

Unit-5 ⇒ ARITHMETIC PROGRESSION

Sequence ⇒ A sequence is a set of number identify with 1st term, 2nd term, 3rd term and show on

Series ⇒ Let $a_1, a_2, a_3, a_4, \dots$ be the term of sequence.

then expression $a_1 + a_2 + a_3 + \dots + a_n$ is called series.

Progression : A series which follow a specific pattern is called progression.

eg ⇒ $9 + 6 + 8 + 10 + 12 + \dots$ to $9 + 6 + 9$

Arithmetic progression: A progression in which difference b/w two consecutive terms is constant is called Arithmetic progression.

Common difference ⇒ Difference b/w two consecutive terms of an AP is called common difference

Unit-5 ⇒ ARITHMETIC PROGRESSION

* $T_1 = a$
 $T_2 = a + d$
 $T_3 = a + 2d$
 $T_n = a + (n-1)d$
 where, $d \geq T_n - T_{n-1}$
 $T_n = n^{\text{th}}$ term
 $a = \text{first term}$
 $d = \text{common difference}$

* If l be the last term of an AP.

⇒ $l = a + (n-1)d$
 ⇒ n^{th} term from end = $l - (n-1)d$

⇒ n^{th} term from starting + n^{th} term from end = constant = $a + l$.

* Properties of A.P. -

If a constant added or subtracted to each term of an A.P. then the resulting sequence is also in AP with same common difference. eg.

⇒ $5, 10, 15, 20, 25, \dots$ $d = 5$
 $+ 2$
 $7, 12, 17, 22, 27, \dots$ $d = 5$

If a constant multiplied or divided to each term of an A.P. then the resulting sequence is also in A.P. with different common difference

e.g. $\Rightarrow 9, 8, 12, 16, \dots$ $d=9$
 $\times 3$
 $12, 24, 36, 48, \dots$ $d=12$

$\Rightarrow$ Sum of n terms of an A.P.

Let a, d, n, l, S_n be the first term, common difference, no. of terms, last term and sum of n terms respectively

$$\begin{aligned} \text{i) } S_n &= \frac{n}{2}(2a + (n-1)d) \\ \text{ii) } S_n &= \frac{n}{2}(a + l) \\ \text{iii) } l_n &= S_n - S_{n-1} \end{aligned}$$

Ex: 1) For a sequence to be A.P. the difference of consecutive terms should remain constant and this is called the common difference of the A.P.

1) Fare for 1st km = ₹15
 Fare for 2nd km = fare of 1st km + additional fare for 1st km

$$\Rightarrow ₹15 + 8$$

$$\Rightarrow ₹23$$

Fare for 3rd km = fare of 2nd km + fare of additional 3rd km

$$\Rightarrow ₹23 + 8$$

$$\Rightarrow ₹31$$

$\Rightarrow$ fare for n km = $15 + 8 \times (n-1)$

In this, each subsequent term is obtained by adding a fixed no. 8 to the previous term.

$\Rightarrow$ Hence it is A.P.

ii) Let us take initial quantity of oil = 1

$\therefore$ quantity of oil removed in first step = $\frac{1}{3}$
 remaining quantity after 1st step = $1 - \frac{1}{3} = \frac{2}{3}$
 quantity removed after 2nd step = quantity removed in first step $\times$ initial quantity

Ex: 2) $\frac{1}{3}$

(Ans)

=) amount of 1st year = 10,800

=) 800

=) 10000 x 8%

=) Interest at the end of 1st year = 8%

=) Amount in the beginning = ₹ 10,000

=) Hence, it is an A.P.

=) each subsequent term is obtained by adding a fixed no. (50) to the previous term.

=) 250

=) 200 + 50

of 2nd meter.

1st + cost of second meter + cost

Cost of digging of 3rd meter = cost of

=) 150 + 50 = 200

of 1st meter + cost of additional meter

Cost of digging of 2nd meter = cost

Cost of digging of 1st meter = ₹ 150

∴ It is not an A.P.

no. is not added to each subsequent term

=) difference is not equal. and a fixed

$\frac{4}{3} - \frac{16}{9} = \frac{16}{9} - \frac{16}{9}$

remaining quantity after 2nd step =

$= \frac{4}{3} \times \frac{4}{3} = \frac{16}{9}$

(Ans)

9th term = $a + (9-1)d$

=) -2

$4 + 2 \times -3$

third term = $a + (3-1)d$

=) $4 - 3 = 1$

=) $4 + (-1) \times 3$

second term = $a_2 = a + (2-1)d$ ($a_n = a + (n-1)d$)

=) $a = 4, d = -3$

$a_1 = -2, a_2 = -2, a_3 = -2, a_4 = -2$

∴ first four terms =

i) $a = -2, d = 0$

=) 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, ...

=) 20

=) 30

=) 40

$10 + 10$

$10 + 2 \times 10$

$10 + 30$

$a_2 = a + d$

$a_3 = a + 2d$

$a_4 = a + 3d$

9th term

2. i) $a = 10, d = 10$

=) each subsequent term is not obtained by adding a unique no. to the previous term, hence, it is not an A.P.

amount after 2nd year = $10800 + 864$

=) 864

=) $10800 \times 8\%$

→ Interest at the end of 2nd year =

Ques

i) $a = 0.6$
 $d = 1.2 - 0.6$
 $d = 0.6$
ii) $a = \frac{1}{4}$
 $d = \frac{5}{4} - \frac{1}{4}$
 $d = 1$

i) $a = -5$
 $d = -1 - (-5) = 4$
3. i) $a = 3$
 $d = 8 - 3 = 5$

$\Rightarrow -1.25, -1.5, -1.75, -2$
 $\Rightarrow -1.5$
 $\Rightarrow -1.25 + 2 \times 0.25$
 $\Rightarrow -1.25 + 0.5 = -0.75$
 $\Rightarrow a + d$
 $\Rightarrow a + 2d$
 $\Rightarrow a + 3d$
ii) $a = -1.25, d = -0.25$
 $\Rightarrow -1, -1.25, -1.5, -1.75, -2$
 $\Rightarrow -1.25$
 $\Rightarrow -1 + 2 \times 0.25$
 $\Rightarrow -1 + 0.5 = -0.5$
 $\Rightarrow a + d$
 $\Rightarrow a + 2d$
 $\Rightarrow a + 3d$
iii) $a = -1, d = \frac{1}{2}$
 $\Rightarrow -1, -0.5, 0, 0.5, 1$
 $\Rightarrow 0$
 $\Rightarrow -1 + 2 \times \frac{1}{2}$
 $\Rightarrow -1 + 1 = 0$
 $\Rightarrow a + d$
 $\Rightarrow a + 2d$
 $\Rightarrow a + 3d$
iv) $a = -1, d = \frac{1}{2}$
 $\Rightarrow -1, -0.5, 0, 0.5, 1$
 $\Rightarrow 0$
 $\Rightarrow -1 + 2 \times \frac{1}{2}$
 $\Rightarrow -1 + 1 = 0$
 $\Rightarrow a + d$
 $\Rightarrow a + 2d$
 $\Rightarrow a + 3d$

