3 = 21$, $a_6 = 89$ and $a_{n+2} = a_n + a_{n+1}$ for any positive integer n, then $a_1 =$

A. 8
B. 13
C. 34
D. 55

[2018-DSE-MATHS 2-12]

16. In the figure, the 1st pattern consists of 6 dots. For any positive integer n, the $(n + 1)$th pattern is formed by adding 4 dots to the nth pattern. Find the number of dots in the 9th pattern.



A. 30
B. 34
C. 38
D. 42

[2019-DSE-MATHS 2-14]

17. In the figure, the 1st pattern consists of 3 dots. For any positive integer n, the $(n + 1)$th pattern is formed by adding $(2n + 1)$ dots to the nth pattern. Find the number of dots in the 7th pattern.

A. 15
B. 27
C. 38
D. 51

[2020-DSE-MATHS 2-12]

Basic Concepts

1. Which of the following is/are in arithmetic progression?

   (1) 0.2, 0.22, 0.222, 0.2222
   (2) $1, 1\frac{1}{3}, 1\frac{2}{3}, 2$
   (3) 1, –2, 3, –4

   A. (2) only
   B. (3) only
   C. (1) and (2) only
   D. (2) and (3) only
   E. (1), (2) and (3)

   [SP-CE-MATHS 2-17]

2. Three distinct numbers x, y and z are in arithmetic progression. Which of the following is/are also in arithmetic progression?

   (1) $x + 10$, $y + 10$, $z + 10$
   (2) $10x$, $10y$, $10z$
   (3) x^2, y^2, z^2

   A. (1) and (2) only
   B. (1) and (3) only
   C. (2) and (3) only
   D. (1), (2) and (3)
   E. None of (1), (2) and (3)

   [1985-CE-MATHS 2-39]

3. If the common difference of the A.P. $a_1, a_2, a_3, \ldots$ is d, then the common difference of the A.P. $2a_1 + 3, 2a_2 + 3, 2a_3 + 3, \ldots$ is

   A. 2.
   B. 3.
   C. d.
   D. $2d$.
   E. $2d + 3$.

   [1996-CE-MATHS 2-42]

4. If a, b, c, d are consecutive terms of an arithmetic sequence, which of the following **must** be true?

   (1) $b - a = d - c$
   (2) d, c, b, a are consecutive terms of an arithmetic sequence
   (3) $a < b < c < d$

   A. (1) only
   B. (1) and (2) only
   C. (1) and (3) only
   D. (2) and (3) only
   E. (1), (2) and (3)

   [1998-CE-MATHS 2-13]

5. Let a, b and c be positive integers. Which of the following **must** be arithmetic sequences?

   (1) $a + 10$, $2a + 7$, $3a + 4$, $4a + 1$
   (2) $8^b - 1$, $8^{2b} - 2$, $8^{3b} - 3$, $8^{4b} - 4$
   (3) $\log c^3$, $\log c^8$, $\log c^{13}$, $\log c^{18}$

   A. (1) and (2) only
   B. (1) and (3) only
   C. (2) and (3) only
   D. (1), (2) and (3)

   [2008-CE-MATHS 2-43]

General Term of Arithmetic Sequences

6. The nth term of an arithmetic progression is given by $(3n + c)$ where c is a constant. If the 1st term of the progression is –4, what is the 5th term?

   A. 22
   B. 16
   C. 14
   D. 11
   E. 8

   [1977-CE-MATHS 2-19]

7. The first and the second terms of an arithmetic progression are $(13a - 2b)$ and $(11a + b)$ respectively. What is the eighth term?

   A. $-a + 19b$
   B. $-3a + 22b$
   C. $a + 16b$
   D. $8a + 8b$
   E. None of the above

   [1979-CE-MATHS 2-50]

8. The first term of an arithmetic progression is 6 and its tenth term is three times its second term. The common difference is

   A. 18.
   B. 4.
   C. 3.
   D. 2.
   E. 1.

   [1980-CE-MATHS 2-11]

9. The n-th term of the arithmetic progression

2, 6, 10, 14, ...

is

A. $2n^2$.
B. $4n$.
C. $4n - 2$.
D. $4n + 2$.
E. $6 - 4n$.

[1981-CE-MATHS 2-11]

