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MATHS

ARITHMETIC PROGRESSION

Part – 8

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Exercise : 5.3

Q.3 In an AP:

i. given $a = 5$, $d = 3$, $a_n = 50$, find n and S_n.

Solu

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

$$50 = 5 + (n-1)3$$

$$\frac{45}{3} = (n-1)$$

$$15 = n - 1$$

$$n = 16$$

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

$$S_{16} = \frac{16}{2}\left[2 \times 5 + (16-1)3\right]$$

$$= 8\left[10 + 15 \times 3\right]$$

$$8\left[10 + 45\right]$$

$$= 8 \times 55$$

$$= 400 + 40$$

$$S_{16} = 440$$

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Exercise : 5.3

iv. given $a_3 = 15$, $S_{10} = 125$, find d and a_{10}.

$S_{10} = 125$

$\frac{10}{2}[2a + 9d] = 125$

$2a + 9d = \frac{125}{5} = 25$

$2a + 9d = 25$ — (1)

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$a_3 = a + 2d = 15$ — (2)

$2a + 9d = 25$

$2 \times (a + 2d = 15)$

$2a + 9d = 25$

$-2a \pm 4d = -30$

$5d = -5$

$d = -1$

$a + 2(-1) = 15$

$a - 2 = 15$

$a = 17$

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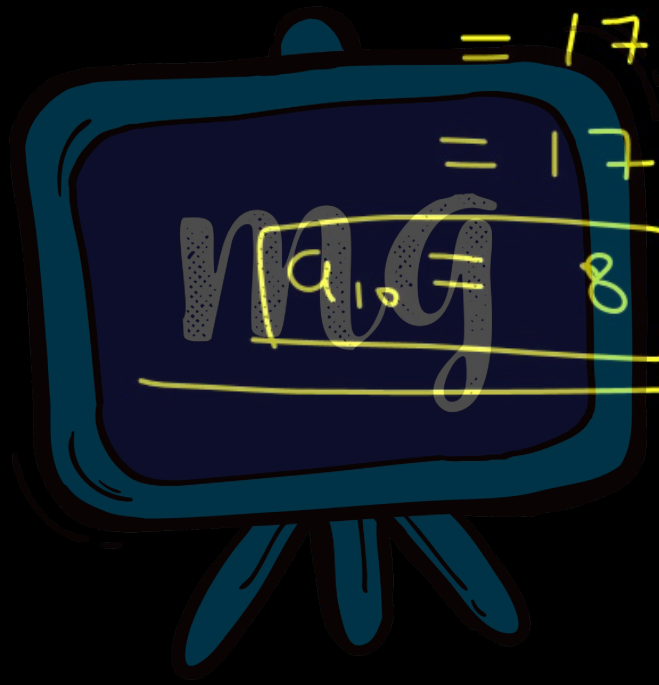
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$$a_{10} = a + 9d$$

$$= 17 + 9(-1)$$

$$= 17 - 9$$

$$\boxed{a_{10} = 8}$$



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Exercise : 5.3

vii. given a = 8, a_n = 62, S_n = 210, find n and d.

Solu: $a = 8$, $a_n = 62$

$S_n = 210$

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

$62 = 8 + (n-1)\,d$

$54 = (n-1)\,d$ — (1)

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$$S_n = 210$$

$$\frac{n}{2}\left[2a + (n-1)d\right] = 210$$

$$\frac{n}{2}\left[2\times 8 + 54\right] = 210$$

$$\frac{n}{2}\left[16 + 54\right] = 210$$

$$\frac{n}{2}\left[70\right] = 210$$

$$n = 2\times 3 = 6$$

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$$(n-1)\,d = 54$$

$$(6-1)\,d = 54$$

$$5 \times d = 54$$

$$d = \frac{54}{5}$$

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Exercise : 5.3

ix. given a = 3, n = 8, S = 192, find d.