Date

Ques

i) $a = 10, -6, -2, 2, \dots$
 $\Rightarrow -10, -6, -2, 2, \dots$
 $\Rightarrow -10 + 4 \times 4$
 $\Rightarrow -10 + 16 = 6$
ii) $a = 1.2, -3.2, -5.2, -7.2$
 $\Rightarrow -1.2, -3.2, -5.2, -7.2$
 $\Rightarrow -1.2 + 2 \times 2$
 $\Rightarrow -1.2 + 4 = 2.8$
iii) $a = 1.2, -3.2, -5.2, -7.2$
 $\Rightarrow -1.2, -3.2, -5.2, -7.2$
 $\Rightarrow -1.2 + 2 \times 2$
 $\Rightarrow -1.2 + 4 = 2.8$
iv) $a = 1.2, -3.2, -5.2, -7.2$
 $\Rightarrow -1.2, -3.2, -5.2, -7.2$
 $\Rightarrow -1.2 + 2 \times 2$
 $\Rightarrow -1.2 + 4 = 2.8$

Date

Ques

 $\Rightarrow$ common diff. $= 29$
 $1, 25, 49, 73, 97, 121, 145, 169, 193, 217, 241, 265, 289, 313, 337, 361, 385, 409, 433, 457, 481, 505, 529, 553, 577, 601, 625, 649, 673, 697, 721, 745, 769, 793, 817, 841, 865, 889, 913, 937, 961, 985, 1009, 1033, 1057, 1081, 1105, 1129, 1153, 1177, 1201, 1225, 1249, 1273, 1297, 1321, 1345, 1369, 1393, 1417, 1441, 1465, 1489, 1513, 1537, 1561, 1585, 1609, 1633, 1657, 1681, 1705, 1729, 1753, 1777, 1801, 1825, 1849, 1873, 1897, 1921, 1945, 1969, 1993, 2017, 2041, 2065, 2089, 2113, 2137, 2161, 2185, 2209, 2233, 2257, 2281, 2305, 2329, 2353, 2377, 2401, 2425, 2449, 2473, 2497, 2521, 2545, 2569, 2593, 2617, 2641, 2665, 2689, 2713, 2737, 2761, 2785, 2809, 2833, 2857, 2881, 2905, 2929, 2953, 2977, 3001, 3025, 3049, 3073, 3097, 3121, 3145, 3169, 3193, 3217, 3241, 3265, 3289, 3313, 3337, 3361, 3385, 3409, 3433, 3457, 3481, 3505, 3529, 3553, 3577, 3601, 3625, 3649, 3673, 3697, 3721, 3745, 3769, 3793, 3817, 3841, 3865, 3889, 3913, 3937, 3961, 3985, 4009, 4033, 4057, 4081, 4105, 4129, 4153, 4177, 4201, 4225, 4249, 4273, 4297, 4321, 4345, 4369, 4393, 4417, 4441, 4465, 4489, 4513, 4537, 4561, 4585, 4609, 4633, 4657, 4681, 4705, 4729, 4753, 4777, 4801, 4825, 4849, 4873, 4897, 4921, 4945, 4969, 4993, 5017, 5041, 5065, 5089, 5113, 5137, 5161, 5185, 5209, 5233, 5257, 5281, 5305, 5329, 5353, 5377, 5401, 5425, 5449, 5473, 5497, 5521, 5545, 5569, 5593, 5617, 5641, 5665, 5689, 5713, 5737, 5761, 5785, 5809, 5833, 5857, 5881, 5905, 5929, 5953, 5977, 6001, 6025, 6049, 6073, 6097, 6121, 6145, 6169, 6193, 6217, 6241, 6265, 6289, 6313, 6337, 6361, 6385, 6409, 6433, 6457, 6481, 6505, 6529, 6553, 6577, 6601, 6625, 6649, 6673, 6697, 6721, 6745, 6769, 6793, 6817, 6841, 6865, 6889, 6913, 6937, 6961, 6985, 7009, 7033, 7057, 7081, 7105, 7129, 7153, 7177, 7201, 7225, 7249, 7273, 7297, 7321, 7345, 7369, 7393, 7417, 7441, 7465, 7489, 7513, 7537, 7561, 7585, 7609, 7633, 7657, 7681, 7705, 7729, 7753, 7777, 7801, 7825, 7849, 7873, 7897, 7921, 7945, 7969, 7993, 8017, 8041, 8065, 8089, 8113, 8137, 8161, 8185, 8209, 8233, 8257, 8281, 8305, 8329, 8353, 8377, 8401, 8425, 8449, 8473, 8497, 8521, 8545, 8569, 8593, 8617, 8641, 8665, 8689, 8713, 8737, 8761, 8785, 8809, 8833, 8857, 8881, 8905, 8929, 8953, 8977, 9001, 9025, 9049, 9073, 9097, 9121, 9145, 9169, 9193, 9217, 9241, 9265, 9289, 9313, 9337, 9361, 9385, 9409, 9433, 9457, 9481, 9505, 9529, 9553, 9577, 9601, 9625, 9649, 9673, 9697, 9721, 9745, 9769, 9793, 9817, 9841, 9865, 9889, 9913, 9937, 9961, 9985, 10009, 10033, 10057, 10081, 10105, 10129, 10153, 10177, 10201, 10225, 10249, 10273, 10297, 10321, 10345, 10369, 10393, 10417, 10441, 10465, 10489, 10513, 10537, 10561, 10585, 10609, 10633, 10657, 10681, 10705, 10729, 10753, 10777, 10801, 10825, 10849, 10873, 10897, 10921, 10945, 10969, 10993, 11017, 11041, 11065, 11089, 11113, 11137, 11161, 11185, 11209, 11233, 11257, 11281, 11305, 11329, 11353, 11377, 11401, 11425, 11449, 11473, 11497, 11521, 11545, 11569, 11593, 11617, 11641, 11665, 11689, 11713, 11737, 11761, 11785, 11809, 11833, 11857, 11881, 11905, 11929, 11953, 11977, 12001, 12025, 12049, 12073, 12097, 12121, 12145, 12169, 12193, 12217, 12241, 12265, 12289, 12313, 12337, 12361, 12385, 12409, 12433, 12457, 12481, 12505, 12529, 12553, 12577, 12601, 12625, 12649, 12673, 12697, 12721, 12745, 12769, 12793, 12817, 12841, 12865, 12889, 12913, 12937, 12961, 12985, 13009, 13033, 13057, 13081, 13105, 13129, 13153, 13177, 13201, 13225, 13249, 13273, 13297, 13321, 13345, 13369, 13393, 13417, 13441, 13465, 13489, 13513, 13537, 13561, 13585, 13609, 13633, 13657, 13681, 13705, 13729, 13753, 13777, 13801, 13825, 13849, 13873, 13897, 13921, 13945, 13969, 13993, 14017, 14041, 14065, 14089, 14113, 14137, 14161, 14185, 14209, 14233, 14257, 14281, 14305, 14329, 14353, 14377, 14401, 14425, 14449, 14473, 14497, 14521, 14545, 14569, 14593, 14617, 14641, 14665, 14689, 14713, 14737, 14761, 14785, 14809, 14833, 14857, 14881, 14905, 14929, 14953, 14977, 15001, 15025, 15049, 15073, 15097, 15121, 15145, 15169, 15193, 15217, 15241, 15265, 15289, 15313, 15337, 15361, 15385, 15409, 15433, 15457, 15481, 15505, 15529, 15553, 15577, 15601, 15625, 15649, 15673, 15697, 15721, 15745, 15769, 15793, 15817, 15841, 15865, 15889, 15913, 15937, 15961, 15985, 16009, 16033, 16057, 16081, 16105, 16129, 16153, 16177, 16201, 16225, 16249, 16273, 16297, 16321, 16345, 16369, 16393, 16417, 16441, 16465, 16489, 16513, 16537, 16561, 16585, 16609, 16633, 