Arithmetic Progressions Ex 9.3 Q21

Answer :

A.P: a, $a+d$, $a+2d$ ...

Here, we first need to write the expression for $a_n - a_k$

Now, as we know,

$a_n = a + (n-1)d$

So, for n^{th} term,

$a_n = a + (n-1)d$

Similarly, for k^{th} term

$a_k = a + (k-1)d$

So,

$a_n - a_k = (a + nd - d) - (a + kd - d)$

$\qquad = a + nd - d - a - kd + d$

$\qquad = nd - kd$

$\qquad = (n-k)d$

So, $\boxed{a_n - a_k = (n-k)d}$

(i) In the given problem, we are given 11th and 13th term of an A.P.

We need to find the common difference. Let us take the common difference as d and the first term as a.

Here,

$a_{11} = 5$

$a_{13} = 79$

Now, we will find a_{11} and a_{13} using the formula $a_n = a + (n-1)d$

So,

$a_{11} = a + (11-1)d$

$5 = a + 10d$ ......(1)

Also,

$a_{13} = a + (13-1)d$

$79 = a + 12d$ ......(2)

Solving for a and d

On subtracting (1) from (2), we get

$79 - 5 = (a + 12d) - (a + 10d)$

$74 = a + 12d - a - 10d$

$74 = 2d$

$d = \dfrac{74}{2}$

$d = 37$

Therefore, the common difference for the A.P. is $\boxed{d = 37}$.

(ii) We are given, $a_{10} - a_5 = 200$

Here,

Let us take the first term as a and the common difference as d

Now, as we know,

$a_n = a + (n-1)d$

Here, we find a_{30} and a_{20}.

So, for 10th term,

$$a_{10} = a + (10-1)d$$
$$= a + (9)d$$

Also, for 5th term,
$$a_5 = a + (5-1)d$$
$$= a + (4)d$$

So,
$$a_{10} - a_5 = (a+9d) - (a+4d)$$
$$200 = a + 9d - a - 4d$$
$$200 = 5d$$
$$d = \frac{200}{5}$$
$$d = 40$$

Therefore, the common difference for the A.P. is $\boxed{d = 40}$.

(iii) In the given problem, the 20th term is 10 more than the 18th term. So, let us first find the 20th term and 18th term of the A.P.

Here

Let us take the first term as a and the common difference as d

Now, as we know,
$$a_n = a + (n-1)d$$

So, for 20th term ($n = 20$),
$$a_{20} = a + (20-1)d$$
$$= a + 19d$$

Also, for 18th term ($n = 18$),
$$a_{18} = a + (18-1)d$$
$$= a + 17d$$

Now, we are given,
$$a_{20} = a_{18} + 10$$

On substituting the values, we get,
$$a + 19d = a + 17d + 10$$
$$19d - 17d = 10$$
$$2d = 10$$
$$d = \frac{10}{2}$$
$$d = 5$$

Therefore, the common difference for the A.P. is $\boxed{d = 5}$

********** END *********