10. The sixth term and the eleventh term of an arithmetic progression are 10 and 30 respectively. The first term is

A. -14.
B. -10.
C. 10.
D. 50.
E. 54.

[1983-CE-MATHS 2-9]

11. p, q, r, s are in A.P. If $p + q = 8$ and $r + s = 20$, then the common difference is

A. 3.
B. 4.
C. 6.
D. 7.
E. 12.

[1988-CE-MATHS 2-38]

12. Find the n-th term of the A.P. 4, 2, 0, -2, ...

A. $2 + 2n$
B. $4 - 2n$
C. $4 + 2n$
D. $6 - 2n$
E. $(5 - n)n$

[1996-CE-MATHS 2-12]

13. The 1st and 10th terms of an arithmetic sequence are 2 and 29 respectively. The 20th term of the sequence is

A. 56.
B. 58.
C. 59.
D. 60.
E. 62.

[2000-CE-MATHS 2-15]

14. The first negative term in the arithmetic sequence 2006, 1998, 1990, ... is

A. -8.
B. -6.
C. -4.
D. -2.

[2006-CE-MATHS 2-42]

Arithmetic Mean

15. If $\log_{10} x$, $\log_{10} y$, $\log_{10} z$ are in A.P., then

A. $y = 10^{\frac{x+z}{2}}$.
B. $y = \frac{x+z}{2}$.
C. $y^2 = x + z$.
D. $y^2 = xz$.
E. $y = 10^{\sqrt{xz}}$.

[1987-CE-MATHS 2-11]

16. If 10 arithmetic means are inserted between a and b, then the last one is

A. $\frac{10a + b}{11}$.
B. $\frac{9a + b}{10}$.
C. $\frac{10(b - a)}{11}$.
D. $\frac{a + 9b}{10}$.
E. $\frac{a + 10b}{11}$.

[1989-CE-MATHS 2-34]

17. Let a, x_1, x_2, b and a, y_1, y_2, y_3, b be two arithmetic progressions. $\frac{x_2 - x_1}{y_3 - y_2} =$

A. $\frac{3}{4}$.
B. $\frac{4}{3}$.
C. 1.
D. $\frac{4}{5}$.
E. $\frac{5}{4}$.

[1990-CE-MATHS 2-38]

18. If 3, a, b, c, 23 are in A.P., then $a + b + c =$

A. 13.
B. 26.
C. 33.
D. 39.
E. 65.

[1993-CE-MATHS 2-10]

19. If four arithmetic means are inserted between 12 and 27, then the sum of the four arithmetic means is

A. 78.
B. 90.
C. 105.
D. 117.

[2005-CE-MATHS 2-42]

Summation of Arithmetic Sequences

20. An arithmetic progression consists of 10 terms. The first term is 4. The sum of the 10 terms is 130. What is the last term?

A. 13
B. 14
C. 17
D. 22
E. 23

[1978-CE-MATHS 2-24]

21. The sum of the first n terms of the arithmetic progression

$$3,\ 5,\ 7,\ \ldots$$

is

A. n^2.
B. $n^2 - 1$.
C. $n^2 + n$.
D. $n^2 + 2n$.
E. $\frac{1}{2}(n^2 + n)$.

[1979-CE-MATHS 2-11]

22. The sum of the first five terms of an arithmetic progression is 15. If the fourth term is 7, the first term is

A. –5.
B. –3.
C. –1.
D. 1.
E. 10.

[1981-CE-MATHS 2-34]

23. \$9000 is divided among A, B and C. A's share, B's share and C's share, in that order, form an arithmetic progression. If B's share is three times A's share, how much does C get?

A. \$1500
B. \$3000
C. \$4500
D. \$5000
E. \$6000

[1982-CE-MATHS 2-35]

24. In an arithmetic progression, the first term is 3 and the common difference is 2. If the sum of the first n terms of the arithmetic progression is 143, then n =

A. 10.
B. 11.
C. 12.
D. 13.
E. 14.

[1983-CE-MATHS 2-38]

25. The sum of the first ten terms of an arithmetic progression is 120. If the common difference is 4, then the first term is

A. –12.
B. –6.
C. –2.
D. 2.
E. 6.

[1984-CE-MATHS 2-8]

26. If the five interior angles of a convex pentagon form an A.P. with a common difference of 10°, then the smallest interior angle of the pentagon is

A. 52°.
B. 72°.
C. 88°.
D. 98°.
E. 108°.

[1986-CE-MATHS 2-43]

27. If the sum to n terms of an A.P. is $n^2 + 3n$, find the 7th term of the A.P.

A. 16
B. 18
C. 54
D. 70
E. It cannot be found.

[1991-CE-MATHS 2-40]

28. If the product of the first n terms of the sequence

$$10,\ 10^2,\ 10^3,\ \ldots,\ 10^n,\ \ldots$$

exceeds 10^{55}, find the minimum value of n.

