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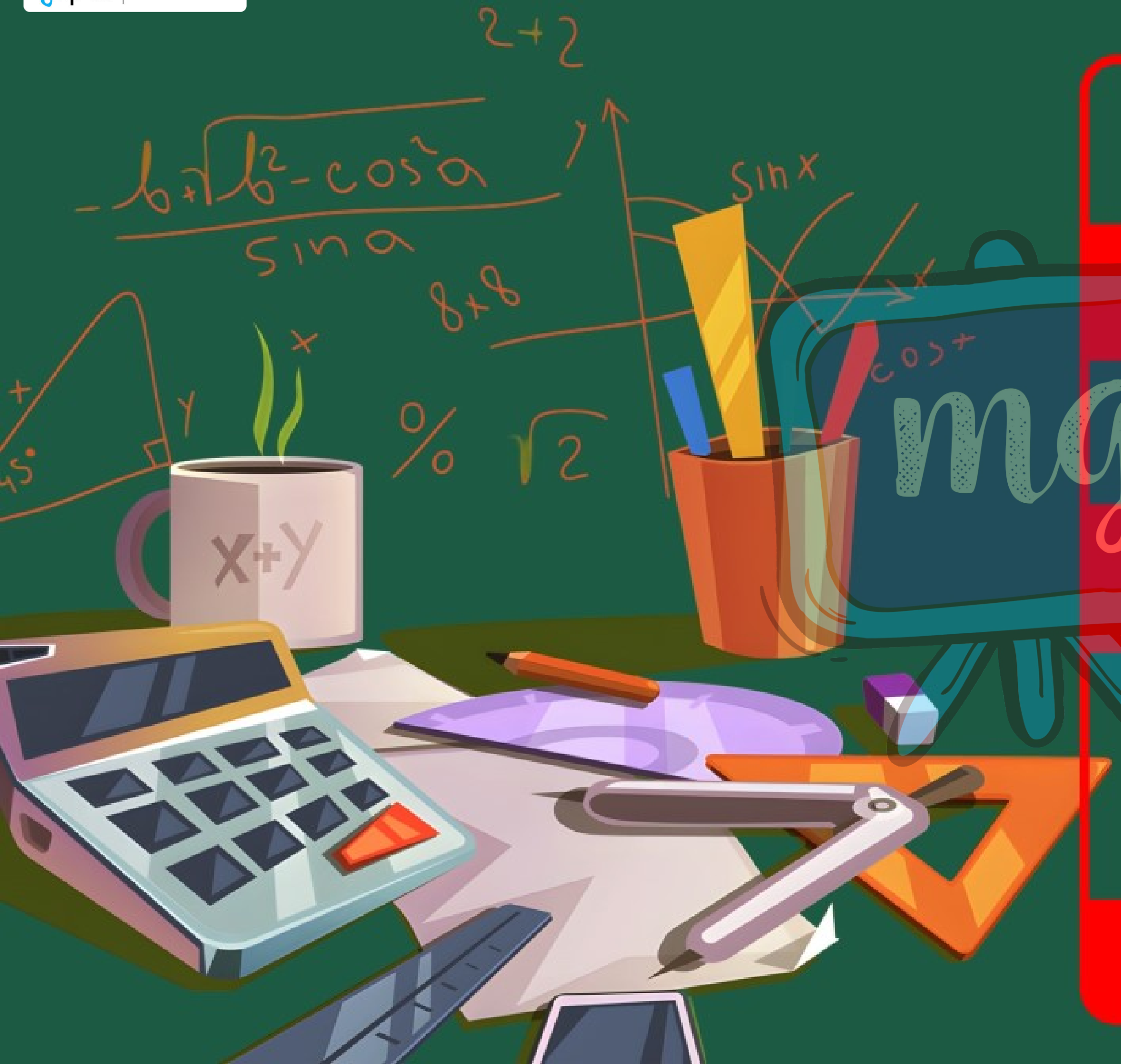

CLASS – 10

MATHEMATICS

Chapter – 5

Arithmetic Progressions

Part – 3

EXERCISE 5.1 (Q.4)

Shubham Tiwari

4. Which of the following are APs ? If they form an AP, find the common difference d and write three more terms.

(i) 2, 4, 8, 16, ……

Soln. Let's compare the given sequence by a_1, a_2, a_3, a_4 ---

$a_1 = 2, \; a_2 = 4, \; a_3 = 8, \; a_4 = 16$

$d_1 = a_2 - a_1 = 4 - 2 = 2$

$d_2 = a_3 - a_2 = 8 - 4 = 4$

$d_3 = a_4 - a_3 = 16 - 8 = 8$

$d_1 \neq d_2 \neq d_3$

it is not an AP.

