

(1)

PROGRESSIONS-II
Class: VIII, Mathematics

SOLUTIONS

TEACHING TASK

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

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

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

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

$$\Rightarrow n(4 + 3n - 3) = 120200$$

$$\Rightarrow n = 200 \text{ . satisfies the above equation Ans: D}$$

02

$$S_1 = T_1 + T_2 + \dots + T_n$$

$$S_1 = \frac{n}{2} [T_1 + T_n] \rightarrow \textcircled{1}$$

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

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

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

Now

$$\frac{S_1}{S_2} = \frac{\frac{n}{2} (T_1 + T_n)}{\left(\frac{n-1}{4}\right) (T_2 + T_{n-1})}$$

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

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

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

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

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

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

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

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

$$\text{Now } a_1 + a_2 + a_3 + \dots + a_{99}$$

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

$$= 99 [a_1 + 49d]$$

$$= 99 \times 51$$

$$= 5049$$

Ans: B

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

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

$$1 + \dots + x^{1+6+11+\dots+101}$$

$$\text{Now Degree} = 1 + 6 + 11 + \dots + 101$$

$$\text{here } 101 = 1 + (n-1)5$$

$$\Rightarrow n = 21$$

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

Ans: A

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

They are 105, 112, 119 - - - 994

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

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

$$= 70,336$$

Ans: C

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

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

$$\Rightarrow 6a + 69d = 225$$

$$\Rightarrow 2a + 23d = 75$$

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

$$= 12 \times 75$$

$$= 900$$

Ans: C

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

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

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

Now

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

$$\therefore 168 : 103$$

Ans: B

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

Now $a+6d=13$

$\Rightarrow 2+6d=13$

$\Rightarrow d=$

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

(4)

Now $a+6d=13$

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

$\Rightarrow a=1$

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

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

$\Rightarrow n^2=49$

$\Rightarrow n=7$

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. n^{th} terms ratio = $\frac{2n+8}{5n-3}$

(5)

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

$$\text{Sum of } n \text{ terms ratio} = \frac{\frac{n}{2} (2 \cdot 10 + (n-1)2)}{\frac{n}{2} (2 \cdot 2 + (n-1)5)}$$

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

Ans: C

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

$$\Rightarrow 3a = -3$$

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

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

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

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

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

$$\Rightarrow d^2 = 9$$

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

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. n^{th} terms ratio = $\frac{2n+8}{5n-3}$

(5)

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

$$\text{Sum of } n \text{ terms ratio} = \frac{\frac{n}{2} (2 \cdot 10 + (n-1)2)}{\frac{n}{2} (2 \cdot 2 + (n-1)5)}$$

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

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

Given $S_{2n} = S_n$

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

$$\Rightarrow n = 11$$

Ans: C



(6)

13. Statement-II
 Given $3 + 7 + \textcircled{11} + \dots$ AP

$$1 + 6 + \textcircled{11} + \dots$$

Common difference. $d_1 = 4, d_2 = 5$

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

1st common term = 11.

$$\text{Now } t_{10} = \cancel{20} + (\cancel{11} - 1) \times 4 = (20)(10 - 1) + 11 = 191 \text{ (True)}$$

Statement-II Conceptual (True)

Ans: A

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

Given ~~148~~, 148, 146, $\dots$ one in AP

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

$$\Rightarrow n = 24.$$

$$\text{Total time} = 10 \text{ min} + 24 \text{ min} = 34 \text{ min (True)}$$

Statement II: Conceptual (True)

Ans: A

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

(7)

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

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

$$\text{first term} = a_1 = S_1 = 2(1)^2 + 3(1) + 5 = 8$$

Ans: B

18

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

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

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

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

$$\text{Now c.d} = a_2 - a_1 = 1 - 0 = 1$$

Ans: C

19.

$$1 + 4 + 7 + \dots + n = 287$$

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

$$\Rightarrow \boxed{n=14}$$

$$\begin{aligned} \therefore n &= a + 13d \\ &= 1 + 13(3) \\ &= 40. \end{aligned}$$

Ans: 40

20.

$$\text{Given } S_n = 3n^2 + n$$

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

$$\therefore \text{first term} = 4$$

Ans: 4

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

(8)

