PROGRESSIONS - II

Class: VIII, Mathematics

SOLUTIONS

TEACHING TASK

01. 2, 5, 8, ... AP

$a = 2,\ d = 3,\ S_n = 60100$

$\therefore \frac{n}{2}[2a + (n-1)d] = 60100$

$\Rightarrow \frac{n}{2}(2(2) + (n-1)3) = 60100$

$\Rightarrow n(3n+1) = 120200$

$\Rightarrow n = 200$. Statistifies the above equation Ans: D

02. $S_1 = T_1 + T_2 + \cdots + T_n$

$S_1 = \frac{n}{2}[T_1 + T_n] \to (1)$

$S_2 = T_2 + T_4 + \cdots + T_{n-1}$

$= \frac{\left(\frac{n-1}{2}\right)}{2}[T_2 + T_{n-1}]$ since $\left(\frac{n-1}{2}\right)$ terms

$S_2 = \frac{n-1}{4}(T_2 + T_{n-1})$

Now $\frac{S_1}{S_2} = \frac{\frac{n}{2}\cancel{(T_1 + T_n)}}{\left(\frac{n-1}{4}\right)\cancel{(T_2 + T_{n-1})}}$ Since in an A.P. $T_1 + T_n = T_2 + T_{n-1}$

$\frac{S_1}{S_2} = \frac{2n}{n-1}$

Ans: A

03 $a_1 + a_3 + a_5 + \cdots + a_{99} = 2550$ (2)

$a + (a+2d) + (a+4d) + \cdots + (a+98d) = 2550$

$\Rightarrow 50a + d(2+4+6+\cdots+98) = 2550$

$\Rightarrow 50a + 2d(1+2+3+\cdots+49) = 2550$

$\Rightarrow 50a + 2d \times \frac{49 \times 50}{2} = 2550$

$\Rightarrow 50a + d \times 49 \times 50 = 2550$

$\Rightarrow a + 49d = 51$

Now $a_1 + a_2 + a_3 + \cdots + a_{99}$

$S_{99} = \frac{99}{2}[2a_1 + 98d]$

$= 99[a_1 + 49d]$

$= 99 \times 51$

$= 5049$

Ans: B

4. $\underbrace{(1+x)(1+x^6)(1+x^{11}) \cdots (1+x^{101})}$

$1 + \_\_\_\_\_\_ + x \cdot x^6 \cdot x^{11} \cdots x^{101}$

$1 + \_\_\_\_\_\_ + x^{1+6+11+\cdots+101}$

Now Degree $= 1 + 6 + 11 + \cdots + 101$.

here $101 = 1 + (n-1)5$

$\Rightarrow n = 21$

$\therefore S_{21} = \frac{21}{2}[1+101] = 21 \times 51 = 1071$

Ans: A

05 3 digit natural numbers which are divisible by 7. (3)

They are 105, 112, 119 - - - 994

here $994 = 105 + (n-1)7$

$\Rightarrow n = 128$

Now $S_{128} = \frac{128}{2}[105 + 994]$

$= 70,336$

Ans: C

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06. $a_1 + a_5 + a_{10} + a_{15} + a_{20} + a_{24} = 225$

$\Rightarrow a + (a+4d) + (a+9d) + (a+14d) + (a+19d) + (a+23d) = 225$

$\Rightarrow 6a + 69d = 225$

$\Rightarrow 2a + 23d = 75$

Now, $S_{24} = \frac{24}{2}[2a + 23d]$

$= 12 \times 75$

$= 900$

Ans: C

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07 $\frac{\cancel{\frac{n}{2}}[2a_1 + (n-1)d_1]}{\cancel{\frac{n}{2}}[2a_2 + (n-1)d_2]} = \frac{5n+3}{3n+4}$

$\Rightarrow \frac{a_1 + \left(\frac{n-1}{2}\right)d_1}{a_2 + \left(\frac{n-1}{2}\right)d_2} = \frac{5n+3}{3n+4}$