(ii) $2, \frac{5}{2}, 3, \frac{7}{2}, \ldots\ldots$

Soln. $a_1 = 2,\ a_2 = 5/2,\ a_3 = 3$

$a_4 = \frac{7}{2}$

$d_1 = a_2 - a_1 = \frac{5}{2} - 2 = \frac{5-4}{2} = \frac{1}{2}$

$d_2 = a_3 - a_2 = 3 - 5/2 = \frac{6-5}{2} = \frac{1}{2}$

$d_3 = a_4 - a_3 = 7/2 - 3 = \frac{7-6}{2} = \frac{1}{2}$

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$d_1 = d_2 = d_3 = \frac{1}{2}$

Hence it is an AP.

and the common diff is $\frac{1}{2}$.

$a_5 = a_4 + d = \frac{7}{2} + \frac{1}{2} = 4,$

$a_6 = a_5 + d = 4 + \frac{1}{2} = \frac{9}{2},$

$a_7 = a_6 + d = \frac{9}{2} + \frac{1}{2} = \frac{10}{2} = 5,$

(iii) –1.2, –3.2, –5.2, –7.2, ……

Soln. $a_1 = -1.2$, $a_2 = -3.2$, $a_3 = -5.2$

$a_4 = -7.2$.

$d_1 = -3.2 - (-1.2) = -3.2 + 1.2 = -2$

$d_2 = -5.2 - (-3.2) = -5.2 + 3.2 = -2$

$d_3 = -7.2 - (-5.2) = -7.2 + 5.2 = -2$

as $d_1 = d_2 = d_3 = -2$

Hence it is an A.P.

and the common diff is -2.

$a_5 = a_4 + d = -7.2 + (-2) = -9.2$

$a_6 = a_5 + d = -9.2 + (-2) = -11.2$

$a_7 = -11.2 + (-2) = -13.2$

(iv) –10, –6, –2, 2, ……

$a_1 = -10,\ a_2 = -6,\ a_3 = -2,\ a_4 = 2$

$d_1 = a_2 - a_1 = -6 - (-10) = 4$

$d_2 = a_3 - a_2 = -2 - (-6) = 4$

$d_3 = a_4 - a_3 = 2 - (-2) = 4$

as $d_1 = d_2 = d_3 = 4$

Hence it is an A.P. with 4 as the common diff.

$a_5 = a_4 + d = 2 + 4 = 6$

$a_6 = a_5 + d = 6 + 4 = 10$

$a_7 = a_6 + d = 10 + 4 = 14$

(v) $3, 3+\sqrt{2}, 3+2\sqrt{2}, 3+3\sqrt{2}, \ldots$

$a_1 = 3, \quad a_2 = 3+\sqrt{2}, \quad a_3 = 3+2\sqrt{2}$

$a_4 = 3+3\sqrt{2}$

$d_1 = a_2 - a_1 = 3+\sqrt{2} - 3 = \sqrt{2}$

$d_2 = a_3 - a_2 = 3+2\sqrt{2} - (3+\sqrt{2}) = \sqrt{2}$

$d_3 = a_4 - a_3 = (3+3\sqrt{2}) - (3+2\sqrt{2}) = \sqrt{2}$

as $d_1 = d_2 = d_3 = \sqrt{2}$

Hence it is an A.P.

$a_5 = 3 + 3\sqrt{2} + \sqrt{2} = 3 + 4\sqrt{2}$

$a_6 = 3 + 4\sqrt{2} + \sqrt{2} = 3 + 5\sqrt{2}$

$a_7 = 3 + 5\sqrt{2} + \sqrt{2} = 3 + 6\sqrt{2}$

$$(3+2\sqrt{2})-(3+\sqrt{2})$$

$$\cancel{3}+\underbrace{2\sqrt{2}}-\cancel{3}\underbrace{-\sqrt{2}}$$

$$\sqrt{2}$$

(vi) 0.2, 0.22, 0.222, 0.2222, ...

$a_1 = 0.2$ | $a_2 = 0.22$ | $a_3 = 0.222$

$d_1 = a_2 - a_1 = 0.22 - 0.2 = 0.02$

$d_2 = a_3 - a_2 = 0.222 - 0.22 = 0.002$

as $d_1 \neq d_2$ | Hence it is not an AP.

$$
\begin{array}{r}
0.222 \\
0.220 \\
\hline
0.002 \\
\hline
\end{array}
$$

(vii) 0, –4, –8, –12, …….

$a_1 = 0$, $a_2 = -4$, $a_3 = -8$, $a_4 = -12$

$d_1 = a_2 - a_1 = -4 - 0 = -4$

$d_2 = a_3 - a_2 = -8 - (-4) =$

$= -8 + 4 = -4$

$d_3 = a_4 - a_3 = -12 - (-8) =$

$= -12 + 8 = -4$

$d_1 = d_2 = d_3 = -4$

it is an AP

with $\underline{d = -4}$

$a_5 = -12 - 4 = -16$

$a_6 = -16 - 4 = -20$

$a_7 = -20 - 4 = -24$

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(viii) $-\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \ldots\ldots$

$a_1 = -\frac{1}{2}$, $a_2 = -\frac{1}{2}$, $a_3 = -\frac{1}{2}$

$a_4 = -\frac{1}{2}$

$d_1 = -\frac{1}{2} - \left(-\frac{1}{2}\right) = 0$

$d_2 = -\frac{1}{2} - \left(-\frac{1}{2}\right) = 0$

$d_3 = -\frac{1}{2} - \left(-\frac{1}{2}\right) = 0$

it is an AP with $d=0$

$a_5 = a_6 = a_7 = -\frac{1}{2}$

(ix) 1, 3, 9, 27, ...