$S_8 = \frac{8}{2}[2 \times 3 + (7)\, d]$

$192 = 4[6 + 7d]$

$48 = 6 + 7d$

$42 = 7d$

$42/7 = d$

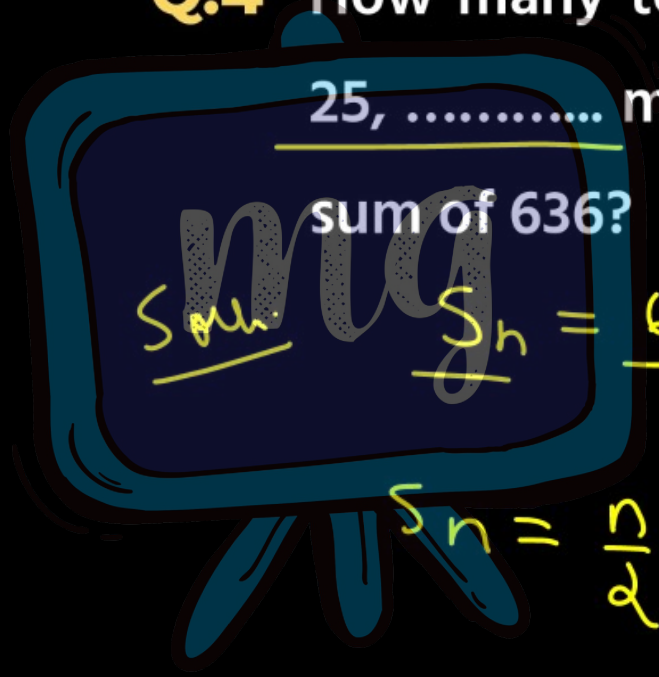
$d = 6$

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Exercise : 5.3

Q.4 How many terms of the AP : 9, 17, 25, ... must be taken to give a sum of 636?



Sum. $S_n = 636$

$a = 9$
$d = 8$
$n = ?$

$$S_n = \frac{n}{2}\left[2 \times 9 + (n-1)8\right]$$

$$636 = \frac{n}{2}\left[18 + 8n - 8\right]$$

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$$636 = \frac{n}{2}\left[18 + 8n - 8\right]$$

$$636 = \frac{n}{2}\left[10 + 8n\right]$$

$$636 = n\left[5 + 4n\right]$$

$$636 = 5n + 4n^2$$

$$0 = 4n^2 + 5n - 636$$

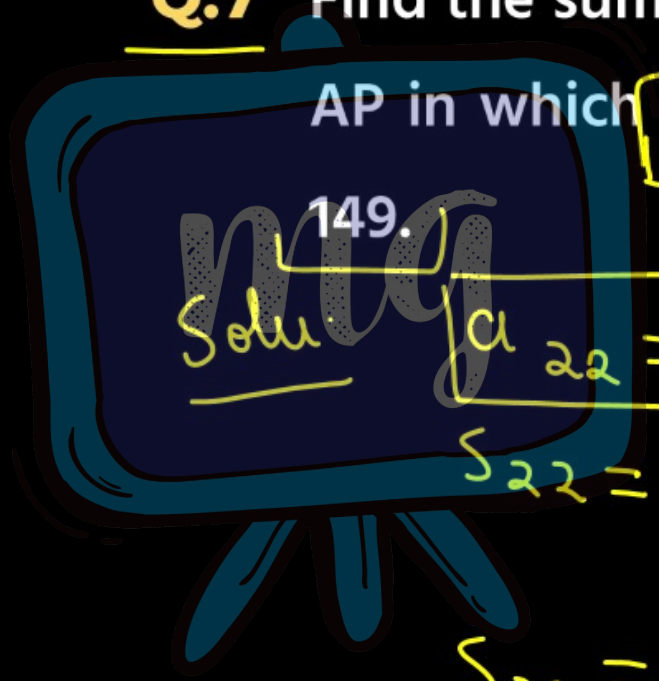
$$n = (\ ),(\ )$$

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Exercise : 5.3

Q.7 Find the sum of first 22 terms of an AP in which d = 7 and 22nd term is 149.