$\Rightarrow \frac{n-1}{2} = 16 \Rightarrow n = 33$

Now

$\frac{5(33)+3}{3(33)+4} = \frac{168}{103}$

$\therefore 168 : 103$

Ans: B

08 $d=2, \quad S_n=49, \quad t_7 = 13$

Now $a+6d=13$

$\Rightarrow 2+6d=13$

$\Rightarrow d=$

08 $d=2, \quad S_n=49, \quad t_7=13$ (4)

Now $a+6d=13$

$\Rightarrow a+6(2)=13$

$\Rightarrow a=1$

~~Now~~ $\frac{n}{2}\left(2a+(n-1)d\right)=49$

$\Rightarrow \frac{n}{2}\left(2\cdot 1+(n-1)\cdot 2\right)=49$

$\Rightarrow n^2=49$

$\Rightarrow n=7$

Ans: C

09. $(a-d)+a+(a+d)=27$

$\Rightarrow 3a=27$

$\Rightarrow \boxed{a=9}$

$(a-d)(a+d)=77$

$\Rightarrow a^2-d^2=77$

$\Rightarrow 81-d^2=77$

$\Rightarrow d^2=4$

$\Rightarrow d=\pm 2$

Required numbers are

$9-2, \ 9, \ 9+2$

$7, 9, 11$

Ans: A

10. nth terms ratio $= \frac{2n+8}{5n-3}$ (5)

$$= \frac{10+(n-1)2}{2+(n-1)5}$$

Sum of n terms ratio $= \frac{\frac{n}{2}(2.10+(n-1)2)}{\frac{n}{2}(2.2+(n-1)5}$

$$= \frac{2n+18}{5n-1}$$

Ans: C

11. $(a-d)+a+(a+d) = -3$

$\Rightarrow 3a = -3$

$\Rightarrow \boxed{a=-1}$

$(a-d) \times a \times (a+d) = 8$

$\Rightarrow (a^2-d^2) \times a = 8$

$\Rightarrow (1-d^2)(-1) = 8$

$\Rightarrow 1-d^2 = -8$

$\Rightarrow d^2 = 9$

$\Rightarrow \boxed{d = \pm 3}$

The numbers are

$(-1-3)$, -1, $-1+3$

$\boxed{-4, -1, 2}$

Also

$-1+3$, -1, $-1-3$

$\boxed{2, -1, -4}$

Ans: B, C

12.

10. nth terms ratio = $\frac{2n+8}{5n-3}$ (57)

$$= \frac{10+(n-1)2}{2+(n-1)5}$$

Sum of n terms ratio = $\frac{\frac{n}{2}(2.10+(n-1)2)}{\frac{n}{2}(2.2+(n-1)5}$

$$= \frac{2n+18}{5n-1}$$

Ans: C

11. $(a-d)+a+(a+d) = -3$

$\Rightarrow 3a = -3$

$\Rightarrow \boxed{a=-1}$

$(a-d) \times a \times (a+d) = 8$

$\Rightarrow (a^2-d^2) \times a = 8$

$\Rightarrow (1-d^2)(-1) = 8$

$\Rightarrow 1-d^2 = -8$

$\Rightarrow d^2 = 9$

$\Rightarrow \boxed{d = \pm 3}$

The numbers are

$(-1-3), -1, -1+3$

$\boxed{-4, -1, 2}$

Also

$-1+3, -1, -1-3$

$\boxed{2, -1, -4}$

Ans: B, C

12. $2, 5, 8, \ldots$ AP also $57, 59, 61 \ldots$ AP

Given $S_{2n} = S_n$

$\Rightarrow \frac{2n}{2}\left[2 \times 2 + (2n-1)3\right] = \frac{n}{2}\left[2 \times 57 + (n-1) \times 2\right]$

$\Rightarrow n = 11$

Ans: C

13. Statement-I

Given $3 + 7 + 11 + \cdots$ AP

$1 + 6 + 11 + \cdots$ AP.