A. 9
B. 10
C. 11
D. 12
E. 56

[1994-CE-MATHS 2-41]

29. In an A.P., the sum of the first 2 terms is 3 and the sum of the first 3 terms is 2. The common difference is

A. $-\frac{5}{3}$.
B. –1.
C. 1.
D. $\frac{5}{3}$.
E. $\frac{7}{3}$.

[1995-CE-MATHS 2-42]

30. The n-th term of an arithmetic sequence is $3 + 2n$. Find the sum of the first 50 terms of the sequence.

A. 103
B. 2575
C. 2700
D. 2750
E. 5400

[1997-CE-MATHS 2-35]

31. The n-th term of an arithmetic sequence is $2 + 5n$. Find the sum of the first 100 terms of the sequence.

A. 502
B. 12 450
C. 25 200
D. 25 450
E. 25 700

[1999-CE-MATHS 2-10]

32. The sum of the first n terms of an arithmetic sequence is n^2. Find the 10th term of the sequence.

A. 19
B. 21
C. 28
D. 31
E. 100

[2001-CE-MATHS 2-14]

33. The 10th term of an arithmetic sequence is 29 and the sum of the first 10 terms is 155. The 2nd term of the sequence is

A. 2.
B. 4.7.
C. 5.
D. 43.

[2002-CE-MATHS 2-11]

34. Let a_n be the nth term of an arithmetic sequence. If $a_1 = 10$ and $a_2 = 13$, then $a_{21} + a_{22} + ... + a_{30} =$

A. 765.
B. 835.
C. 865.
D. 1605.

[2004-CE-MATHS 2-11]

35. Let a_n be the nth term of an arithmetic sequence. If $a_1 = a_2 - 6$ and $a_1 + a_2 + ... + a_{28} = 1624$, then $a_1 =$

A. –52.
B. –26.
C. –23.
D. 139.

[2007-CE-MATHS 2-44]

36. If the 3rd term and the 12th term of an arithmetic sequence are 42 and 6 respectively, then the sum of the first n terms of the sequence is

A. $28n + 2n^2$.
B. $32n + 2n^2$.
C. $52n - 2n^2$.
D. $56n - 2n^2$.

[2011-CE-MATHS 2-44]

HKDSE Problems

37. If the 3rd term and the 6th term of an arithmetic sequence are 18 and –6 respectively, then the 2nd term of the sequence is

A. –8.
B. 10.
C. 26.
D. 34.

[SP-DSE-MATHS 2-36]

38. The nth term of a sequence is $2n + 3$. If the sum of the first m terms of the sequence is less than 3000, then the greatest value of m is

A. 52.
B. 53.
C. 56.
D. 57.

[PP-DSE-MATHS 2-35]

39. Let a_n be the nth term of an arithmetic sequence. If $a_{18} = 26$ and $a_{23} = 61$, which of the following are true?

(1) $a_{14} < 0$
(2) $a_1 - a_2 < 0$
(3) $a_1 + a_2 + a_3 + ... + a_{27} > 0$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2012-DSE-MATHS 2-37]

40. The nth term of a sequence is $2n - 19$. Which of the following is/are true?

(1) 25 is a term of the sequence.
(2) The sequence has 10 negative terms.
(3) The sum of the first n terms of the sequence is $n^2 - 18n$.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2013-DSE-MATHS 2-38]

41. Which of the following are arithmetic sequences?

(1) π^{30}, π^{45}, π^{60}
(2) 30π, 45π, 60π
(3) $\pi - 30$, $\pi - 45$, $\pi - 60$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2017-DSE-MATHS 2-36]

