# SEQUENCE AND SERIES KCSE QUESTIONS WITH ANSWERS MODEL27042023 PDF

1. The average of the first and fourth terms of a G.P is 140. Given that the first term is 64, find the common ratio. (3 Marks)

2. A sequence is formed by adding corresponding terms of an AP and GP. The first, second and third terms of the sequence formed are 14, 34 and 78 respectively.
   (a) Given that the common ratio of the GP is 3;
       (i)    Find the first term of the AP and GP and the common difference of the AP. (2marks)
       (ii)    Find the sixth term and the sum of the first six terms of the sequence. (3marks)
   (b) The second and third terms of a geometric progression are 24 and $12(x + 1)$ respectively.
   Find the whole number value of x and hence the first term given the sum of the first three terms of the progression is 76. (5marks)

3. A) an arithmetic progression is such that the first term is -5, the last is 135 and the sum of progression is 975.
   Calculate
   I) the number of terms in the series (7mks)
   II) the common difference of the progression (2mks)

   B) the sum of the first three terms of a geometric progression is 27 and the first term is 36. Determine the common ratio and the value of the fourth term (4mks)

4. The 5th and 10th terms of an arithmetic progression are 18 and -2 respectively.
   (a) Find the common difference and the first term.
   (b) Determine the least number of terms which must be added together so that the sum of the progression is negative. Hence find the sum.

5. The first three consecutive terms of a geometrical progression are 3, x and 5 1/3. Find the value of x. ( 2 marks)

6. The first, fifth and seventh terms of an Arithmetic Progression (AP) correspond to the first three consecutive terms of a decreasing Geometric Progression (G.P).
   The first term of each progression is 64, the common difference of the AP is d and the common ratio of the G.P is r.
   (a) (i) Write two equations involving d and r.
   (ii) Find the values of d and r.
   (b) Find the sum of the first 10 terms of:
   (i) The Arithmetic Progression (A.P);
   (ii) The Geometric Progression (G.P).

**1**

| | |
|---|---|
| $T_1 = a \qquad T_4 = ar^3$ | |
| $\dfrac{64 + 64r^3}{2} = 140$ | M1 |
| $64 + 64r^3 = 280$ | M1 |
| $r^3 = 3.375$ | A1 |
| $r = 1.5$ | |
| | 03 |

**2**

18. A sequence is formed by adding corresponding terms of an AP and GP. The first, second and third terms of the sequence formed are 14, 34 and 78 respectively.

(a) Given that the common ratio of the GP is 3;

(i) Find the first term of the AP and GP and the common difference of the AP. (2marks)

$AP: a \qquad a+d \qquad a+2d$

$GP: \dfrac{x}{x} \qquad \dfrac{xr}{3x} \qquad \dfrac{xr^2}{9x} \quad +$

$a + x = 14$

$2(a + d + 3x = 34)$

$a + 2d + 9x = 78$

$2a + 2d + 6x = 68$
$a + 2d + 9x = 78$
_____
$a - 3x = -10$
$a + x = 14$
_____
$\dfrac{-4x}{-4} = \dfrac{-24}{-4}$
$X = 6$

$a + x = 14$
$a + 6 = 14$
$a = 8$ ②

(ii) Find the sixth term and the sum of the first six terms of the sequence. (3marks)

$14, 34, 78$

$T_6 = a + 5d + 3^5 x$

$= 8 +$

$a + d + 3x = 34$
$8 + d + 18 = 34$
$d = 34 - 26$
$d = 8$

$T_6 = a + 5d + 243x$
$\quad = 8 + 5(8) + 243 \times 6$
$\quad = 1506$

$T_5 = a + 4d + 81x$
$\quad = 8 + 4(8) + 81 \times 6$
$\quad = 526$

$T_4 = a + 3d + 27x$
$\quad = 8 + 3(8) + 27 \times 6 = 194$

$S_6$

$14 + 34 + 78 + 194$
$+ 526 + 1506$
$= 2352$ ③

(b) The second and third terms of a geometric progression are 24 and $12(x + 1)$ respectively.