Common differences. $d_1 = 4,\ d_2 = 5$

$L.C.M = \{4, 5\} = 20$

1st common term = 11.

Now $t_{10} = \cancel{20 + (11-1)}x = (20)(10-1) + 11$

$= 191$. (True)

Statement-II Conceptual (True)

Ans: A

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14 Statement I: Total notes he counts in the first 10 minutes = $150 \times 10 = 1500$.

Given $\cancel{150}$, 148, 146, ... are in AP

$4500 = 1500 + \frac{n}{2}\left[2 \times 148 + (n-1)(-2)\right]$

$\Rightarrow n = 24$.

Total time = 10 min + 24 min = 34 min (True)

Statement II: Conceptual (True)

Ans: A

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15 $S_n = 2n^2 + 1$

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

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

$= (2n^2 + 1) - (2n^2 - 4n + 3)$

$= 1 + 4n - 3$

$= 4n - 2$

Ans: B

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

$\Rightarrow 2n-1 = n^2 - S_{n-1}$

$\Rightarrow S_{n-1} = n^2 - 2n + 1 = (n-1)^2$

Ans: C

17 $S_n = 2n^2 + 3n + 5$

first term $= a_1 = S_1 = 2(1)^2 + 3(1) + 5 = 8$

Ans: B

18 $S_n = n^2 - 2n + 1 = (n-1)^2$

$S_1 = a_1 = (1-1)^2 = 0$

$S_2 = a_1 + a_2 = (2-1)^2 = 1$

$\Rightarrow 0 + a_2 = 1 \quad \Rightarrow a_2 = 1$

Now $c.d = a_2 - a_1 = 1 - 0 = 1$

Ans: C

19. $1 + 4 + 7 + \cdots + x = 287$

$\Rightarrow 287 = \frac{n}{2}\left[2\times1 + (n-1)3\right]$

$\Rightarrow \boxed{n = 14}$

$\therefore x = a + 13d$

$= 1 + 13(3)$

$= 40.$

Ans: 40

20. Given $S_n = 3n^2 + n$

$a_1 = S_1 = 3(1)^2 + 1 = 4$

$\therefore$ first term $= 4$

Ans: 4

(8)

a) $1, 4, 7, \ldots$

$S_{20} = \frac{20}{2}\left[2(1) + (20-1)\cdot 3\right]$

$= 590$

b) $S_n = \sum a_n = \sum (2n+1)$

$= 2\sum n + \sum 1$

$= 2\left(\frac{n(n+1)}{2}\right) + n$

$= n\,[n+1+1] = n(n+2)$

c) $a + d = 2 \rightarrow (1)$

$a + 6d = 22 \rightarrow (2)$

solving (1) & (2) $\Rightarrow a = -2,\ d = 4$

Now, $S_{30} = \frac{30}{2}\left[2(-2) + (30-1)\times 4\right]$

$= 1680$

d) $a_3 = 7$,

$a + 2d = 7 \rightarrow (1)$

$a_7 = 3a_3 + 2$

$a + 6d = 3(a+2d) + 2$

$\Rightarrow a + \cancel{6d} = 3a + \cancel{6d} + 2$

$\Rightarrow 2a = -2$

$\Rightarrow \boxed{a = -1}$

$\therefore -1 + 2d = 7$

$\Rightarrow \boxed{d = 4}$

$S_{20} = \frac{20}{2}\left[2(-1) + (20-1)\times 4\right]$

$= 740$

Ans: s, p, t, q

22 a) $S_n = 5n^2 + 3n$ (9)

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

$= (5n^2+3n) - (5(n-1)^2 + 3(n-1))$

$= 10n - 2$

b) $a_{25} = S_{25} - S_{24}$

$= \left[\frac{3(25)^2}{2} + \frac{5(25)}{2}\right] - \left[\frac{3(24)^2}{2} + \frac{5(24)}{2}\right]$