42. If the sum of the first n terms of a sequence is $6n^2 - n$, which of the following is/are true?

I. 22 is a term of the sequence.
II. The 1st term of the sequence is 5.
III. The sequence is a geometric sequence.

A. I only
B. II only
C. I and III only
D. II and III only

[2018-DSE-MATHS 2-35]

43. If $a > 0$, which of the following are arithmetic sequence?

I. $\log a^{-3}, \log a, \log a^5$
II. $8 - 4a, 9 - 5a, 10 - 6a$
III. $\cos(90 - a)°, \cos 90°, \cos(90 + a)°$

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

[2020-DSE-MATHS 2-35]

Basic Concepts

1. If $x \neq 0$, which of the following is / are geometric progressions?

   (1) x, x^2, x^3, x^4
   (2) $x, 2x, 3x, 4x$
   (3) $x, -x^2, x^3, -x^4$

   A. (1) only
   B. (1) and (2) only
   C. (1) and (3) only
   D. (2) and (3) only
   E. (1), (2) and (3)

   [1982-CE-MATHS 2-37]

2. Which of the following **must** be geometric progression(s)?

   (1) $\log_{10} 3, \log_{10} 9, \log_{10} 27, \log_{10} 81$
   (2) 0.9, 0.99, 0.999, 0.9999
   (3) 1, −3, 9, −27

   A. (1) only
   B. (3) only
   C. (1) and (3) only
   D. (1) and (2) only
   E. (1), (2) and (3)

   [1984-CE-MATHS 2-38]

3. If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in geometric progression, then which of the following is true?

   A. $b^2 = ac$
   B. $b^2 = \frac{1}{ac}$
   C. $b = \frac{a+c}{2}$
   D. $b = \frac{a+c}{2ac}$
   E. $b = \frac{2ac}{a+c}$

   [1985-CE-MATHS 2-38]

4. Which of the following is a G.P. / are G.P.s?

   (1) 5, 0.5, 0.05, 0.005, 0.0005
   (2) log 5, log 50, log 500, log 5000, log 50 000
   (3) 5, $5 \sin 70°$, $5(\sin 70°)^2$, $5(\sin 70°)^3$, $5(\sin 70°)^4$

   A. (1) only
   B. (2) only
   C. (3) only
   D. (1) and (3) only
   E. (1), (2) and (3)

   [1988-CE-MATHS 2-9]

5. Let x, y, z are in G.P., which of the following **must** be true?

   (1) $x+3, y+3, z+3$ are in G.P.
   (2) $3x, 3y, 3z$ are in G.P.
   (3) x^2, y^2, z^2 are in G.P.

   A. (1) only
   B. (2) only
   C. (3) only
   D. (1) and (2) only
   E. (2) and (3) only

   [1991-CE-MATHS 2-41]

6. a, b, c, d are 4 consecutive terms of a geometric sequence. Which of the following **must** be true?

   (1) $b^2 = ac$
   (2) $\frac{b}{a} = \frac{d}{c}$
   (3) $\frac{d}{a} = (\frac{c}{b})^3$

   A. (2) only
   B. (1) and (2) only
   C. (1) and (3) only
   D. (2) and (3) only
   E. (1), (2) and (3)

   [1997-CE-MATHS 2-37]

7. Which of the following could be a geometric sequence / geometric sequences?

   (1) $3, 3^3, 3^5, 3^7, \ldots$
   (2) 9, 99, 999, 9999, ...
   (3) 10, −100, 1000, −10000, ...

   A. (3) only
   B. (1) and (2) only
   C. (1) and (3) only
   D. (2) and (3) only
   E. (1), (2) and (3)

   [2000-CE-MATHS 2-16]

General Term of Geometric Sequences

8. If $1, \quad 1+2k, \quad 1+k$ are in geometric progression and $k \neq 0$, then the common ratio of the progression is

   A. $-\frac{3}{2}$.
   B. $-\frac{3}{4}$.
   C. $-\frac{1}{2}$.
   D. $\frac{1}{2}$.
   E. $\frac{5}{2}$.

   [1977-CE-MATHS 2-35]

9. The n-th term of the geometric progression
3, 6, 12, 24, ...
is

A. $3 \times 2n$.
B. $3 \times 2(n-1)$.
C. 3×2^n.
D. $3 \times 2^{n-1}$.
E. $\frac{3}{n-1}$.

[1979-CE-MATHS 2-12]

10. The $2n$-th term of the geometric progression, $8, -4, 2, -1, \ldots$, is

A. $\frac{1}{2^{2n+2}}$.
B. $\frac{-1}{2^{2n+2}}$.
C. $\frac{1}{2^{2n-3}}$.
D. $\frac{1}{2^{2n-4}}$.
E. $\frac{-1}{2^{2n-4}}$.

