Arithmetic Sequence

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

Arithmetic Series

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

or

$S_n = \frac{n}{2}(t_1 + t_n$

Page 469 #1 - 5 odd

1+5+9+....

$a = 1, d = 4, n = 100$

1a) $S_{100} = \frac{100}{2}[2(1) + (100-1)(4)]$

$S_{100} = 50[2 + 99(4)]$

$= 50[2 + 396]$

$= 50[398]$

$\therefore S_{100} = 19900$

1c) $10 + 8 + 6 + \ldots\ldots$

$a = 10, d = -2$

$S_{100} = \frac{100}{2}[2(10) + (100-1)(-2)]$

$= 50[20 + (99)(-2)]$

$= 50[20 - 198]$

$= 50[-178]$

$\therefore S_{100} = 8900$

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2a) $2+4+6+\ldots\ldots$

$a=2 \quad d=2 \quad n=10$

$S_{10} = \frac{10}{2}\left(2(2)+(10-1)(2)\right)$

$= 5\left(4+(9)(2)\right)$

$= 5(4+18)$

$= 5(22)$

$\therefore S_{10} = 110$

2c) $-2+4+10+\ldots\ldots$

$a=-2, \quad d=6, \quad n=30$

$S_{30} = \frac{30}{2}\left(2(-2)+(30-1)(6)\right)$

$= 15\left(-4+(29)(6)\right)$

$= 15(-4+174)$

$= 15(170)$

$\therefore S_{30} = 2550$

2e) $80+76+72+\ldots\ldots$

$a=80, \quad d=-4, \quad n=15$

$S_{15} = \frac{15}{2}\left(2(80)+(15-1)(-4)\right)$

$= \frac{15}{2}\left(180+(14)(-4)\right)$

$= \frac{15}{2}(180-56)$

$= \frac{15}{2}\left(\frac{62}{\cancel{124}}\right)$

$\therefore S_{15} = 930$

3a) $4+6+84\ldots\ldots+200$

$a=4, \quad d=2 \quad n=?$

Series: $t_n = a+(n-1)d$

$200 = 4+(n-1)2$

$200 = 4+2n-2$

$200 = 2+2n$

$198 = 2n$

$\frac{198}{2} = n$

$99 = n$

$S_n = \frac{n}{2}(t_1+t_n)$

$S_{99} = \frac{99}{2}(4+200)$

$S_{99} = \frac{99}{\cancel{2}}(\cancel{204})$

$S_{99} = 99(102)$

$\therefore S_{99} = 10098$

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3c) $100 + 90 + 80 + \ldots - 50$

$a = 100$, $d = -10$, $n = ?$

Find last term number n? Let $t_n = -50$

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

$-50 = 100 + (n-1)(-10)$

$-150 = (n-1)(-10)$

$\frac{-150}{-10} = \frac{(n-1)(-10)}{-10}$

$\frac{-15}{-1} = (n-1)$

$+15 = n - 1$

$\boxed{16 = n}$

$\therefore S_n = \frac{n}{2}(t_1 + t_n)$

$S_{16} = \frac{16}{2}(100 + (-50))$

$= \frac{16}{2}(50)$

$= 8(50)$

$\boxed{S_{16} = 400}$

3e $18+12+6+\ldots\ldots-216$

$a=18 \quad d=-6 \quad n=?$

$t_n = a+(n-1)d \qquad$ let $t_n=-216$

$-216 = 18+(n-1)(-6)$

$-234 = (n-1)(-6)$

$\frac{-234}{(-6)} = \frac{(n-1)(-6)}{(-6)}$

$39 = n-1$

$\boxed{40 = n}$

$S_n = \frac{n}{2}(t_1+t_n)$

$\therefore S_{40} = \frac{40}{2}(18+(-216))$

$S_{40} = 20(-198)$

$\boxed{\therefore S_{40} = -3960}$

3g $\frac{5}{2}+4+\frac{11}{2}+\ldots\ldots+100$

$t_1=\frac{5}{2} \quad t_2=4 \qquad d=t_2-t_1$

$d=4-\frac{5}{2}$

$d=\frac{8}{2}-\frac{5}{2}$

$\boxed{d=\frac{3}{2}}$

We need n!

