

Progression

14 A.P. $T_n = a + (n-1)d$

$$S_n = \frac{n \cdot (2a + (n-1)d)}{2} \text{ or } \frac{n(a+l)}{2}$$

96, 90, 84, ... -112

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

$$-112 = 96 + (n-1)(-6)$$

$$-112 - 96 = (n-1)(-6)$$

$$\frac{-208}{-6} = n-1$$

$$n-1 = 34$$

$$\underline{n = 35}$$

$$\begin{array}{r} 112 \\ 96 \\ \hline 208 \end{array}$$

Which term is first ~~pos~~^{-ve} term?

+203, +199, +195, ...

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

$$T_n < 0$$

$$T_n = 203 + (n-1)(-4)$$

$$203 + (n-1)(-4)$$

$$203 + (n-1)(-4) < 0$$

$$(n-1)(-4) < -203$$

$$4(n-1) > 203$$

$$(n-1) > \frac{203}{4}$$

$$n > 50.75$$

$$n > 51.7$$

$$n = 52$$

$$203, 199, 195, \dots$$

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

$$T_n = 203 + (51-1)(-4)$$

$$T_n = 203 + (50)(-4)$$

$$T_n = 203 - 200$$

$$T_n = 3$$

$$52^{nd}$$

term is -ve

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

$$= 203 + (52-1)(-4)$$

$$= 203 + (51)(-4)$$

$$52^{nd} \text{ term} = 203 - 204$$

$$T_n = -1$$

which is first positive term?

$$-238, -231, -224, \dots$$

$$T_n > 0$$

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

$$-238 + (n-1)7 > 0$$

$$-238 + (n-1)7 > 238$$

$$(n-1) > \frac{238}{7}$$

$$n-1 > 34$$

$$n > 34+1$$

$$n > 35$$

then 36th term is first +ve term

An AP consists of 50 terms of which 3rd term is 12 and the last term is 106. Find the 29th term

$$n = 50$$

$$T_3 = 12$$

$$T_n = 106$$

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

$$T_3 = a + (n-1)d$$

~~$$106 = a + (50-1)d$$~~

$$\begin{array}{r} a + 2d = 12 \\ a + 49d = 106 \\ \hline (-) \quad (-) \quad (-) \end{array}$$

$$+47d = +94$$

$$d = \frac{94}{47}$$

$$\boxed{d = 2}$$

$$a + 2(2) = 12$$

$$a + 4 = 12$$

$$a = 12 - 4$$

$$\boxed{a = 8}$$

$$\begin{array}{r} 106 \\ 12 \\ \hline 94 \\ \uparrow \\ 47 \times 2 \\ \hline 94 \end{array}$$

$$T_{29} = a + (n-1)d$$

$$\begin{aligned} T_{29} &= 8 + (28)2 \\ &= 8 + 56 \end{aligned}$$

$$\boxed{T_{29} = 64}$$

2) If the 3rd and 9th terms of an AP are 4 and -8 resp. which of this AP is zero

$$T_3 = 4$$

$$T_9 = -8$$

$$T_3 = a + 2d = 4$$

$$T_9 = a + 8d = -8$$

$$-6d = +12$$

$$d = \underline{\underline{-2}}$$

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

$$0 = 8 + (n-1)(-2)$$

$$\frac{1-8}{-2} = n-1$$

$$\boxed{n = 5}$$

$$a + (3-2)d = 4$$

$$a - 4 = 4$$

$$a = 8$$

The 17th term of an AP exceeds its 10th term by 7. Find the common difference

$$T_{17} - T_{10} = 7 \quad d = ?$$

For what value of n are the n th terms of two APs: 63, 65, 67... and 3, 10, 17... equal.

$$T_{n1} = T_{n2}$$

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

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

$$63 - 3 + 2n - 2 - 7n + 7 = 0$$

$$60 - 5n + 5 = 0$$

$$-5n + 65 = 0$$

$$+ 5n = 65$$

$$5n = 65$$

$$n = \frac{65}{5} = 13$$

$$n = 13$$

5) The sum of the 4th and 8th terms of an AP is 24 and the sum of the 6th and 10th term is 44. What is the third term of the AP.

~~8~~ ~~8400~~

$$T_4 + T_8 = 24$$

$$T_6 + T_{10} = 44 \rightarrow a + 5d + a + 9d \\ = 2a + 14d$$

$$a + 3d + a + 7d = 24$$

$$2a + 10d = 24$$

$$2a + 14d = 44$$

$$\begin{array}{r} (-) \quad (-) \quad (-) \\ \hline \end{array}$$

$$4d = -20$$

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

$$a + 2d = T_3$$

$$-13 + 2(5) = T_3$$

$$T_3 = -13 + 10$$

$$\boxed{T_3 = -3}$$

$$2a + 10d = 24$$

$$2a + 50 = 24$$

$$2a = 24 - 50$$

$$2a = -26$$

$$\underline{\underline{a = -13}}$$

$$\begin{array}{r} 50 \\ 24 \\ \hline 26 \end{array}$$

6) If the sum of 1st 7 terms of an AP is 49 and that of 17 terms is 289. Find the sum of first 12 terms.