[1980-CE-MATHS 2-31]

11. The second term and the fifth term of a geometric progression are -12 and $40\frac{1}{2}$ respectively. The first term is

A. $1\frac{1}{2}$.
B. 6.
C. 8.
D. 15.
E. 18.

[1985-CE-MATHS 2-10]

12. Given that $x \neq 0$ and $-x$, x, $3x^2$ are in G.P., find x.

A. -1
B. $-\frac{1}{3}$
C. $\sqrt{3}$
D. $\frac{1}{3}$
E. 1

[1987-CE-MATHS 2-5]

13. Find the $(2n)$th term of the G.P. $-\frac{1}{2}$, 1, -2, 4, ...

A. 2^{2n}
B. -2^{2n}
C. -2^{2n-3}
D. 2^{2n-2}
E. -2^{2n-2}

[1992-CE-MATHS 2-42]

14. The nth term of a geometric sequence is $-\frac{1}{2^n}$. Find the first term and the common ratio.

	first term	common ratio
A.	-1	$\frac{1}{2}$
B.	$-\frac{1}{2}$	$-\frac{1}{2}$
C.	$-\frac{1}{2}$	$\frac{1}{2}$
D.	$-\frac{1}{2}$	1
E.	1	$-\frac{1}{2}$

[2001-CE-MATHS 2-15]

15. If the 2nd term and the 5th term of a geometric sequence are -3 and 192 respectively, then the common ratio of the sequence is

A. -8.
B. -4.
C. 4.
D. 8.

[2005-CE-MATHS 2-11]

16. If $a-6$, a, $a+5$ is a geometric sequence, then the common ratio of the sequence is

A. -30.
B. $\frac{5}{6}$.
C. $\frac{6}{5}$.
D. 6.

[2008-CE-MATHS 2-44]

17. The product of the 1st term and the 2nd term of a geometric sequence is 18 while the product of the 3rd term and the 4th term of the sequence is 288. The product of the 4th term and the 5th term of the sequence is

A. 576.
B. 864.
C. 1152.
D. 5184.

[2011-CE-MATHS 2-45]

Geometric Mean

18. The geometric mean of two numbers is 2. If one number is –16, then the other number is

A. 4.
B. 8.
C. –32.
D. $-\frac{1}{4}$.
E. $-\frac{1}{8}$.

[SP-CE-MATHS 2-15]

19. If the geometric mean of two positive numbers a and b is 10, then $\log a + \log b =$

A. $\frac{1}{2}$.
B. 1.
C. 2.
D. 10.
E. 100.

[1995-CE-MATHS 2-43]

20. If the geometric mean of two positive numbers a and b is 100, then the arithmetic mean of $\log a$ and $\log b$ is

A. $\frac{1}{2}$.
B. 1.
C. 2.
D. 10.

[2002-CE-MATHS 2-43]

21. If 81, a, b, 3 is a geometric sequence, then $b - a =$

A. –18.
B. 18.
C. –26.
D. 26.

[2004-CE-MATHS 2-44]

Summation of Geometric Sequences

22. If $a \neq \pm 1$, then $1 + a^2 + a^4 + ... + a^{2n} =$

A. $\frac{1-a^{2n}}{1-a}$.
B. $\frac{1-a^{2n}}{1-a^2}$.
C. $\frac{1-a^{2n+1}}{1-a}$.
D. $\frac{1-a^{2n+1}}{1-a^2}$.
E. $\frac{1-a^{2n+2}}{1-a^2}$.

[1984-CE-MATHS 2-37]

23. The sum of the 4th term and the 5th term of a geometric sequence is –4. If the sum of the first two terms is 32, find the first term of the sequence.

A. –6
B. $\frac{-1}{2}$
C. 19
D. 64

[2003-CE-MATHS 2-10]

24. Let a_n be the nth term of a geometric sequence. If $a_7 = 32$ and $a_9 = 8$, which of the following **must** be true?