16657, 16681, 16705, 16729, 16753, 16777, 16801, 16825, 16849, 16873, 16897, 16921, 16945, 16969, 16993, 17017, 17041, 17065, 17089, 17113, 17137, 17161, 17185, 17209, 17233, 17257, 17281, 17305, 17329, 17353, 17377, 17401, 17425, 17449, 17473, 17497, 17521, 17545, 17569, 17593, 17617, 17641, 17665, 17689, 17713, 17737, 17761, 17785, 17809, 17833, 17857, 17881, 17905, 17929, 17953, 17977, 18001, 18025, 18049, 18073, 18097, 18121, 18145, 18169, 18193, 18217, 18241, 18265, 18289, 18313, 18337, 18361, 18385, 18409, 18433, 18457, 18481, 18505, 18529, 18553, 18577, 18601, 18625, 18649, 18673, 18697, 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22153, 22177, 22201, 22225, 22249, 22273, 22297, 22321, 22345, 22369, 22393, 22417, 22441, 22465, 22489, 22513, 22537, 22561, 22585, 22609, 22633, 22657, 22681, 22705, 22729, 22753, 22777, 22801, 22825, 22849, 22873, 22897, 22921, 22945, 22969, 22993, 23017, 23041, 23065, 23089, 23113, 23137, 23161, 23185, 23209, 23233, 23257, 23281, 23305, 23329, 23353, 23377, 23401, 23425, 23449, 23473, 23497, 23521, 23545, 23569, 23593, 23617, 23641, 23665, 23689, 23713, 23737, 23761, 23785, 23809, 23833, 23857, 23881, 23905, 23929, 23953, 23977, 24001, 24025, 24049, 24073, 24097, 24121, 24145, 24169, 24193, 24217, 24241, 24265, 24289, 24313, 24337, 24361, 24385, 24409, 24433, 24457, 24481, 24505, 24529, 24553, 24577, 24601, 24625, 24649, 24673, 24697, 24721, 24745, 24769, 24793, 24817, 24841, 24865, 24889, 24913, 24937, 24961, 24985, 25009, 25033, 25057, 25081, 25105, 25129, 25153, 25177, 25201, 25225, 25249, 25273, 25297, 25321, 25345, 25369, 25393, 25417, 25441, 25465, 25489, 25513, 25537, 25561, 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32449, 32473, 32497, 32521, 32545, 32569, 32593, 32617, 32641, 32665, 32689, 32713, 32737, 32761, 32785, 32809, 32833, 32857, 32881, 32905, 32929, 32953, 32977, 33001, 33025, 33049, 33073, 33097, 33121, 33145, 33169, 33193, 33217, 33241, 33265, 33289, 33313, 33337, 33361, 33385, 33409, 33433, 33457, 33481, 33505, 33529, 33553, 33577, 33601, 33625, 33649, 33673, 33697, 33721, 33745, 33769, 33793, 33817, 33841, 33865, 33889, 33913, 33937, 33961, 33985, 34009, 34033, 34057, 34081, 34105, 34129, 34153, 34177, 34201, 34225, 34249, 34273, 34297, 34321, 34345, 34369, 34393, 34417, 34441, 34465, 34489, 34513, 34537, 34561, 34585, 34609, 34633, 34657, 34681, 34705, 34729, 34753, 34777, 34801, 34825, 34849, 34873, 34897, 34921, 34945, 34969, 34993, 35017, 35041, 35065, 35089, 35113, 35137, 35161, 35185, 35209, 35233, 35257, 35281, 35305, 35329, 35353, 35377, 35401, 35425, 35449, 35473, 35497, 35521, 35545, 35569, 35593, 35617, 35641, 35665, 35689, 35713, 35737, 35761, 35785, 35809, 35833, 35857, 35881, 35905, 35929, 35953, 35977, 36001, 36025, 36049, 36073, 36097, 36121, 36145, 36169, 36193, 36217, 36241, 36265, 36289, 36313, 36337, 36361, 36385, 36409, 36433, 36457, 36481, 36505, 36529, 36553, 36577, 36601, 36625, 36649, 36673, 36697, 36721, 36745, 36769, 36793, 36817, 36841, 36865, 36889, 36913, 36937, 36961, 36985, 37009, 37033, 37057, 37081, 37105, 37129, 37153, 37177, 37201, 37225, 37249, 37273, 37297, 37321, 37345, 37369, 37393, 37417, 37441, 37465, 37489, 37513, 37537, 37561, 37585, 37609, 37633, 37657, 37681, 37705, 37729, 37753, 37777, 37801, 37825, 37849, 37873, 37897, 37921, 37945, 37969, 37993, 38017, 38041, 38065, 38089, 38113, 38137, 38161, 38185, 38209, 38233, 38257, 38281, 38305, 38329, 38353, 38377, 38401, 38425, 38449, 38473, 38497, 38521, 38545, 38569, 38593, 38617, 38641, 38665, 38689, 38713, 38737, 38761, 38785, 38809, 38833, 38857, 38881, 38905, 38929, 38953, 38977, 39001, 39025, 39049, 39073, 39097, 39121, 39145, 39169, 39193, 39217, 39241, 39265, 39289, 39313, 39337, 39361, 39385, 39409, 39433, 39457, 39481, 39505, 39529, 39553, 39577, 39601, 39625, 39649, 39673, 39697, 39721, 39745, 39769, 39793, 39817, 39841, 39865, 39889, 39913, 39937, 39961, 39985, 40009, 40033, 40057, 40081, 40105, 40129, 40153, 40177, 40201, 40225, 40249, 40273, 40297, 40321, 40345, 40369, 40393, 40417, 40441, 40465, 40489, 40513, 40537, 40561, 40585, 40609, 40633, 40657, 40681, 40705, 40729, 40753, 40777, 40801, 40825, 40849, 40873, 40897, 40921, 40945, 40969, 40993, 41017, 41041, 41065, 41089, 41113, 41137, 41161, 41185, 41209, 41233, 41257, 41281, 41305, 41329, 41353, 41377, 41401, 41425, 41449, 41473, 41497, 41521, 41545, 41569, 41593, 41617, 41641, 41665, 41689, 41713, 41737, 41761, 41785, 41809, 41833, 41857, 41881, 41905, 41929, 41953, 41977, 42001, 42025, 42049, 42073, 42097, 42121, 42145, 42169, 42193, 42217, 42241, 42265, 42289, 42313, 42337, 42361, 42385, 42409, 42433, 42457, 42481, 42505, 42529, 42553, 42577, 42601, 42625, 42649, 42673, 42697, 42721, 42745, 42769, 42793, 42817, 42841, 42865, 42889, 42913, 42937, 42961, 42985, 43009, 43033, 43057, 43081, 43105, 43129, 43153, 43177, 43201, 43225, 43249, 43273, 43297, 43321, 43345, 43369, 43393, 43417, 43441, 43465, 43489, 43513, 43537, 43561, 43585, 43609, 43633, 436$