Find the whole number value of x and hence the first term given the sum of the first three terms of the progression is 76. **(5marks)**

$ar = 24$

$ar^2 = 12(x+1)$

$r = \dfrac{12(x+1)}{24} = \dfrac{x+1}{2}$ ✓

$ar = 24$

$a\left(\dfrac{x+1}{2}\right) = 24$

$a = \dfrac{24 \times 2}{x+1} = \dfrac{48}{x+1}$

$\left(\dfrac{48}{x+1} + 24 + 12(x+1) = 76\right)(x+1)$

$48 + 24(x+1) + 12(x+1)^2 = 76(x+1)$

$48 + 24x + 24 + 12(x^2 + 2x + 1) = 76x + 76$

$72 + 24x + 12x^2 + 24x + 12 - 76x - 76 = 0$

$\dfrac{12x^2}{4} - \dfrac{28x}{4} + \dfrac{8}{4} = 0$  ⑤

$3x^2 - 7x + 2 = 0$

$3x^2 - 6x - x + 2 = 0$

$3x(x-2) - 1(x-2) = 0$

$(x-2)(3x-1) = 0$

$x = 2$    or   $x = \frac{1}{3}$

$x = 2$ ✓

| 3 | (a)(i) nth term= a+(n-1)d | | |
|---|---|---|---|
| | Last term =-5+(n-1)d=135 | M1 | |
| | (n-1)d =140 | | |
| | | | |
| | Sum of n terms = $^n/_2$(2a+(n-d)d) | M1 | |
| | n/2(-10+140)=979 | M1 | |
| | n/2(130)=979 | | |
| | 130n=2x979 | | |
| | n=$\dfrac{2x979}{130}$ | | |
| | | A1 | |
| | n=15 | | |
| | | M1 | |
| | (i) at | | |
| | A+(n-1)d=Tn | A1 | |
| | -5+14d=135 | | |
| | 14d=140 | | |
| | d=10 | | |
| | (b) s=27,a=36 | | |
| | S=a+ar+ar$^3$ | | |
| | | | |
| | 27=36+36r+36r$^2$ | M1 | |
| | 3=4+4r+4r$^2$ | | |
| | (2r+1)(2r+1)=0 | | |
| | r=- ½ | A1 | |
| | | | |
| | | 10 | |

**4**

| | | |
|---|---|---|
| (a) | $a + 4d = 18$     (i) $\Big\}$ | B1 |
| | $a + 9d = -2$    (ii) | |
| | $\qquad 5d = -20$ | M1 |
| | $\qquad d = -4$ | A1 |
| | $\qquad a = 34$ | B1 |
| (b) | $\dfrac{n}{2}\{2\times34+(n-1)(-4)\}=0$ | M1 |
| | $\dfrac{n}{2}\{72-4n\}=0$ | M1 |
| | $4n = 72$ | |
| | $n = 18$ | A1 |
| | least number of terms $= 19$ | B1 |
| | $S_{19} = \dfrac{19}{2}\{2\times34+18(-4)\}$ | M1 |
| | $\qquad = \dfrac{19}{2}(68-72)$ | |
| | $\qquad = \dfrac{19}{2}(-4)$ | |
| | $\qquad = -38$ | A1 |

**5**

| | | | |
|---|---|---|---|
| **5.** | $\dfrac{x}{3} = \dfrac{16}{3x}$ | B1 | $\dfrac{16}{3x} = \dfrac{x}{3}$ |
| | $3x^2 = 48$ | A1 | $x \times \dfrac{16}{x} = x \times x$ |
| | $x^2 = 16$ | | $x = \sqrt{16}$ |
| | $x = 4$ | | $\qquad = 4$ |

6

(a) (i) $64 + 4d = 64r$

$64 + 6d = 64r^2$

(ii) From (i)

$d = 16r - 16$

$64r^2 = 64 + 6(16r - 16)$

$64r^2 = 64 + 96r - 96$

$2r^2 - 3r + 1 = 0$

$(2r - 1)(r - 1) = 0$

$r = \frac{1}{2}$ or $r = 1$

For decreasing GP, $r = \frac{1}{2}$

Substituting $r = \frac{1}{2}$ in (i)

$64 \times \frac{1}{2} = 64 + 4d$

$d = -8$

(b) (i) A.P

$$S_{10} = \frac{10}{2}\left\{2 \times 64 + 9 \times -8\right\} = 280$$

(ii) G.P

$$S_{10} = \frac{64\left(1 - \frac{1}{2^{10}}\right)}{1 - \frac{1}{2}} = \frac{64\left(\frac{1023}{1024}\right)}{\frac{1}{2}} = 127.875$$