$= 76$

c) common difference $= b - a$

$\boxed{l = a + (n-1)d}$

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

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

$n = \frac{b}{b-a}$

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

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

$= \frac{3ab}{2(b-a)}$

d) $\sqrt{2} + \sqrt{8} + \sqrt{18} + \cdots = \sqrt{2} + 2\sqrt{2} + 3\sqrt{2} + \cdots$

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

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

Ans: t, p, q, s

LEARNERS TASK

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

Ans: A

02. $S_m = n$ and $S_n = m \Rightarrow S_{m+n} = -(m+n)$

Ans: D

03. Conceptual.

$S_n = an^2 + bn + C$.

Ans: D

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

Ans: B

05 $(n-2)\times 180^\circ$

Ans: D

06 $\frac{n+1}{2}$

Ans: A

07. Let the number be xyz

$\therefore xyz = 100x + 10y + z$

Given $x + y + z = 15$

$$\begin{array}{ccc} x & y & z \\ \downarrow & \downarrow & \downarrow \\ a-d & a & a+d \end{array}$$

$a - d + a + a + d = 15$

$\boxed{a = 5}$

Now

$zyx = 100z + 10y + x$

$= 100(5+d) + 50 + (5-d)$

Given $zyx = xyz - 594$

$\Rightarrow 100(5+d) + 50 + (5-d) = (5-d)(100) + 50 + (5+d) - 594$

$\Rightarrow \boxed{d = -3}$

Original number $= 852$

Ans: D

08 Given $(x+1)+(x+4)+(x+7)+\dots+(x+28)=155$

clearly $1, 4, 7, \dots 28$ are in A.P. (11)

with $a=1$, $d=4-1$, $l=28$

$$=3$$

$\therefore l=28$

$\Rightarrow a+(n-1)d=28$

$\Rightarrow 1+(n-1).3=28$

$\Rightarrow n=10$; terms

$\therefore 10x+\frac{10}{2}[1+28]=155$

$\Rightarrow x=1$

Ans: B

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09 $S_2-S_1=\frac{2n}{2}[2a+(2n-1)d]-\frac{n}{2}[2a+(n-1)d]$

$=n[2a+2nd-d]-\frac{n}{2}(2a+nd-d]$

$=2an+2nd^2-nd-na-\frac{n^2}{2}d+\frac{nd}{2}$

$=an+\frac{3n^2d}{2}-\frac{nd}{2}$

$\therefore 3(S_2-S_1)=3an+\frac{9n^2d}{2}-\frac{3nd}{2}$

$=\frac{3n}{2}[2a+(3n-1)d]=S_3$

Ans: C

~~10.~~ ~~17, 21, 25, … 417~~

~~16, 21, 26, … 466.~~

10. ~~17, 21, 25, ..., 417~~ | ~~16, 21, 26, ...~~

~~$a_n = 417 = 17 + (n-1)\cdot 4$~~

~~$a_n = n \Rightarrow$~~

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10. $17, 21, 25, \ldots 417$ | $16, 21, 26, \ldots 466$ (12)

$417 = 17 + (n_1 - 1) \times 4$ | $466 = 16 + (n_2 - 1)5$

$\Rightarrow n_1 = 101$ | $\Rightarrow n_2 = 91$

$a_n = 17 + (n_1 - 1) \times 4$ | $a_n = 16 + (n_2 - 1)5$

Now $17 + (n_1 - 1)4 = 16 + (n_2 - 1)5$

$\Rightarrow n_2 = \dfrac{4n_1 + 2}{5}$, n_2 should be integer

$\therefore n_1 \in \{2, 7, \ldots\ldots 97\} \rightarrow$ A.P.