$$\begin{aligned} \text{ii) } a &= -3, n = 11, d = \frac{2}{5}, a_n = p \\ a_n &= a + (n-1)d \\ &= -3 + (11-1)\frac{2}{5} \\ &= -3 + 4 = 1 \end{aligned}$$

$$\begin{aligned} \text{2.1) } a &= 10, n = 30, d = -3, a_n = p \\ a_n &= a + (n-1)d \\ &= 10 + (30-1)(-3) \\ &= 10 - 29 \times 3 \\ &= 10 - 87 \\ &= -77 \end{aligned}$$

$$\begin{aligned} \text{f) } a &= 3.5, d = 0, n = 105, a_n = p \\ a_n &= a + (n-1)d \\ &= 3.5 + (105-1)0 \\ &= 3.5 + 104 \times 0 \\ &= 3.5 \end{aligned}$$

$$\begin{aligned} \text{N) } a &= -18.9, d = 2.5, n = p, a_n = 36 \\ a_n &= a + (n-1)d \\ 3.6 &= -18.9 + (n-1)2.5 \\ 3.6 &= -18.9 + 2.5n - 2.5 \\ 3.6 &= -21.4 + 2.5n \\ 2.5n &= 3.6 + 21.4 \\ 2.5n &= 25.0 \\ n &= 10 \end{aligned}$$

$$\begin{aligned} \text{8.1) } a &= 2, n = 26, n = 3 \\ a_n &= a + (n-1)d \\ 26 &= 2 + 2d \\ d &= 12 \end{aligned}$$

$$\begin{aligned} \text{iii) } a &= 5, a_n = 9\frac{1}{2}, d = p \\ a_n &= a + (n-1)d \\ 9\frac{1}{2} &= 5 + (n-1)p \\ 4\frac{1}{2} &= (n-1)p \end{aligned}$$

$$\begin{aligned} \text{from (i) } a &= 18 \\ a - 8 &= 13 \\ a - 2d &= 13 \\ 18 - 2d &= 13 \\ 2d &= 5 \\ d &= 2.5 \end{aligned}$$

$$\begin{aligned} \text{ii) } a &= p, d = p, T_2 = 13 \\ a + d &= 13 \text{ --- (i)} \\ T_2 &= 3 \\ a + 3d &= 3 \text{ --- (ii)} \\ \text{(i) - (ii)} & \\ 2d &= 10 \\ d &= 5 \end{aligned}$$

7. Let a and d be the first term and common diff. of an AP.
 $\Rightarrow$ Given that:
 $T_n = 38$
 $a + (n-1)d = 38 \quad \text{--- (i)}$
 and $T_6 = 73$
 $a + 5d = 73 \quad \text{--- (ii)}$
 (i) - (ii)
 $-4d = -35$
 $d = 7$
 from (i)
 $a + 7d = 38$
 $a + 7 \times 7 = 38$
 $a + 49d = 106 \quad \text{--- (1)}$