(1) $a_1 > 0$
(2) $a_1 - a_2 > 0$
(3) $a_2 + a_3 + a_4 + ... + a_{100} > 0$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2009-CE-MATHS 2-43]

25. The sum of the first 2 terms of a geometric sequence is 8 and the 3rd term of the sequence is 18. Find the 1st term of the sequence.

A. 2
B. 3
C. 2 or 32
D. 3 or 32

[2010-CE-MATHS 2-44]

Summation to Infinity

26. The first term of an infinite geometric progression is –15 and the second term is 10. What is the sum of all the positive terms?

A. 6
B. 9
C. 18
D. 30
E. 45

[1978-CE-MATHS 2-44]

27. The common ratio of a geometric progression is r. If the progression could be summed to infinity, then

A. $r > 0$.
B. $r > 1$.
C. $r > -1$.
D. $-1 < r < 1$.
E. $-1 \leq r \leq 1$.

[1979-CE-MATHS 2-51]

28. Which of the following can be summed to infinity?

(1) The arithmetic progression 4, 3, 2, 1, ...
(2) The geometric progression 27, 9, 3, 1, ...
(3) The geometric progression 16, –8, 4, –2, ...

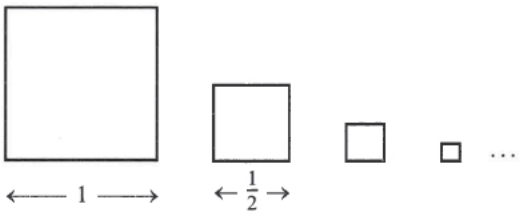
A. (2) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1981-CE-MATHS 2-35]

29. 1, –0.1, 0.01, –0.001, ... is a geometric progression. What is its sum to infinity?

A. 0
B. 1
C. 0.99
D. $\frac{10}{11}$
E. $\frac{10}{9}$

[1982-CE-MATHS 2-36]

30. 

The figure shows an infinite number of squares. The length of a side of the first square is 1. The side of each subsequent square is equal to half of the side of the preceding one. Find the sum of the areas of the infinite number of squares.

A. 4
B. 2
C. $\frac{5}{3}$
D. $\frac{3}{2}$
E. $\frac{4}{3}$

[1986-CE-MATHS 2-7]

31. If the sum to infinity of the G.P. 1, $-t$, t^2, $-t^3$, ... is $\frac{2}{3}$, find the fourth term.

A. $-\frac{1}{16}$
B. $-\frac{1}{8}$
C. $\frac{1}{16}$
D. $\frac{1}{8}$
E. $\frac{5}{8}$

[1989-CE-MATHS 2-39]

32. Let $a > b > 0$. If a and b are respectively the 1st and 2nd terms of a geometric progression, the sum to infinity of the progression is

A. $\frac{1}{a-b}$.
B. $\frac{a}{1-b}$.
C. $\frac{ab}{b-a}$.
D. $\frac{a^2}{a+b}$.
E. $\frac{a^2}{a-b}$.

[1990-CE-MATHS 2-6]

33. If the sum to infinity of a G.P. is $\frac{81}{4}$ and its second term is –9, the common ratio is

A. $-\frac{1}{3}$.
B. $\frac{1}{3}$.
C. $-\frac{4}{3}$.
D. $\frac{4}{3}$.
E. $-\frac{4}{9}$.

[1994-CE-MATHS 2-12]

34. The sum to infinity of a G.P. is 2. If the first term is $\frac{3}{2}$, find the common ratio.

A. $-\frac{1}{2}$
B. $-\frac{1}{4}$
C. $\frac{1}{4}$
D. $\frac{1}{2}$
E. $\frac{3}{2}$

[1996-CE-MATHS 2-13]

35. The first term of a geometric sequence is a. If the sum to infinity of the sequence is $\frac{3}{4}a$, then its common ratio is

A. $-\frac{1}{3}$.

B. $-\frac{1}{4}$.

C. $\frac{1}{4}$.

D. $\frac{1}{3}$.

E. $\frac{3}{4}$.

[1997-CE-MATHS 2-36]

36. Find the sum to infinity of the geometric sequence $-1, \frac{1}{x}, -\frac{1}{x^2}, \frac{1}{x^3}, \ldots$, where $x > 1$.