$\Rightarrow 97 = 2 + (n-1)5$

$\Rightarrow n = 20$

Ans: D

JEE MAINS LEVEL

~~Q1. let the four number be~~

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01. option verification method

option A: $2, 4, 6, 8$

$Sum = 2 + 4 + 6 + 8 = 20$

Also $2^2 + 4^2 + 6^2 + 8^2 = 120$

Ans: A

02 $S_{n_1} : S_{n_2} = (2n+3):(3n-1)$ (13)

$$\frac{\frac{n}{2}(2a+(n-1)d)}{\frac{n}{2}(2A+(n-1)D)} = \frac{2n+3}{3n-1}$$

$$\Rightarrow \frac{a+(\frac{n-1}{2})d}{A+(\frac{n-1}{2})D} = \frac{2n+3}{3n-1}$$

Now, 5^{th} term ratio.

$\therefore \frac{n-1}{2} = 4 \Rightarrow n = 9$.

$\therefore$ Required ratio $\Rightarrow \frac{2(9)+3}{3(9)-1} = \frac{21}{26}$

Ans: C

03 Interior angles $120°, 125°, 130°, \ldots$ n terms

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

$$= \frac{n}{2}(2(120°)+(n-1)5°)$$

$$= \frac{n}{2}(5n+235°)$$

We know, sum of interior angles $= (n-2)180°$

$$\therefore (n-2)180° = \frac{n}{2}(5n+235)$$

$$\Rightarrow n = 16 \text{ or } 9$$

Ans: B

~~04~~ Given $7+10+13+\cdots$, $4+11+18+\cdots$

Now ~~7, 10, 13, 16, 19, 22,~~ 25, ~~28, 33~~, 36, 39, 41, 44, 47, 50, 53, ..

4, 11, ~~18~~, 25, 32, 39, 46, 53

~~25, 39, 53 . .~~

$25 + 11 \times 14$

12^{th} Common term $= a + 11d = 25 + 11 \times 14 =$

04. $7, 10, 13, \dots 25, \dots 46, \dots$ 14

$4, 11, 18, \dots 25, \dots 46, \dots$

$\therefore 25, 46, \dots$ AP

$\therefore t_{12} = a + 11d$

$= 25 + 11(21)$

$= 256.$

Ans: A

05 $17, 21, 25, \dots 417$

$417 = 17 + (n-1)4$

$\Rightarrow n = 101$

$a_n = 17 + (n_1 - 1) \times 4$

$16, 21, 26, \dots 466$

$466 = 16 + (n-1)$

$a_n = 16 + (n_2 - 1)5$

$\therefore 17 + (n_1 - 1) \times 4 = 16 + (n_2 - 1) \times 5$

$\Rightarrow n_2 = \dfrac{4n_1 + 2}{5}$, n_2 should be integer

$\therefore n_1 \in \{2, 7, \dots 97\} \rightarrow$ A.P

$\therefore 97 = 2 + (n-1) \times 5$

$\Rightarrow n = 20$

Ans: A

06 $200 + 200 + 200 + 240 + 280 + 320 + \dots = 11040$

$\Rightarrow 240 + 280 + 320 + \dots = 11040 - 600$

$= 10440$

$\therefore \frac{n}{2}\left[2 \times 240 + (n-1) \times 40\right) = 10440$

$\Rightarrow n = 18$

$\therefore$ total months $= 18 + 3$

$= 21.$

Ans: A

15

07. $S_n = 3n^2+5n$

$T_m = S_m - S_{m-1}$

$164 = (3m^2+5m) - (3(m-1)^2+5(m-1))$

$\Rightarrow \quad m = 27$

Ans: C

08 Interior angles $100°, 104°, 108°, \dots$

$(n-2)\times 180° = \frac{n}{2}(2\times 100+(n-1)\times 4)$

$\Rightarrow \quad n=5$

Ans: 5

09. $\dfrac{\frac{n}{2}(2a+(n-1)d)}{\frac{n}{2}(2a+(n-1)d}=\dfrac{3n+8}{7n+15}$

$\Rightarrow \dfrac{a+(\frac{n-1}{2})d}{a+(\frac{n-1}{2})d}=\dfrac{3n+8}{7n+15}$

$\Rightarrow \frac{n-1}{2} = 1\cancel{1}$

$n = 2\cancel{3}$

Required ratio $= \dfrac{3(2\cancel{3})+8}{7(2\cancel{3})+15} = \dfrac{77}{176} = \dfrac{7}{16}$