8. Let a and d be the first term and common diff. of an AP.
 Given: $n = 50$
 $T_3 = 12$
 $a + 2d = 12 \quad \text{--- (i)}$
 and
 $T_9 = 178$
 $a + 8d = 178$
 $-32 + 30 \times 7$
 $-32 + 210$
 $T_9 = 178$

9. Given:
 $a_3 = 4, a_9 = -8$
 $a_3 = a + 2d = 4$
 $a_9 = a + 8d = -8$
 Subtracting 3rd term from 9th term, we get:
 $a + 8d - a + 2d = -8 - 4 = -12$
 $6d = -12$
 $d = -2$
 Substituting the value of d in 3rd term, we get:
 $a + 2(-2) = 4$
 $a - 4 = 4$
 $a = 8$
 Now, $0 = a + (n-1)d$
 $0 = 8 + (n-1)(-2)$
 $(n-1)(-2) = -8$
 $n-1 = 4$
 $n = 5$

⇒ 5th term of AP = 0

10. To find: Common difference d .

n th term of an AP = $a_n = a + (n-1)d$

So,

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

$$a_{17} = a + 16d$$

⇒ 17th term is 7 more than the 10th term

Subtracting 10th term from 17th term

$$\Rightarrow a + 16d - a - 9d = 7$$

$$7d = 7$$

$$d = 1$$

⇒ So, common difference of the AP is 1.

11. To find: n such that $a_n = a_{50} + 132$

Given: $a = 3$, $d = 15 - 3 = 12$

→ n th term of an AP →

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

$$a_{50} = a + 49 \times 12$$

$$a + 636$$

$$\Rightarrow 3 + 636$$

$$\Rightarrow 639$$

⇒ find the term which is 132 more than 636 i.e. 771

$$a_n = 771, n = ?$$

$$\Rightarrow 771 = a + (n-1)d$$

$$771 = 3 + (n-1)12$$

$$(771-3)/12 = 771-3 = 768$$

$$n-1 = 768/12$$

$$n = 64+1$$

$$n = 65$$

⇒ The required term is 65th term.

12. Let the common difference of two APs be d , their first terms as a and a' , n th term will be written as,

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

$$a'_n = a' + (n-1)d$$

Now, 100th term of 1st AP;

$$a_{100} = a + (100-1)d \Rightarrow a + 99d$$

100th term of 2nd AP;

$$a'_{100} = a' + (100-1)d = a' + 99d$$

Given:-

$$a_{100} - a'_{100} = (a + 99d) - (a' + 99d)$$

$$a_{100} - a'_{100} = a - a'$$

So, difference does not depend on no. of terms.

$$\therefore a_{1000} - a'_{1000} = 100 = a_{100} - a'_{100}$$

⇒ So the difference b/w their 100th term is 100.

13. 100 is the smallest three digit no. and it gives a remainder of 2 when divided by 7, $\therefore$ 105 is the smallest 3 digit no. which is divisible by 7.



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∴ 999 is greatest 3 digit no. and it gives a remainder of 5, thus, $999 - 5 = 994$ will be the greatest 3 digit no. which is divisible by 7.

∴ we have,

$$a = 105$$

$$\text{The last term } (a_n) = 994$$

$$\text{Common difference } (d) = 7$$

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

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

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

$$n-1 = 127$$

$$n = 128$$

∴ there are 128 three digit no. which are divisible by 7

14. 12 is the first no. after 10 which is divisible by 7.

∴ 248 is the greatest no less than 250 which is divisible by 7.

$$\Rightarrow a = 12$$

$$a_n = 248$$

$$d = 7$$

$$n = ?$$

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

$$248 = 12 + (n-1)7$$

$$(n-1)7 = 248 - 12$$

$$n-1 = 34$$

$$n = 35$$

⇒ There are 60 no. b/w 10 & 250 that are divisible by 7.

15. In first AP: $a = 63, d = 2$

In second AP: $a = 3, d = 7$

ACQ,

n^{th} term of 1st AP = n^{th} term of 2nd AP.

$$63 + (n-1)2 = 3 + (n-1)7$$

$$63 - 3 + (n-1)2 = (n-1)7$$

$$60 + 2n - 2 = 7n - 7$$

$$2n + 58 = 7n - 7$$

$$2n + 58 + 7 = 7n$$

$$2n + 65 = 7n$$

$$7n - 2n = 65$$

$$5n = 65$$

$$n = 13$$

16. To find: AP.

$$\text{Given: } a_3 = 16, a_7 - a_5 = 12$$

We need to find 3rd, 5th & 7th term of an AP by formula of n^{th} term.

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

$a_3 =$ third term of the AP,

$$a_3 = a + 2d = 16 \quad \text{--- (i)}$$

$$a_5 = a + 4d$$

$$a_7 = a + 6d$$

∴ 7th term exceeds the 5th term by 12, so the difference of seventh & 5th term will be 12.



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$$a+6d - a - 4d = 12$$

$$2d = 12$$

$$d = 6$$

substituting the value of d in eq (i),

$$a + 2 \times 6 = 16$$

$$a + 12 = 16$$

$$a = 4$$

$\therefore$ The AP can be given as follows;
 $a, a+d, a+2d, a+3d, a+4d, \dots$ and
 thus, 4, 10, 16, 22, 28.

$$17. a = 3$$

$$d = 5$$

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

$$253 = a + (n-1)d$$

$$253 = 3 + (n-1) \times 5$$

$$253 = 3 + 5n - 5 = -2$$

$$5n = 253 + 2 = 255$$

$$n = 51$$

$\Rightarrow$ Total no. of terms in AP is 51.

$\Rightarrow$ If there are n terms in an AP then
 some m th term from end will be equal
 to $n-m+1$ term from beginning.