A. $\frac{-1}{x-1}$

B. $\frac{-1}{x+1}$

C. $\frac{-x}{x-1}$

D. $\frac{-x}{x+1}$

E. $\frac{x}{x+1}$

[1998-CE-MATHS 2-43]

37. The sum of the first two terms of a geometric sequence is 3 and the sum to infinity of the sequence is 4. Find the common ratio of the sequence.

A. $-\frac{1}{7}$

B. $\frac{1}{7}$

C. $\frac{1}{4}$

D. $-\frac{1}{2}$

E. $-\frac{1}{2}$ or $\frac{1}{2}$

[1999-CE-MATHS 2-44]

38. The sum of all the positive terms in the geometric sequence 4, –2, 1, ... is

A. 8.

B. $\frac{8}{3}$.

C. $\frac{16}{3}$.

D. $\frac{16}{5}$.

[2007-CE-MATHS 2-45]

Relationships with Arithmetic Sequences

39. Three positive numbers a, b and c are in geometric progression. Which of the following are true?

(1) $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in geometric progression.

(2) a^2, b^2, c^2 are in geometric progression.

(3) $\log_{10} a, \log_{10} b, \log_{10} c$ are in arithmetic progression.

A. (1) and (2) only

B. (1) and (3) only

C. (2) and (3) only

D. (1), (2) and (3)

E. None of them

[1983-CE-MATHS 2-39]

40. If the quadratic equation $ax^2 - 2bx + c = 0$ has two equal roots, which of the following is/are true?

(1) a, b, c form an arithmetic progression.

(2) a, b, c form a geometric progression.

(3) Both roots are $\frac{b}{a}$.

A. (1) only

B. (2) only

C. (3) only

D. (1) and (2) only

E. (2) and (3) only

[1992-CE-MATHS 2-35]

41. Given that the positive numbers p, q, r, s are in G.P., which of the following **must** be true?

(1) kp, kq, kr, ks are in G.P., where k is a non-zero constant.

(2) a^p, a^q, a^r, a^s are in G.P., where a is a positive constant.

(3) $\log p$, $\log q$, $\log r$, $\log s$ are in A.P.

A. (1) only

B. (2) only

C. (1) and (2) only

D. (1) and (3) only

E. (1), (2) and (3)

[1993-CE-MATHS 2-37]

42. Let a, b and c be positive integers. If $b = \sqrt{ac}$, which of the following **must** be true?

(1) $\log a^2$, $\log b^2$, $\log c^2$ is an arithmetic sequence.
(2) a^3, b^3, c^3 is a geometric sequence.
(3) 4^a, 4^b, 4^c is a geometric sequence.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2006-CE-MATHS 2-43]

43. If h, 5, k are the first 3 terms of an arithmetic sequence and h, 4, k are the first 3 terms of a geometric sequence, then $h^2 + k^2 =$

A. 36.
B. 68.
C. 84.
D. 100.

[2010-CE-MATHS 2-43]

HKDSE Problems

44. If $m > 1$, which of the following are geometric sequences?

(1) 2^m, 2^{2m}, 2^{3m}, 2^{4m}
(2) m, $2m^2$, $3m^4$, $4m^8$
(3) $\log m$, $\log m^2$, $\log m^4$, $\log m^8$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2014-DSE-MATHS 2-37]

45. Let x_n be the nth term of a geometric sequence. If $x_6 = 216$ and $x_8 = 96$, which of the following must be true?

(1) $x_3 = 729$
(2) $\frac{x_5}{x_7} > 1$
(3) $x_2 + x_4 + x_6 + ... + x_{2n} < 2015$

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2015-DSE-MATHS 2-37]

46. Let a_n be the nth term of a geometric sequence. If $a_3 = 21$ and $a_7 = 189$, which of the following must be true?

(1) The common ratio of the sequence is less than 1.
(2) Some of the terms of the sequence are irrational numbers.
(3) The sum of the first 99 terms of the sequence is greater than 3×10^{24}.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2016-DSE-MATHS 2-36]

47. The sum of the 2nd term and the 5th term of a geometric sequence is 9 while the sum of the 7th term and the 10th term of the sequence is 288. Find the 20th term of the sequence.

A. 65 536
B. 131 072
C. 262 144
D. 524 288

[2019-DSE-MATHS 2-36]