Ans: B

10 $a+(a+d)+(a+2d)+(a+3d)+(a+4d)+\dots (a+9d)$

$= 4((a+\cancel{9d})+(a+\cancel{2}d)+\dots +(a+4d)]$

$\Rightarrow 10a+45d = 4(5a+10d)$

$\Rightarrow \frac{a}{d}=\frac{1}{2} \Rightarrow a:d = 1:2$

Ans A

11. $S_{n+3} - 3S_{n+2} + 3 \cdot S_{n+1} - S_n$

$= \left[\frac{n+3}{2}\left(2a + (n+2)d\right)\right] - 3\left\{\frac{n+2}{2}\left[2a + (n+1)d\right)\right.$

$\left. + 3\left(\frac{n+1}{2}\left(2a + nd\right)\right)\right] - \frac{n}{2}\left(2a + (n-1)d\right]$

upon simplification we get. 0.

put $n=1$ we get Ans : 0

(16)

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11. $S_{n+3} - 3S_{n+2} + 3 \cdot S_{n+1} - S_n$

let $n = 1$

$S_4 - 3S_3 + 3 \cdot S_2 - S_1$

$= \frac{4}{2}\left[2a+3d\right] - 3\left[\frac{3}{2}\left(2a+2d\right)\right] + 3\left[\frac{2}{2}\left[2a+d\right)\right] - a = 0$

Ans A

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12. $a_1 + a_3 + a_5 + \dots + a_{99} = 2550$

$a + (a+2d) + (a+4d) + \dots + (a+98d) = 2550$ (These are 50 terms)

$\Rightarrow 50a + d(2+4+6 \dots + 98) = 2550$

$\Rightarrow$ ~~$50a + d$~~ $a + 49d = 51$

Now, $a_1, a_2, a_3 \dots a_{99}$

$: \frac{99}{2}\left(2a + 98d\right)$

$= 99(a + 49d)$

$= 99 \times 51 = 5049.$

Ans : D

13 <u>Statement I:</u> $a_1 = a$

$$a_2 = b$$

$$\therefore \; d = a_2 - a_1 = b - a$$

Last term $= c = a + (n-1)d$

$$c = a + (n-1)(b-a)$$

$$\Rightarrow n = \frac{b+c-2a}{b-a}$$

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

$$= \frac{b+c-2a}{2\cancel{ab}(b-a)}(a+c)$$

$$= \frac{(a+c)(b+c-2a)}{2(b-a)} \qquad \text{(False)}$$

<u>Statemen II:</u> $a-3d,\; a-d,\; a+d,\; a+3d$

Sum $\Rightarrow (a-3d) + (a+3d) = 8$

$$\Rightarrow a = 4$$

product $\Rightarrow (a-d)(a+d) = 15$

$$\Rightarrow a^2 - d^2 = 15$$

$$\Rightarrow 16 - d^2 = 15$$

$$\Rightarrow d = \pm 1.$$

Required terms $1, 3, 5, 7$ (or)

$7, 5, 3, 1.$

$\therefore$ least no $= 1$ (True)

<u>Ans D</u>

14. Statement I $\quad S_{101} = 1212$ (18)

$\frac{101}{2}(2a + 100d) = 1212$

$\Rightarrow 101(a + 50d) = 1212$

$\Rightarrow a + 50d = 12$

$\Rightarrow a_{51} = 12$, which is middle term (True)

Statement II: $\log 2, \log(2^x - 1), \log(2^x + 3) \rightarrow$ A.P.