$\therefore$ 20th term from last term will be 32nd
 term from starting (as $51 - 20 + 1 = 32$)

$$\Rightarrow a_{32} = a + 31d$$

$$3 + 31 \times 5$$

Required term = 158

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$$18. \text{ Given: } a_8 + a_9 = 29 \text{ \& } a_{10} + a_6 = 79$$

we know,

$$n\text{th term of an AP} = a + (n-1)d$$

$$\Rightarrow a_8 = a + 7d$$

$$a_9 = a + 8d$$

as per question;

$$a + 7d + a + 8d = 29$$

$$2a + 15d = 29$$

$$a + 5d = 12 \quad \text{--- (i)}$$

also,

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

$$a_6 = a + 5d$$

ACQ,

$$a + 9d + a + 5d = 79$$

$$2a + 14d = 79$$

$$a + 7d = 22 \quad \text{--- (ii)}$$

subtracting eq. (i) from (ii)

$$a + 7d - a - 5d = 22 - 12$$

$$2d = 10$$

$$d = 5$$

Putting the value of d in eq. (i), we get,

$$a + 5(5) = 12$$

$$a + 25 = 12$$

$$a = -13$$

$\Rightarrow$ first three terms of AP $\Rightarrow a, a+d, a+2d$,
 $-13, -8, -3$.



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Required term = 158

19. Here,

$$a = 5000$$

$$d = 200$$

$$a_n = 7000$$

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

$$7000 = 5000 + (n-1)200$$

$$(n-1)200 = 7000 - 5000$$

$$(n-1)200 = 2000$$

$$(n-1)200 = 10$$

$$n = 11$$

i.e. after 11 years, starting from 1995, his salary will reach to 7000, so we have to add 10 in 1995, because there no. are in years.

$$\therefore 1995 + 10 = 2005$$

$\therefore$ his salary reached at ₹ 7000 in 2005

20. Ramkali's saving in first week = ₹ 2.5

" " " " Second " =

Ramkali's saving of 1st week + Ramkali's

saving of 2nd week = $5 + 1.75 = ₹ 6.75$

Ramkali's saving in 3rd week = ₹ 6.75

$$1.75 = ₹ 8.50$$

$\therefore$ thus, an AP is formed :- 5, 6.75, 8.50

... with common difference of 1.75

saving in nth week = ₹ 20.75

$$a = 5, d = 1.75, a_n = 20.75$$

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

$$20.75 = 5 + (n-1)d$$

$$(n-1)1.75 = 20.75 - 5$$

$$(n-1)1.75 = 15.75$$

$$(n-1) = 9$$

$$n = 10$$

$\therefore$ So, in 10 weeks her saving will be ₹ 20.75

Exercise 5.3

$$1. i) a = 2, d = 2, n = 10$$

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

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

$$= 5(4 + 18)$$

$$= 5 \times 22$$

$$= ₹ 110$$

$$iv) a = \frac{1}{15}, n = 11, d = \frac{1}{12} - \frac{1}{15} = \frac{1}{60}$$

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

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

$$\Rightarrow \frac{11}{2} (\frac{2}{15} + \frac{1}{6})$$

$$\Rightarrow \frac{11 \times 9}{2 \times 30}$$

$$\Rightarrow \frac{33}{20}$$

"No genius was ever done the world" - Mahatma Gandhi



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2. i) $a = 7, d = 3.5$, last term = 84

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

$$84 = 7 + (n-1)3.5$$

$$(n-1)3.5 = 84 - 7$$

$$n-1 = 77/3.5 = 22$$

$$n = 23$$

$$\text{Sum} \Rightarrow \frac{n}{2} [2a + (n-1)d]$$

$$S_{23} = \frac{23}{2} [2 \times 7 + (22)3.5]$$

$$23(14 + 77)$$

$$\Rightarrow 23 \times 91$$

$$\Rightarrow 2093$$

ii) $a = -5, d = -3$, last term = -230

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

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

$$-230 - 5 = (n-1)(-3)$$

$$(n-1)(-3) = -235$$

$$n-1 = 78$$

$$n = 79$$

$$\text{Sum} \Rightarrow \frac{n}{2} [2a + (n-1)d]$$

$$S_{79} \Rightarrow \frac{79}{2} [2 \times (-5) + (78)(-3)]$$

$$\Rightarrow 39(-10 - 235)$$

$$\Rightarrow 39 \times (-245)$$

$$\Rightarrow -9555$$

3. $a = 9, d = 8, S_n = 636$

Let the no. of terms be n .

$\Rightarrow$

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

$$636 = \frac{n}{2} [2 \times 9 + (n-1)8]$$

$$636 = \frac{n}{2} (18 + 8n - 8)$$

$$636 = n(9 + 4n - 4)$$

$$636 = 9n + 4n^2 - 4n$$

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

$\therefore$ Factorize the eq;

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

$$\Rightarrow n(4n + 53) - 12(4n - 53) = 0$$

$$(n-12)(4n+53) = 0$$

$$n = -\frac{53}{4}, n = 12$$

$$\text{So, } n = 12$$

5. $a = 5, l = 45, \text{sum} = 700, n = ?, d = ?$

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

$$700 = \frac{n}{2} (5 + 45)$$

$$800 = 50n$$

$$n = \frac{800}{50}$$

$$n = 16$$

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

$$45 = 5 + (16-1)d$$

$$40 = 15d$$

$$d = \frac{40}{15}$$



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6. $a=17, l=350, d=9, n=? , \text{Sum}=P$

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

$$350 = 17 + (n-1)9$$

$$(n-1)9 = 333$$

$$n-1 = 37$$

$$n = 38$$

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

$$\Rightarrow \frac{38}{2} [17 + 350]$$

$$\Rightarrow 19 \times 367$$

$$\Rightarrow 6973$$

7. $n=22, d=7, a_{22}=199$

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

$$199 = a + (21)7$$

$$199 = a + 147$$

$$a = 2$$

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

$$\frac{22}{2} [2 + 199]$$

$$\Rightarrow 11 \times 201$$

$$\Rightarrow 2211$$

8. $S_{51} = P$

$$a_2 = 17, a_3 = 18, n = 51$$

$$d = a_3 - a_2 \Rightarrow 18 - 17 \Rightarrow 1$$

$$a_2 - a = 1$$

$$17 - a = 1$$

$$a = 16$$

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

$$\Rightarrow \frac{51}{2} [2 \times 16 + 50 \times 1]$$

$$51 \times (16 + 25)$$

$$\Rightarrow 51 \times 41$$

$$\Rightarrow 2091$$

$$S_{51} \Rightarrow 2091$$

9. $S_7 = 99, S_{17} = 289$

$$\Rightarrow S_7 = 99$$

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

$$99 = \frac{7}{2} [2a + (7-1)d]$$

$$99 = 7(a + 3d)$$

$$7 = a + 3d$$

$$a + 3d = 7 \quad \text{--- (i)}$$

Similarly

$$S_{17} = \frac{17}{2} [2a + (17-1)d]$$

$$289 = 17[a + 8d]$$

$$17 = a + 8d$$

$$a + 8d = 17 \quad \text{--- (ii)}$$

~~Subtracting (i) from (ii)~~

$$a + 8d - a - 3d = 17 - 7$$

$$5d = 10$$

$$d = 2$$

$\Rightarrow$ Using 'd' in eq. (i)

$$a + 3d = 7$$

$$a + 6 = 7$$

$$a = 1$$



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using the value of a & d ; we can find the sum of first n terms as follows;