$t_n = a+(n-1)d \qquad$ let $t_n=-12,\ a=\frac{5}{2},\ d=\frac{3}{2}$

$100 = \frac{5}{2}+(n-1)\left(\frac{3}{2}\right)$

$S_n = \frac{n}{2}(t_1+t_n)$

$\frac{200}{2} = \frac{5}{2}+(n-1)\left(\frac{3}{2}\right)$

$\frac{195}{2} = (n-1)\left(\frac{3}{2}\right)$

$195 = (n-1)3$

$65 = n-1$

$\boxed{66 = n}$

$S_{66} = \frac{66}{2}\left(\frac{5}{2}+100\right)$

$= \frac{66}{2}\left(\frac{5}{2}+\frac{200}{2}\right)$

$= 33\left(\frac{205}{2}\right)$

$\boxed{S_{66} = 3382\frac{1}{2}}$

4a) $a=6,\ t_9=24 \quad t_1=6 \quad n=9$

$$S_9 = \frac{9}{2}(t_1+t_9)$$

$$= \frac{9}{2}(6+24)$$

$$= \frac{9}{2}(30)^{15}$$

$$\boxed{S_9 = 135}$$

4d) $f(1)=5,\ f(10)=-13,\ n=10$

$$S_{10} = \frac{10}{2}(5+(-13))$$

$$= 5(-8)$$

$$\boxed{S_{10} = -40}$$

4e) $a=4.5 \quad t_{11}=-46 \quad n=11,\ t_1=4.5$

$$S_n = \frac{n}{2}(t_1+t_n)$$

$$S_{11} = \frac{11}{2}(4.5+(-46))$$

$$= \frac{11}{2}\left(\frac{9}{2}-\frac{92}{2}\right)$$

$$= \frac{11}{2}\left(\frac{-83}{2}\right)$$

$$= \frac{913}{4}$$

$$\boxed{S_{11} = 228\tfrac{1}{4}}$$

Page 469 # 4g, #5a

4g) $a=-5$ $t_1=-5$, $t_{45}=17$, $n=45$

$$S_n = \frac{n}{2}(t_1 + t_n)$$

$$S_{45} = \frac{45}{2}(-5+17)$$

$$= \frac{45}{\cancel{2}_{1}}\left(\cancel{12}^{6}\right)$$

$$\boxed{S_{45} = 270}$$

5a) $S_{50} = 1+2+3+\ldots\ldots+50$, $n=50$

$$S_n = \frac{n}{2}(t_1 + t_n)$$

$$S_{50} = \frac{50}{2}(1+50)$$

$$S_{50} = 25(51)$$

$$\boxed{S_{50} = 1275}$$

5b) $S_{75} = 3+6+9+\ldots\ldots+225$

① $\times 3$ gives

② $3S_{75} = 6+9+\ldots\ldots+225+675$

$$S_{75} - 3S_{75} = 3 - 675$$

$$\frac{S_{75}(1-3)}{-2} = \frac{-672}{-2}$$

$$\boxed{S_{75} = 336}$$

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1	(2)	(3)	4	(5)	6	(7)	8	9	10
(11)	12	(13)	14	15	16	(17)	18	(19)	20
21	22	(23)	24	25	26	27	28	(29)	~~23~~
(31)	32	33	34	35	36	(37)	38	39	40
(41)	~~42~~	(43)	44	45	46	(47)	48	49	50
51	52	53	54	55	56	57	58	(59)	60
(61)	62	63	64	65	66	(67)	68	69	70
(71)	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	(93)	94	95	96	(97)	98	99	100

∴ There are 20