$2 \cdot \log(2^x - 1) = \log 2 + \log(2^x + 3)$

$\Rightarrow \log(2^x - 1)^2 = \log(2(2^x + 3))$

$\Rightarrow (2^x - 1)^2 = 2(2^x + 3)$

$\Rightarrow 2^x = 5$

$\Rightarrow x = \log_2 5$ (True)

Ans: B

15 numbers which are multiples of 5 between 100 and 1000

$\therefore 105, 110, 115, \ldots 995.$

$995 = 105 + (n-1) \times 5$

$\Rightarrow n = 179$

$\therefore S_{179} = \frac{179}{2}(105 + 995)$

$= 98450$

Ans: D

(19)

16. $a-d,\ a,\ a+d$ be the nos.

$a-d+a+a+d=-3$

$\Rightarrow\ 3a=-3$

$\Rightarrow\ \boxed{a=-1}$

$(a-d)(a)(a+d)=8$

$(a^2-d^2)(a)=8$

$-(1-d^2)=8 \Rightarrow d=\pm 3$

Required no: $-1-3,\ -1,\ -1+3$

$=-4,-1,2$

Sum of the squares $=16+1+4=21.$ Ans: C

17 Sum $=(n-2)\times 180^\circ$

$=(5-2)\times 180^\circ$

$=540^\circ$ Ans: B

18 $(n-2)\times 180^\circ=1800$

$\Rightarrow\ n-2=10$

$\Rightarrow\ n=12$ Ans: D

19 paid $=1-\frac{1}{3}=\frac{2}{3}$ of the instalments.

$S_{40}=3600$

$S_{30}=\frac{2}{3}\times 3600=2400.$

$\therefore \frac{40}{2}(2a+39d)=3600$

$\Rightarrow\ 2a+39d=180 \rightarrow (1)$

$\frac{30}{2}(2a+29d)=2400$

$\Rightarrow\ 2a+29d=160 \rightarrow (2)$

Solving. $\boxed{d=2}$ $\boxed{a=51}$

$\therefore\ 51, 53, \ldots$

8^{th} instalment $=51+7\times 2=65$

Ans: 65

20. Required numbers 13, 17, ... 97

$97 = 13 + (n-1)\times 4$

$\Rightarrow n = 22$

$\therefore S_{22} = \frac{22}{2}(13+97)$

$= 1210$

Ans: 1210

21 a) $(a-d) + a + (a+d) = 24$

$\Rightarrow a = 8$

$(a-d)\times a \times (a+d) = 440$

$\Rightarrow d = \pm 3$

Numbers are 5, 8, 11   least No: 5

b) $x^3 - 12x^2 + 39x - 28 = 0$

$\alpha + \beta + \gamma = \frac{-b}{a}$

$\alpha\beta\gamma = -\frac{c}{a}$

$(a-d) + a + (a+d) = 12$

$\Rightarrow a = 4$

$(a-d)\times a \times (a+d) = 28$

$\Rightarrow (4-d)\times 4 \times (4+d) = 28$

$\Rightarrow d = \pm 3$

c) $S_n = 3n + 2n^2$

$a_1 = S_1 = 5$

$\frac{a_1 + a_2}{2} = \frac{S_2}{2} = 14$

$a_2 = 14 - 5 = 9$

$c.d = 9 - 5 = 4$

d) $116 = \frac{n}{2}(2\times 25 + (n-1).(-3))$

$n = 8$

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

$= 25 + 7\times(-3)$

$= 25 - 21$

$= 4$ Ans: s, p, q, q

22 a) $t_m = a + (m-1)d$ (21)

b) $S_p = \frac{p}{2}(2a + (p-1)d)$

c) $a_m = S_m - S_{m-1}$

d) $c \cdot d = t_n - t_{n-1}$ Ans: s, p, q, r

=) THE END