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

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

$$S_n = \frac{n}{2} \cdot 2n$$

$$\Rightarrow \boxed{S_n = n^2}$$

$$a_n = 3 + 9n$$

to i) let us take different values for a , i.e. 1, 2, 3 and so on,

$$a_1 = 3 + 9 \cdot 1 = 12$$

$$a_2 = 3 + 9 \cdot 2 = 21$$

$$a_3 = 3 + 9 \cdot 3 = 30$$

$$a_4 = 3 + 9 \cdot 4 = 39$$

It is form an AP;

$$\text{Sum} = \frac{n}{2} (2a + (n-1)d)$$

$\therefore$ The sum of first 15 terms of AP;

$$= \frac{15}{2} [2 \times 3 + (15-1)9]$$

$$= \frac{15}{2} [6 + 126]$$

$$= \frac{15}{2} \times 132$$

$$= 990$$

$$\Rightarrow a_n = 9 \cdot n$$

let us take values for a ; i.e. 1, 2, 3 and so on;

$$a_1 = 9 \cdot 1 = 9$$

$$a_2 = 9 \cdot 2 = 18$$

$$a_3 = 9 \cdot 3 = 27$$

$$a_4 = 9 \cdot 4 = 36$$

$$a_5 = 9 \cdot 5 = 45$$

$\Rightarrow$ It is an AP.

$\Rightarrow$ Sum of first 15 terms;

$$\Rightarrow \frac{15}{2} [2 \times 9 + (15-1) \cdot 9]$$

$$\Rightarrow \frac{15}{2} [18 + 126]$$

$$\Rightarrow \frac{15}{2} \times 144$$

$$\Rightarrow 1080$$

ii) As the sum till first term will only contain first term,

$$S_1 = a_1$$

$\Rightarrow$ we can find the first term as follows;

$$S_n = 9n - n^2$$

by putting the values in place of n , we will get the sum till that term

$$S_1 = 9 \times 1 - 1^2 = 8$$

Sum of 1st 2 terms S_2

$$S_2 = 9 \times 2 - 2^2$$

$$18 - 4 = 14$$

$$S_2 = 14$$

We know the formula $\Rightarrow S_n - S_{n-1} = a_n$

$$\therefore \text{Second term} = 14 - 8 = 6$$

$$d = 6 - 8 = -2$$

$\Rightarrow$ Now we have the AP as follows;

$a = 8$, $d = -2$, so, AP will look like:

$$8, 6, 4, 2, 0, -2, -4, \dots$$

n th term of an AP is given by the formula;

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

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



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$$a_n = 3 - 2n + 2$$

$$a_n = 5 - 2n$$

So, 3rd term can be calculated by just replacing n with 3,

$$a_3 = 5 - 2 \times 3$$

$$a_3 = -1$$

similarly $a_{10} = 5 - 2 \times 10$
 $= -15$

and so on we can calculate any no. of term of this AP.

12. The smallest positive integer which is divisible by 6 is 6 itself and its 90th multiple will be $6 \times 90 = 270$,

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

$$\Rightarrow \frac{90}{2} [2 \times 6 + (90-1)6]$$

$$\Rightarrow \frac{90}{2} [20 \times (12 + 234)]$$

$$\Rightarrow 20 \times 246$$

$$\Rightarrow 4920$$

sum of

13. 15 multiples of 8:-

8, 16, 24, 32, ... up to 15 terms

$a = 8$, $d = 8$, nth term, $n = 15$

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

$$15 [2 \times 8 + (15-1)8]$$

$$\Rightarrow 15 (8 + 112)$$

$$\Rightarrow 15 \times 120$$

14. odd no. b/w 0 & 50.

1, 3, 5, ... 49

$a = 1$, $d = 2$, $a_n = 49$

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

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

$$48 = (n-1)2$$

$$n = 25$$

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

$$\Rightarrow \frac{25}{2} [2 \times 1 + (25-1)2]$$

$$S_{25} = \frac{25}{2} [48 + 2]$$

$$S_{25} \Rightarrow \frac{25}{2} \times 50$$

$$\Rightarrow 625$$

15. $a = 200$, $d = 50$, $n = 30$

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

$$30 [2 \times 200 + (30-1)50]$$

$$\Rightarrow \frac{30}{2} [400 + 1450]$$

$$\Rightarrow 15 \times 1850$$

$$\Rightarrow 27750$$

$\Rightarrow$ he has to pay an amount of ₹ 27750 as penalty.

16. let the lowest price given be 'a' and then prize is increased by ₹ 20,

$a = P$, $d = 20$,

No. of terms, $n =$ No. of students getting

prize = 7

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 Sum of 'n' terms = Total prize money
 = 700.

$$S = n [2a + (n-1)d]$$

$$700 = 7 [2a + 6 \times (20)]$$

$$700 \times 2 = 7 [2a + 120]$$

$$200 = 2a + 120$$

$$2a = 200 + 120$$

$$a = 160$$

⇒ The divisions are; ₹160, ₹170, ₹180, ₹190, ₹200, ₹210, ₹220, ₹230, ₹240, ₹250, ₹260, ₹270

17. First there are 12 classes and each class has 3 sections.

Since each section of class 1 will plant 1 tree, so 3 trees will be planted by 3 sections of class 1.

Thus every class will plant 3 times the no. of their class.