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

$$= 590$$

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

$$= 2 \sum n + \sum 1$$

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

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

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

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

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

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

$$= 1680$$

d) $a_3 = 7,$

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

$$\therefore -1 + 2d = 7$$

$$\Rightarrow \boxed{d = 4}$$

$$a_7 = 3a_3 + 2$$

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

$$\Rightarrow a + 6d = 3a + 6d + 2$$

$$\Rightarrow 2a = -2$$

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

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

$$= 740$$

Ans: S, P, T, Q



22

(9)

$$a) S_n = 5n^2 + 3n$$

$$\begin{aligned} \therefore a_n &= S_n - S_{n-1} \\ &= (5n^2 + 3n) - (5(n-1)^2 + 3(n-1)) \\ &= 10n - 2 \end{aligned}$$

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

$$\begin{aligned} &= \left[\frac{3(25)^2}{2} + \frac{5(25)}{2} \right] - \left[\frac{3(24)^2}{2} + \frac{5(24)}{2} \right] \\ &= 76 \end{aligned}$$

$$c) \text{ common difference} = b - a$$

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

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

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

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

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

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

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

$$d) \sqrt{2} + \sqrt{8} + \sqrt{18} + \dots$$

$$= \sqrt{2} + 2\sqrt{2} + 3\sqrt{2} + \dots$$

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

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

Ans: 1, 19, 5

LEARNERS TASK

(10)

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

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 $x + y + z = 15$

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

x	y	z
$\downarrow$	$\downarrow$	$\downarrow$
$a-d$	a	$a+d$
$a-d + a + a+d = 15$		

$$\boxed{a = 5}$$

Ans: D

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

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

With $a=1$, $d=4-1$, $l=28$
 $= 3$

$\therefore l = 28$

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

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

$\Rightarrow n = 10$; terms

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

$\Rightarrow x = 1$

Ans: B

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.~~

$$10. \quad 17, 21, 25, \dots, 417 \quad \left| \quad 16, 21, 26, \dots\right.$$

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

$$a_n \neq n \Rightarrow$$

$10 \quad 17, 21, 25, \dots, 417$ $417 = 17 + (n_1 - 1) \times 4$ $\Rightarrow n_1 = 101$ $a_n = 17 + (n_1 - 1) \times 4$	$16, 21, 26, \dots, 466$ $466 = 16 + (n_2 - 1) \times 5 \quad (12)$ $\Rightarrow n_2 = 91$ $a_n = 16 + (n_2 - 1) \times 5$
--	---

$$\text{Now } 17 + (n_1 - 1) \times 4 = 16 + (n_2 - 1) \times 5$$

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

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

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

$$\Rightarrow n = 20$$

Ans: D

JEE MAINS LEVEL

~~Q1. let the four numbers be~~

Q1. option verification method

option A: 2, 4, 6, 8

$$\text{Sum} = 2 + 4 + 6 + 8 = 20$$

$$\text{Also } 2^2 + 4^2 + 6^2 + 8^2 = 120$$

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, 5th term ratio.

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

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

Ans: C

03

Interior angles $120^\circ, 125^\circ, 130^\circ, \dots$ n terms

$$\begin{aligned} \therefore S_n &= \frac{n}{2}(2a + (n-1)d) \\ &= \frac{n}{2}(2(120^\circ) + (n-1)5^\circ) \\ &= \frac{n}{2}(5n + 235^\circ) \end{aligned}$$

We know, Sum of interior angles = $(n-2)180^\circ$

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

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

Ans: B

Given $7 + 10 + 13 + \dots$, $4 + 11 + 18 + \dots$

Now ~~$7 + 10 + 13, 16, 19, 22, 25, 28, 31, 34, 37$~~

~~$4, 11, 18, 25, 32, 39, 46, 50, 53$~~

~~$25, 39, 53$~~

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



04. $7, 10, 13, \dots (25), \dots (46), \dots (14)$
 $4, 11, 18, \dots (25), \dots (46), \dots$

$\therefore 25, 46, \dots$ AP.

$$\begin{aligned} \therefore t_{12} &= a + 11d \\ &= 25 + 11(21) \\ &= 256. \end{aligned}$$