$a_1 = 1$, $a_2 = 3$, $a_3 = 9$, $a_4 = 27$

$d_1 = a_2 - a_1 = 3 - 1 = 2$

$d_2 = a_3 - a_2 = 9 - 3 = 6$

as $d_1 \neq d_2$ (it is not an AP. }

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(x) a, 2a, 3a, 4a, ...

$a_1 = a$, $a_2 = 2a$, $3a = a_3$, $4a = a_4$

$d_1 = a_2 - a_1 = 2a - a = a$

$d_2 = a_3 - a_2 = 3a - 2a = a$

$d_3 = a_4 - a_3 = 4a - 3a = a$

$d_1 = d_2 = d_3 = a$

Hence it is an AP with $d = a$

$$a_5 = 4a + a = 5a$$

$$a_6 = 5a + a = 6a$$

$$a_7 = 6a + a = 7a$$

(xi) a, a², a³, a⁴, ...

$a_1 = a$, $a_2 = a^2$, $a_3 = a^3$, $a_4 = a^4$

$d_1 = a_2 - a_1 = a^2 - a = a(a-1)$

$d_2 = a_3 - a_2 = a^3 - a^2 = a^2(a-1)$

$d_1 \neq d_2$ | it is not an AP.

(xii) $\sqrt{2}, \sqrt{8}, \sqrt{18}, \sqrt{32}, \ldots\ldots$

$\sqrt{2}$,

$\sqrt{8} = \sqrt{4 \times 2} = 2\sqrt{2}$

$\sqrt{18} = \sqrt{9 \times 2} = 3\sqrt{2}$

$\sqrt{32} = \sqrt{16 \times 2} = 4\sqrt{2}$

$d_1 = 2\sqrt{2} - \sqrt{2} = \sqrt{2}$

$d_2 = 3\sqrt{2} - 2\sqrt{2} = \sqrt{2}$

$d_3 = 4\sqrt{2} - 3\sqrt{2} = \sqrt{2}$

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it is an AP with $d = \sqrt{2}$

$5\sqrt{2}$

$\sqrt{25} \times \sqrt{2}$

$\sqrt{50}$

$a_5 = 4\sqrt{2} + \sqrt{2} = 5\sqrt{2} = \sqrt{50}$

$a_6 = 5\sqrt{2} + \sqrt{2} = 6\sqrt{2} = \sqrt{72}$

$a_7 = 6\sqrt{2} + \sqrt{2} = 7\sqrt{2} = \sqrt{98}$

(xiii) $\sqrt{3}, \sqrt{6}, \sqrt{9}, \sqrt{12}, ...$

$a_1 = \sqrt{3}, \ a_2 = \sqrt{6}, \ a_3 = \sqrt{9}, \ a_4 = \sqrt{12}$

$d_1 = a_2 - a_1 = \sqrt{6} - \sqrt{3} = \sqrt{3}(\sqrt{2} - 1)$

$d_2 = a_3 - a_2 = \sqrt{9} - \sqrt{6} = \sqrt{3}[\sqrt{3} - \sqrt{2})$

as $d_1 \neq d_2$ | it is not an A.P.

$\sqrt{6}$

$\sqrt{3} \quad \sqrt{2}$

1

$\sqrt{9}$

$\sqrt{3} \quad \sqrt{3}$

(xiv) $1^2, 3^2, 5^2, 7^2, \ldots\ldots$

$a_1 = 1$, $a_2 = 9$, $a_3 = 25$

$d_1 = a_2 - a_1 = 9 - 1 = 8$

$d_2 = a_3 - a_2 = 25 - 9 = 16$

$d_1 \neq d_2$ | it is not an AP.

(xv) $1^2, 5^2, 7^2, 73, \ldots\ldots$

$a_1 = 1,\ a_2 = 25,\ a_3 = 49$

$a_4 = 73$

$d_1 = a_2 - a_1 = 25 - 1 = 24$

$d_2 = a_3 - a_2 = 49 - 25 = 24$

$d_3 = a_4 - a_3 = 73 - 49 = 24$

as $d_1 = d_2 = d_3 = 24$

it is an A.P. where $d = 24$

$a_5 = 73 + 24 = 97$

$a_6 = 97 + 24 = 121$

$a_7 = 121 + 24 = 145$