(e.g. class (iii) will plant = $3 \times 3 = 9$ plants)

Similarly;

No. of trees planted by 3 sections of class 1 = 3

No. of trees planted by 3 sections of class 2 = 6

No. of trees planted by 3 sections of class 3 = 9

No. of trees planted by 3 sections of class 4 = 12

It is clearly an AP with first term = No. of trees planted by class 1 = 3.

We have,

$$a = 3, d = 3, n = 12$$

⇒ We can find the total no. of trees as follows:

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

$$\Rightarrow \frac{12}{2} [2 \times 3 + (12-1)3]$$

$$\Rightarrow 6 [6 + 33]$$

$$\Rightarrow 6 \times 39$$

$$= 234$$

⇒ Total no. of trees planted by students = 234.

18. Circumference of 1st semicircle = $\pi \cdot 0.5\pi$

Circumference of 2nd " " = $\pi \cdot 1\pi = \pi$

" " 3rd " " = $\pi \cdot 1.5\pi = 1.5\pi$

It is clear that $a = 0.5\pi$, $d = 0.5\pi$ & $n = 13$.

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

$$\Rightarrow \frac{13}{2} [2 \cdot 0.5\pi + (13-1)0.5\pi]$$

$$\Rightarrow \frac{13}{2} [\pi + 6\pi]$$

$$\Rightarrow \frac{13}{2} (7\pi)$$

$$\Rightarrow \frac{13 \times 7 \times 22}{2} \Rightarrow 1001 \text{ cm.}$$



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19. as the rows are going up, the no. of logs are decreasing;
20, 19, 18,
it's an AP.

Suppose 200 logs are arranged in 'n' rows.

then,

We have,

first term, $a = 20$

common difference $= d = -1$

$S_n = \text{No. of logs} = 200$

So,

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

$$200 = \frac{N}{2} [2 \times 20 + (N-1)(-1)]$$

$$400 = N(40 - N + 1)$$

$$400 = 41N - N^2$$

$$N^2 - 41N + 400 = 0$$

$$(N-16)(N-25)$$

$$n = 16, n = 25$$

If no. of rows is 25, then

$$a_{25} = 20 + (25-1)(-1)$$

$$20 - 24 = -4$$

$\therefore$ negative value for no. of logs is not possible $\therefore$ no. of rows = 16.

$$a_{16} = 20 + 15(-1)$$

$$\Rightarrow 20 - 15 = 5$$

$$\Rightarrow \text{No. of rows} = 16$$

$$\text{No. of logs in top rows} = 5$$

20. Distance covered in picking and dropping

$$1^{\text{st}} \text{ potato} = 2 \times 5 = 10 \text{m}$$

$$\text{distance} \quad || \quad || \quad || \quad || \quad ||$$

$$2^{\text{nd}} \text{ potato} = 2(5+3) = 16 \text{m}$$

$$\text{distance} \quad || \quad || \quad || \quad || \quad ||$$

$$3^{\text{rd}} \text{ potato} = 2(5+3+3) = 22 \text{m}$$

$$\therefore a = 10, d = 6, n = 10$$

$\hookrightarrow$

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

$$\Rightarrow \frac{10}{2} [2 \times 10 + (9)6]$$

$$\Rightarrow 5(20 + 54)$$

$$\Rightarrow 5 \times 74$$

$$\Rightarrow 370 \text{m}$$

$\therefore$ Total distance run by the competitor = 370m

3. i) given,

$a = 5, d = 3, a_n = 50$, find n & S_n .

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

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

$$(n-1)3 = 50 - 5 = 45$$

$$n-1 = 15$$

$$n = 16$$

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

$$S_{16} = \frac{16}{2} [2 \times 5 + (15)3]$$

$$\Rightarrow 8(10 + 45)$$

$$\Rightarrow 8 \times 55$$

$$\Rightarrow 440$$



Shot on Y83 Pro
vivo dual camera

ii) given $a = 7$, $a_{13} = 35$, find d & S_{13}
 $\Rightarrow a_n = a + (n-1)d$
 $35 = 7 + 12d$
 $12d = 35 - 7$
 $d = \frac{28}{12} = \frac{7}{3}$

Sum of n terms $S = \frac{n}{2} [2a + (n-1)d]$
 $S_{13} = \frac{13}{2} [2 \times 7 + (13-1) \times \frac{7}{3}]$
 $S_{13} = \frac{13}{2} [14 + 12 \times \frac{7}{3}]$
 $\Rightarrow \frac{13}{2} (14 + 28)$
 $\Rightarrow \frac{13}{2} \times 42$
 $\Rightarrow 273$

iv) Given: $a_3 = 15$, $S_{10} = 125$, find d & a_1
 $\Rightarrow S = \frac{n}{2} [2a + (n-1)d]$
 $S_{10} = \frac{10}{2} [2a + (10-1)d]$
 $125 = 5(2a + 9d)$
 $25 = 2a + 9d \dots \dots \dots \text{eq (i)}$
 Also, the 3rd term is 15,
 $a + 2d = 15 \dots \dots \dots \text{eq (ii)}$
 Subtracting eq. (ii) from eq. (i),
 $(2a + 9d) - 2(a + 2d) = 25 - 30$
 $2a + 9d - 2a - 4d = -5$
 $5d = -5$
 $d = -1$

Substituting the value of d in eq. (ii)
 $a + 2(-1) = 15$

10th term can be calculated as follows;
 $a_{10} = a + 9d$
 $17 - 9 = 8$
 $a_{10} = 8$
 $\Rightarrow d = -1$, & 10th term = 8

ix) given $a = 3$, $n = 8$, $S = 192$, find d
 $S = \frac{n}{2} [2a + (n-1)d]$
 $192 = \frac{8}{2} [2 \times 3 + 7d]$
 $192 = 4(6 + 7d)$
 $48 = 6 + 7d$
 $7d = 42$
 $d = 6$

x) Given, $l = 28$, $S = 144$ & there are total 9 terms, find a ;
 $S = \frac{n}{2} [2a + (n-1)d]$
 $144 = \frac{9}{2} [a + a_n]$
 $288 = 9(a + 28)$
 $9a + 252 = 288$
 $9a = 288 - 252$
 $9a = 36$
 $a = 4$