Ans: A

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

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

$$\Rightarrow n = 101$$

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

$16, 21, 26, \dots, 466$

$$466 = 16 + (n-1)5$$

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

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

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

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

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

$$\Rightarrow n = 20$$

Ans: A

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

$$\Rightarrow 240 + 280 + 320 + \dots = 11040 - 600 = 10440$$

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

$$\Rightarrow n = 18$$

$$\therefore \text{total months} = 18 + 3 = 21.$$

Ans: A



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

(15)

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

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

$$\Rightarrow m = 27$$

Ans: C

08 Interior angles $100^\circ, 104^\circ, 108^\circ, \dots$

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

$$\Rightarrow n = 5$$

Ans: 5

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

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

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

$$\Rightarrow n = 23$$

$$\text{Required ratio} = \frac{3(23)+8}{7(23)+15} = \frac{77}{176} = \frac{7}{16}$$

Ans: B

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

$$= 4((a+d) + (a+2d) + \dots + (a+4d))$$

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

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

Ans: A



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

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

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

Upon simplification we get 0.

Put $n=1$ we get Ans: 0

(16)

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

Let $n=1$

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

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

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

$$a + (a+2d) + (a+4d) + \dots + (a+98d) = 2550 \quad (\text{There are 50 terms})$$

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

$$\Rightarrow \cancel{50a + d} \quad a + 49d = 51$$

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

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

$$= 99(a + 49d)$$

$$= 99 \times 51 = 5049.$$

Ans: D

13 Statement I: $a_1 = a$

$$a_2 = b$$

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

$$\text{Last term} = c = a + (n-1)d$$

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

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

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

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

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

Statement II: $a-3d, a-d, a+d, a+3d$

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

$$\Rightarrow a = 4$$

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

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

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

$$\Rightarrow d = \pm 1$$

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

$7, 5, 3, 1$.

$\therefore$ least no = 1 (True)

Ans D

4. Statement I: $\sum_{101} = 1212$

(18)

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

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

$$\Rightarrow a + 50d = 12$$

$$\Rightarrow \sum_{51} a = 12, \text{ which is odd term (True)}$$

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

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

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

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

$$\Rightarrow \cancel{2^x} 2^x = 5$$

$$\Rightarrow x = \log_2 5 \text{ (True)}$$

Ans: B

15 numbers which are multiples of 5 between 100 and 1000

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

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

$$\Rightarrow n = 179$$

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

$$= 98450$$

Ans: D



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

(19)

$$\begin{aligned} a-d+a+a+d &= -3 & (a-d)(a)(a+d) &= 8 \\ \Rightarrow 3a &= -3 & (a^2-d^2)(a) &= 8 \\ \Rightarrow \boxed{a=-1} & & -(1-d^2) &= 8 \Rightarrow d = \pm 3 \end{aligned}$$

Required no: $-1+3, -1, -1+3$
 $= -4, -1, 2$

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

Ans: C

17 $\text{Sum} = (n-2) \times 180^\circ$
 $= (5-2) \times 180^\circ$
 $= 540^\circ$

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 instalment.

$$S_{40} = 3600 \quad \left| \quad S_{30} = \frac{2}{3} \times 3600 = 2400 \right.$$

$$\begin{aligned} \therefore \frac{40}{2} (2a + 39d) &= 3600 & \frac{30}{2} (2a + 29d) &= 2400 \\ \Rightarrow 2a + 39d &= 180 \rightarrow (1) & \Rightarrow 2a + 29d &= 160 \rightarrow (2) \end{aligned}$$

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

$\therefore 51, 53, \dots$

8th 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) $x^3 - 12x^2 + 39x - 28 = 0$

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

$$\Rightarrow a = 4$$

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

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

$$\Rightarrow d = \pm 3$$

c) $S_n = 3n + 2n^2$ $\left| \begin{array}{l} a_1 + a_2 = S_2 = 14 \\ a_2 = 14 - 5 = 9 \end{array} \right.$

$$a_1 = S_1 = 5$$

$$c.d = 9 - 5 = 4$$

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

$$n = 8$$

$$l = a + (n-1)d \\ = 25 + 7 \times (-3) \\ = 25 - 21 \\ = 4$$

Ans: 5, 8, 11, 14

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

(21)

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

$$c) \quad a_m = s_m - s_{m-1}$$

$$d) \quad c.d = t_n - t_{n-1}$$

Ans: s, p, q, r

$\Rightarrow$ THE END $\in$