Ex - 5.3

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

(i) ~~a = 2~~

~~n = 10~~

~~d =~~

i) 2, 7, 12 . . . to 10 terms

$a = 2$

$n = 10$

$d = a_2 - a_1 = 7 - 2 = 5$

$S_{10} = \frac{10}{2}[2 \times 2 + (10-1)5]$

$= 5[4 + 45]$

$= 5 \times 49$

$= 245$

ii) $-37, -33, -29$ . . . . to 12 terms

$a = -37$

$n = 12$

$d = a_2 - a_1 = -33 - (-37) = -33 + 37 = 4$

$S_{12} = \frac{12}{2}[2 \times (-37) + (12-1)4]$

$= 6[-74 + 44]$

$= 6 \times (-30)$

$= -180$

74
−44
30

iii) 0.6, 1.7, 2.8 ... to 100 terms

$a = 0.6$

$n = 100$

$d = a_2 - a_1 = 1.7 - 0.6 = 1.1$

$S_{100} = \frac{100}{2}[2 \times 0.6 + (100-1)1.1]$

$= 50[1.2 + 108.9]$

$= 50[110.1]$

$= 5505$

11.1
×
111
−55

iv) $\frac{1}{15}, \frac{1}{12}, \frac{1}{10}$ .... to 11 terms

$a = \frac{1}{15}$

$n = 11$

$d = a_2 - a_1 = \frac{1}{12} - \frac{1}{15} = \frac{5-4}{60} = \frac{1}{60}$

$S_{11} = \frac{11}{2}\left[2 \times \frac{1}{15} + (11-1)\frac{1}{60}\right]$

$= \frac{11}{2}\left[\frac{2}{15} + \frac{10 \times 1}{60}\right]$

$= \frac{11}{2}\left[\frac{2}{15} + \frac{1}{6}\right]$

$= \frac{11}{2} \times \left[\frac{12 + 15}{90}\right]$

$= \frac{11}{2}\left[\frac{93}{90}\right]$

$= \frac{33}{20}$

2) $\frac{7 + 10 + 14 + \ldots + 84}{2}$

$a = 7$

$d = 10\frac{1}{2} - 7 = \frac{21}{2} - 7 = \frac{21-14}{2} = \frac{7}{2}$

$a_n = 84$

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

$\Rightarrow 84 = 7 + (n-1)\frac{7}{2}$

$\Rightarrow 77 = (n-1)\frac{7}{2}$

$\Rightarrow \frac{77}{7} \times 2 = (n-1)$

$\Rightarrow 22 = n - 1$

$\Rightarrow 23 = n$

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

$= \frac{23}{2}\left[2 \times 7 + 22 \times \frac{7}{2}\right]$

$= \frac{23}{2}[14 + 77]$

$= \frac{23}{2} \times 91$

$= \frac{2093}{2} = 1046\frac{1}{2}$

iii) $34 + 32 + 30 \ldots + 10$

$a = 34$

$d = 32 - 34 = -2$

$a_n = 10$

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

$\Rightarrow 10 = 34 + (n-1)(-2)$

$\Rightarrow -24 = (n-1)(-2)$

$\Rightarrow \frac{-24}{-2} = (n-1)$

$\Rightarrow 12 = n-1$

$\Rightarrow 13 = n$

$S_{13} = \frac{13}{2}[2 \times 34 + (13-1)(-2)]$

$= \frac{13}{2}[68 + (-24)]$

$= \frac{13}{2} \times 44^{22}$

$= 286$

$$\begin{array}{r} 22 \\ \times 13 \\ \hline 66 \\ 22^{2} \\ \hline 286 \end{array}$$

iii) $-5 + (-8) + (-11) + \ldots + (-230)$

$a = -5$

$d = -8 - (-5) = -8 + 5 = -3$

$a_n = -230$

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

$\Rightarrow -230 = -5 + (n-1)-3$

$\Rightarrow -225 = (n-1)-3$

$\Rightarrow \frac{-225}{-3} = (n-1)$

$\Rightarrow 75 = (n-1)$

$\Rightarrow 76 = n$

$S_{76} = \frac{76}{2}[2 \times -5 + (76-1)-3]$

$= 38[-10 + [-225)]$

$= 38[-235)$

$= -8930$

75
×3
225

235
×38
1880
705×
8930

3 i) $a = 5$

$d = 3$

$a_n = 50$

iv) $a_3 = 15$

$S_{10} = 125$

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

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

$\Rightarrow 15 = a + 2d$ ——— (I)

~~$S_{10} = \frac{10}{2}$~~

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

$S_{10} = \frac{10}{2}[2a + (n-1)d]$

$\Rightarrow 125 = 5[2a + 9d]$

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

$\Rightarrow 25 = 2a + 9d$ ——— (II)

Subtracting (I) from (II), we get,

$25 = 2a + 9d$

$\ominus \quad 15 = a + 2d$

$10 = a + 7d$ ——— (III)