Soln. $a_{22} = 149$, $d = 7$

$$S_{22} = \frac{22}{2}\left[2a + (n-1)7\right]$$

$$S_{22} = 11\left[2a + 21 \times 7\right]$$

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$$a_{22} = a + 21d$$

$$149 = a + 21 \times 7$$

$$149 = a + 147$$

$$149 - 147 = a = 2$$

$$S_{22} = 11\left[4 + 147\right]$$

$$S_{22} = 11(151)$$

$$S_{22} = 1661$$

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15 1
1
15
6
1
16 6)

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Exercise : 5.3

Q.10 Show that $a_1, a_2, \ldots\ldots, a_n,$ form an AP where a_n is defined as below:

i. $a_n = 3 + 4n$

ii. $a_n = 9 - 5n$

Also find the sum of the first 15 terms in each case.

H.W

Solu:

$a_n = 9 - 5n$

$a_1 = 9 - 5$

$a_1 = 4$

$a_2 = 9 - 5(2)$

$= 9 - 10$

$a_2 = -1$

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$a_3 = 9 - 5(3)$

$= 9 - 15$

$a_3 = -6$

$4, -1, -6$

$d_1 = -1 - 4$

$d_1 = -5$

$d_2 = -6 - (-1)$

$= -6 + 1$

$d_2 = -5$

$d_1 = d_2 = d = -5$

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$$S_{15} = \frac{15}{2}\left[2a + 14d\right]$$

$$S_{15} = 15\left[a + 7d\right]$$

$$= 15\left[4 + 7(-5)\right]$$

$$= 15\left[4 + (-35)\right]$$

$$= 15\left[-31\right]$$

$$S_{15} = -465$$

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Exercise : 5.3

Q.11 If the sum of the first n terms of an AP is $4n - n^2$, what is the first term (that is S_1)? What is the sum of first two terms? What is the second term? Similarly, find the 3^{rd}, the 10^{th} and the n^{th} terms.

Solu

$a_n = S_n - S_{n-1}$

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Solu $S_n = 4n - n^2$

$S_1 = 4(1) - (1)^2$

$= 4 - 1$

$S_1 = 3 = a_1$

$S_2 = 4(2) - (2)^2$

$= 8 - 4$

$S_2 = 4$

$S_2 = a_1 + a_2$

$a_1 + a_2 = 4$

$3 + a_2 = 4$

$a_2 = 1$

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$a_3 = a + 2d = a_2 + d$



$d = a_2 - a_1$

$d = 1 - 3$

$\boxed{d = -2}$

$a_3 = 3 + 2(-2)$

$= 3 - 4$

$\boxed{a_3 = -1}$

$a_{10} =$

$= a + 9d$

$= 3 + 9(-2)$

$= 3 - 18$

$= -15$

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

$$3 + (n-1)(-2)$$

$$3 + [-2n + 2]$$

$$3 - 2n + 2$$

$$\boxed{5 - 2n = a_n}$$

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$$a_n = S_n - S_{n-1}$$

$$= (4n - n^2) - [4(n-1) - (n-1)^2]$$

$$= 4n - n^2 - 4n + 4 + n^2 - 2n + 1$$

$$5 - 2n$$

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Exercise : 5.3

Q.14 Find the sum of the odd numbers between 0 and 50.

0, 1, 3, 5, ... 49 | 50

$a_1 = 1$

$a_2 = 3$

$d = 2$

$n = ?$

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

$49 = 1 + (n-1)2$

$48 = (n-1)2$

$24 = n - 1$

$25 = n$

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$$S_n = \frac{n}{2}[a + l]$$

$$= \frac{25}{2}[1 + 49]$$

$$= 25 \times \frac{50}{2}$$

$$S_n = 625$$

$S_n - n?$