SELF ASSESSMENT TEST SOLUTIONS

1. First term is a and d = 3a - a = 2a

n^{th} term $a_n = a + (n - 1)d$

$= a + (n - 1)2a$

$= a + 2na - 2a$

$= 2na - a = (2n - 1)a$

So (b) is the correct option.

2 $d = \frac{1 - p}{p} - \frac{1}{p} = \frac{1 - p - 1}{p} = \frac{-p}{p} = -1$

So (c) is the correct option.

3. Since $2x$, $(x + 10)$ and $(3x + 2)$ are in AP,

$$(x + 10) - 2x = (3x + 2) - (x + 10)$$

$$-x + 10 = 2x - 8$$

$$-x - 2x = -8 - 10$$

$$-3x = -18 \Rightarrow x = 6$$

So (a) is the correct option.

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

$$= p + 9q$$

So (c) is the correct option.

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

$$a_n = 3.5 + (101 - 1) \times 0 = 3.5$$

So (b) is the correct option.

6. Here, a = 3, d = 2 and $S_n = 120$

$$S_n = \frac{n}{2}[2a + (n - 1)d]$$

$$120 = \frac{n}{2}[2 \times 3 + (n - 1)2]$$

$$120 = n(3 + n - 1)$$

$$120 = n(n + 2)$$

$$n^2 + 2n - 120 = 0$$

$$n^2 + 12n - 10n - 120 = 0$$

$$(n + 12)(n - 10) = 0 \quad \Rightarrow n = 10 \text{ or } n = -12$$

But n can't be negative. So we get n = 10. ie 10 terms must be taken to get the sum

120.

7. Given AP is $-\frac{9}{2}, -3, -\frac{3}{2}, ...$

Here, $a = \frac{-9}{2}$, $d = -3 - \left(-\frac{9}{2}\right) = -3 + \frac{9}{2} = \frac{3}{2}$

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

$$a_{21} = \left(-\frac{9}{2}\right) + (21 - 1)\left(\frac{3}{2}\right)$$

$$= -\frac{9}{2} + 20 \times \frac{3}{2} = -\frac{9}{2} + 30$$

$$= \frac{-9 + 60}{2} = \frac{51}{2} = 25\frac{1}{2}.$$

So 21st term of given AP is $25\frac{1}{2}$.

8. Given, $S_n = n^2$ ...(1)

Put n = 1 in equation (1),

$S_1 = 1$

So, first term, $a = 1$ ..(2)

Put n = 2 in equation (1),

$S_2 = (2)^2 = 4$

Sum of first 2 terms is 4.

Now $a + a_2 = 4$.

$\Rightarrow a_2 = 3$

Now, common difference, $d = a_2 - a = 3 - 1 = 2$

Now, 10th term of AP, $a_{10} = a + (10 - 1)d$

$= 1 + 9 \times 2 = 19$

9. Here, $a = 213$, $d = 205 - 213 = -8$, $a_n = 37$

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

$37 = 213 + (n - 1)(-8)$

$37 - 213 = -8(n - 1)$

$n - 1 = \frac{-176}{-8} = 22$

$n = 22 + 1 = 23$

The middle term will be $= \frac{23 + 1}{2} = 12^{th}$

$a_{12} = a + (12 - 1)d$

$= 213 + 11 \times -8$

$= 213 - 88 = 125$

10. Here, $a = 6$, $a_n = 216$, $d = 13 - 6 = 7$

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

$216 = 6 + (n - 1)(7)$

$210 = 7(m - 1)$

$m - 1 = \frac{210}{7} = 30$

$m = 30 + 1 = 31$

The middle term will be $= \frac{31 + 1}{2} = 16^{th}$ term.

$a_{16} = a + (16 - 1)d$

$= 6 + 15 \times 7 = 6 + 105 = 111$

11. Let the first term be a and the common difference be d. Let a_n be the nth term.

$a_p = a + (p - 1)d$

$a_{p+2q} = a + (p + 2q - 1)d$

$a_p + a_{p+2q} = a + (p - 1)d + a + (p + 2q - 1)d$

$= a + pd - d + a + pd + 2qd - d$

$= 2a + 2pd + 2qd - 2d$

$= 2[a + (p + q - 1)d]$ ...(1)

But $2a_{p+q} = 2[a + (p + q - 1)d]$ ...(2)

From (1) and (2), we get $a_p + a_{p+2q} = 2a_{p+q}$

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

Given, $a_4 = 0$

ie. $a + 3d = 0$

$3d = -a$

$-3d = a$ ...(1)

Now, $a_{25} = a + 24d = -3d + 24d = 21d$ ...(2)

$a_{11} = a + 10d = -3d + 10d = 7d$ ....(3)

From (2) and (3), $a_{25} = 3a_{11}$. Hence Proved.

13. Given, $a = 5$, $a_n = 45$

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

$$45 = 5 + (n - 1)d$$

$$(n - 1)d = 40 \quad \text{...(1)}$$

Given, $S_n = 400$

Now $S_n = \frac{n}{2}(a + a_n)$

$$400 = \frac{n}{2}(5 + 45)$$

$$800 = 50n$$

$$\Rightarrow \quad n = 16$$

(1) $\Rightarrow$ $(n - 1)d = 40$

$$15d = 40$$

$$d = \frac{40}{15} = \frac{8}{3}$$

14. Given, $a = -6$, $d = \frac{-11}{2} - (-6) = \frac{1}{2}$.

$$S_n = \frac{n}{2}(2a + (n - 1)d)$$

Let the sum of n term be zero.

Then, $\frac{n}{2}\left[2 \times -6 + (n - 1)\frac{1}{2}\right] = 0$

$$\frac{n}{2}\left[-12 + \frac{n}{2} - \frac{1}{2}\right] = 0$$

$$\frac{n}{2}\left[\frac{n}{2} - \frac{25}{2}\right] = 0$$

$$\frac{n}{2}\left[\frac{n - 25}{2}\right] = 0$$

$$n^2 - 25n = 0$$

$$n(n - 25) = 0$$

$$n = 25$$

So 25 terms are needed.

15. Number divisible by 8 are 208, 216, 224, ... 496.

It forms an AP. Here a= 208, d = 8 and $a_n = 496$

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

$$208 + (n - 1)\,d = 496$$

$$(n - 1)\,8 = 496 - 208$$

$$n - 1 = \frac{288}{8} = 36$$

$$n = 36 + 1 = 37$$

So required numbers divisible by 8 is 37.