6.1

1. Find the next four terms of each sequence

(i) 12, 16, 20, ...

First term = 12, 16, 20, ...

4 is added every time, so

Next term = 20+4 = 24

2nd term = 24+4 = 28

3rd term = 28+4 = 32

4th term = 32+4 = 36

(ii) 3, 1, -1, ...

2 is subtracted every time, to get new term, so

Next first term = -1-2 = -3

2nd term = -3-2 = -5

3rd term = -5-2 = -7

4th term = -7-2 = -9

2. Write down the first three terms of each of the following sequences:

(i) $a_n = 3n+5$

Put $n=1$

$a_1 = 3(1)+5 = 3+5 = 8$

Put $n=2$

$a_2 = 3(2)+5 = 6+5 = 11$

Put $n=3$

$a_3 = 3(3)+5 = 9+5 = 14$

8, 11, 14

(ii) $a_{n+1} = 4a_n - 7$ and $a_1 = 3$

$a_1 = 3$

let $n=1$

$a_{1+1} = 4a_1 - 7$

$a_2 = 4(3) - 7$

$a_2 = 12 - 7$

$a_2 = 5$

Put $n=2$

$a_{2+1} = 4a_2 - 7$

$a_3 = 4(5) - 7$

$a_3 = 20 - 7 = 13$

3, 5, 13

(iii) $a_n = (n-3)(n+1)$

if $n=1$

$a_1 = (1-3)(1+1)$

$= (-2)(2)$

$a_1 = -4$

Put $n=2$

$a_2 = (2-3)(2+1)$

$a_2 = (-1)(3)$

$a_2 = -3$

Put $n=3$

$a_3 = (3-3)(3+1)$

$a_3 = (0)(4)$

$a_3 = 0$

$-4, -3, 0$

(iv) $a_1 = -1, \quad a_{n+1} = \dfrac{3}{a_{n+2}}$

let $n=1$

$a_{1+1} = \dfrac{3}{a_{1+2}}$

$a_2 = \dfrac{3}{-1+2}$

$a_2 = \dfrac{3}{1} = 3$

Put $n = 2$

$$a_{2+1} = \frac{3}{a_2 + 2}$$

$$a_3 = \frac{3}{3+2}$$

$$a_3 = 3/5$$

$-1, 3, 3/5$

(v) $$a_n = 8 - \frac{20}{3+n}$$

Put $n = 1$

$$a_1 = 8 - \frac{20}{3+1}$$

$$a_1 = 8 - \frac{\cancel{20}5}{\cancel{4}}$$

$$a_1 = 8 - 5 = 3$$

Put $n = 2$

$$a_2 = 8 - \frac{20}{3+2}$$

$$a_2 = 8 - \frac{\cancel{20}4}{\cancel{5}}$$

$$a_2 = 8 - 4 = 4$$

Put $n = 3$

$a_3 = 8 - \frac{20}{3+3}$

$a_3 = 8 - \frac{20}{6}$

$a_3 = \frac{48-20}{6} = \frac{28}{6}$

$a_3 = 14/3$

$3, 4, 14/3$

(vi) $a_1 = 1, \quad a_{n+1} = (3a_n + 2)^2$

Put $n = 1$

$a_{1+1} = (3a_1 + 2)^2$

$a_2 = (3(1) + 2)^2$

$a_2 = (5)^2 = 25$

Put $n = 2$

$a_{2+1} = (3a_2 + 2)^2$

$a_3 = (3(25) + 2)^2$

$a_3 = (75+2)^2 = (77)^2 = 5929$

$1, 25, 5929$

(vii) $a_n = (-2n)^2$

Put $n = 1$

$a_1 = (-2(1))^2$

$a_1 = (-2)^2 = 4$

Put $n = 2$

$a_2 = (-2(2))^2$

$a_2 = (-4)^2 = 16$

Put $n = 3$

$a_3 = (-2(3))^2$

$a_3 = (-6)^2 = 36$ 4, 16, 36

(viii) $a_n = (-1)^n 7n^2$

Put $n = 1$

$a_1 = (-1)^1 7(1)^2$

$a_1 = -1 \times 7 = -7$

Put $n = 2$

$a_2 = (-1)^2 7(2)^2$

$a_2 = 1 \times 7 \times 4$

$a_2 = 28$

Put $n = 3$

$a_3 = (-1)^3 7(3)^2$

$a_3 = (-1) \times 7(9)$

$a_3 = -63$

$-7, 28, -63$

3. An expression for the n^{th} triangular number is $\frac{n(n+1)}{2}$. Write down the 15^{th} triangular number. Make a triangle of dots by taking $n = 5$.

nth term = $\frac{n(n+1)}{2}$

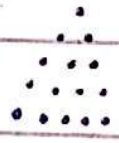
let $n = 15$

15th term = $\frac{15(15+1)}{2}$

15th term = $\frac{15 \times 16}{2} = 15 \times \frac{16}{2}$

15th term = $15 \times 8 = 120$

Now triangle with $n = 5$ dots.



4. Write down the n^{th} term of each of the following sequences:

(i) 1, 4, 9, ...

$(1)^2, (2)^2, (3)^2, \ldots$

nth term = n^2

(ii) 1, 1+2, 1+2+3, ...

first term with single term

Second term with two term

3rd term with three term

So,

nth term = $1+2+3+4, \ldots +n$

(iii) $a_1b_1, a_2b_2, a_3b_3, \ldots$

First term = a_1b_1

second term = a_2b_2

third term = a_3b_3

nth term = a_nb_n

(iv) $x, 2x^2, 3x^3, \ldots$

$a_1 = x$

$a_2 = 2x^2$

$\ldots\ldots$

$a_n = nx^n$

(v) $a_1, a_1+d, a_1+2d, \ldots$

first term = a_1

2nd term = a_1+d

3rd term = a_1+2d

nth term = $a_1+(n-1)d$

(vi) $a_1, a_1r, a_1r^2, \ldots$

1st term = a_1

2nd term = a_1r

3rd term = a_1r^2

nth term = $a_1r^{(n-1)}$

(vii) $\frac{a_1}{b_1+c_1}, \frac{2a_2}{b_2+c_2}, \frac{3a_3}{b_3+c_3}, \ldots$

1st term = $\frac{a_1}{b_1+c_1}$

2nd term = $\frac{2a_2}{b_2+c_2}$

3rd term = $\frac{3a_3}{b_3+c_3}$

nth term = $\frac{na_n}{b_n+c_n}$

(viii) $\frac{1}{a_1}, \frac{1}{a_1+d}, \frac{1}{a_1+2d}, \ldots\ldots$

1st term = $\frac{1}{a_1}$

2nd term = $\frac{1}{a_1+d}$

3rd term = $\frac{1}{a_1+2d}$

nth term = $a_n = \frac{1}{a_1+(n-1)d}$

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