$10 = a + 7d$

$\Rightarrow a = 10 - 7d$

Replacing a in eq (1), we get

$15 = a + 2d$

$15 = 10 - 7d + 2d$

$15 - 10 = -5d$

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

$-1 = d$

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

$15 = a + (3-1) - 1$

$15 = a + (-2)$

$17 = a$

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

$a_{10} = 17 - 9$

$a_{10} = 8$

$d = 5$

$S_9 = 75$

$S_9 = \frac{9}{2}[2a + (9-1)5]$

$\Rightarrow 75 = \frac{9}{2}[2a + 40]$

$\Rightarrow \frac{75 \times 2}{9} = 2a + 40$

$\Rightarrow \frac{75 \times 2}{9 \times 2} = a + 20$

$\Rightarrow \frac{75}{9} = a + 20$ ——— (1)

$\Rightarrow -35/3 = a$

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

$\Rightarrow a_9 = a + (9-1)5$

$\Rightarrow a_9 = a + 40$

$\Rightarrow a_9 = \frac{-35}{3} + 40$

$\Rightarrow a_9 = \frac{-35 + 120}{3}$

$\Rightarrow a_9 = \frac{85}{3}$

$\therefore a = \frac{-35}{3}$, $a_9 = \frac{85}{3}$

$\frac{75 - 180}{9}$

$\frac{-35}{a_3}$

$\frac{120}{-35}$
85

vi) $a = 2$

$d = 8$

$S_n = 90$

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

$\Rightarrow a_n = 2 + (n-1)8$

$\Rightarrow a_n = 2 + 8n - 8$

$\Rightarrow a_n = 8n - 6$

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

$\Rightarrow 90 = \frac{n}{2}[4 + (n-1)8]$

$\Rightarrow 180 = n[4 + 8n - 8]$

$\Rightarrow 180 = n[8n - 4]$

$\Rightarrow 180 = 8n^2 - 4n$

$\Rightarrow 2n^2 - n - 45 = 0$

$\Rightarrow 2n^2 - 10n + 9n - 45 = 0$

$\Rightarrow 2n(n-5) + 9(n-5) = 0$

$\Rightarrow (2n+9)(n-5) = 0$

No. of terms can't be negative

$\therefore n = 5$

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

$\Rightarrow a_5 = 2 + (5-1)8$

$\Rightarrow a_5 = 2 + 32$

$\Rightarrow a_5 = 34$

iii) $a = 8$

$a_n = 62$

$S_n = 210$

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

$\Rightarrow 210 = \frac{n}{2}(8 + 62)$

$\Rightarrow 420 = n(70)$

$\Rightarrow 6 = n$

$a_6 = a + (6-1)d$

$\Rightarrow 62 = 8 + 5d$

$\Rightarrow 54 = 5d$

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

$\therefore n = 6, d = \frac{54}{5}$

iii) $a_n = 4$

$d = 2$

$S_n = -14$

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

$\Rightarrow 4 = a + (n-1)2$

~~$-14 = \frac{n}{2}[a +$~~ $\Rightarrow 4 = a + 2n - 2$

$\Rightarrow a = 6 - 2n$ ——— (1)

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

$\Rightarrow -14 = \frac{n}{2}[2a + (n-1)2]$

$\Rightarrow -48 = n[2a + 2n - 2]$

$\Rightarrow -48 = n[2(6-2n) + 2n - 2]$

$\Rightarrow -48 = n[12 - 4n + 2n - 2]$

$\Rightarrow -48 = n[-2n + 10]$

$\Rightarrow -48 = -2n^2 + 10n$

$\Rightarrow n^2 - 5n - 14 = 0$

$\Rightarrow (n-7)(n+2) = 0$

$\Rightarrow$

$n = 7, n = -2$

$\therefore n = 7$

Putting value of n in eq. (1),

• $a = 6 - 2 \times 7$

$\Rightarrow a = 6 - 14$

$\Rightarrow a = -8$

(iii) $a = 3$

$n = 8$

$S_8 = 192$

$S_8 = \frac{8}{2} [2 \times 3 + 7d)$ $\quad \frac{492}{4}$

$\Rightarrow 192 = 4 [6 + 7d]$

$\Rightarrow$ ~~$63 = 6 + 7d$~~

$\Rightarrow$ ~~$53 = 48 =$~~

$\Rightarrow 48 = 6 + 7d$

$\Rightarrow d = 6$

2) $l = 28$

$S_9 = 144$

$n = 9$

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

$\Rightarrow 144 = \frac{9}{2}[a + 28]$

$\Rightarrow \frac{144 \times 2}{9} = a + 28$

$\Rightarrow 288 - 28 = a$

$\Rightarrow 288 - 258 = a$

$\Rightarrow 32 = a + 28$

$\Rightarrow 4 = a$