$$S_7 = 49$$

$$S_{17} = 289$$

$$S_{12} = ?$$

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

$$S_7 = \frac{7}{2}(2a + (7-1)d)$$

$$49 = \frac{7}{2}(2a + 6d)$$

$$\frac{14}{7} = 2a + 6d$$

$$\underline{\underline{2a + 6d = 14}}$$

$$\begin{array}{r} 2a + 6d = 14 \\ 2a + 16d = 34 \\ \hline (-) \quad (-) \quad (-) \end{array}$$

$$-10d = -20$$

$$d = 2$$

$$S_{12} = \frac{12}{2}(2 + (11)2)$$

$$= 6(2 + 22)$$

$$= (24)6 = \underline{\underline{144}}$$

$$S_{17} = 289$$

$$\frac{n}{2}(2a + (n-1)d) = 289$$

$$\frac{17}{2}(2a + (16)d) = 289$$

$$2a + 16d = \frac{34}{17}$$

$$\underline{\underline{2a + 16d = 34}}$$

$$2a + 16d = 34$$

$$\begin{array}{r} 34 \\ -14 \\ \hline 20 \end{array}$$

$$2a + 6d = 14$$

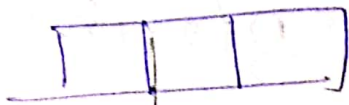
$$2a + 12 = 14$$

$$\underline{\underline{a = 1}}$$

7) How many 3 digit numbers can be formed from digit 1-9 strictly in increasing order and follows an AP.

- a) 9 b) 14 c) 16 d) 12

1 2 3 4 5 6 7 8 9



no other option we should write and calculate how many there.

① 1 2 3	④ 2 3 4	⑦ 3 4 5	⑩ 4 5 6	⑬ 5 6 7	⑭ 6 7 8
② 1 3 5	⑤ 2 4 6	⑧ 3 5 7	⑪ 4 6 8	⑫ 5 7 9	⑮ 7 8 9
③ 1 4 7	⑥ 2 5 8	⑨ 3 6 9			
1 5 9					

c)

16

~~3 4 5 6 7 8 9~~
~~16 84~~
~~64~~

~~1 2 3 4 5 6 7 8 9~~
~~100~~

8) The sum of 2nd and 19th term of AP is equal to the sum of 3rd, 15th and 12th term. Find the term which is 0?

~~Ques~~ $T_2 + T_{19} = T_3 + T_{15} + T_{12}$

$$a + d + a + 18d = a + 7d + a + 14d + a + 11d$$

$$2a + 19d = 3a + 32d$$

$$a + 32d - 19d = 0$$

$$a + 13d = 0$$

$$\begin{array}{r} 32 \\ -19 \\ \hline 13 \end{array}$$

12th term

T₁₄

A rebounding ball rebounds each time to a height equal to one half the height of the previous bounce. if it is dropped from a height of 16 mts. Find the total distance it has travelled when it hits ground for the 6th time.

$$a = 16$$

$$16, 8, 4,$$

$$S_n = 16 \left(\frac{2^6 - 1}{2 - 1} \right)$$

$$S_n = 1008$$

GP:

$$T_n = a(r)^{n-1}$$

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

$$S_n = \frac{a(1 - r^n)}{1 - r}$$

$$\frac{16(1 - (1/2)^6)}{1 - 1/2}$$

16.8.

$$\frac{81}{162}$$

$$\frac{16(1 - \frac{1}{64})}{\frac{2-1}{2}}$$

$$\frac{16(\frac{64-1}{64})}{1/2}$$

$$16\left(\frac{63}{64}\right) \times 2$$

32
82

$$\frac{63}{2}$$

$$S_6 = \frac{16(1 - (1/2)^6)}{1 - 1/2}$$

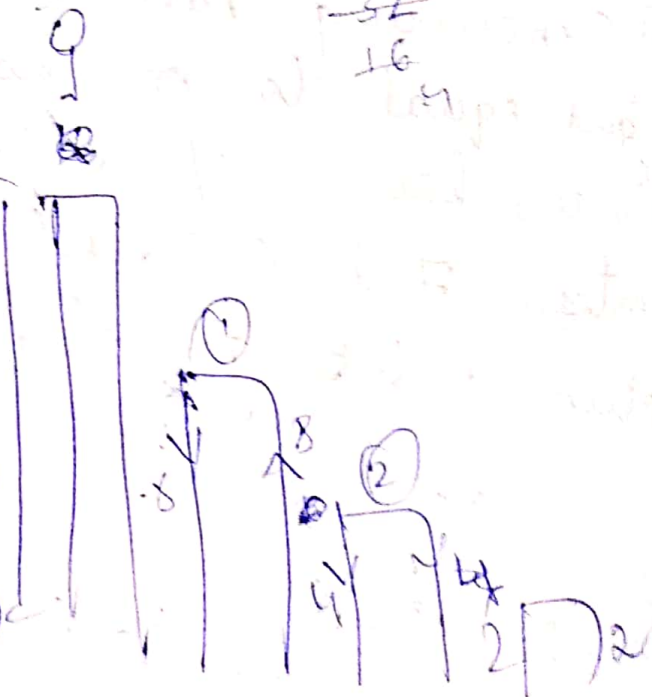
$$16\left(\frac{63}{64}\right) \times 2$$

32
16

Total distance
(coming & going up & down)

$$16 + 2(8 + 4 + 2 + \dots 6^{\text{th}} \text{ term})$$

$$16 + 2(8 + 4 + 2 + \dots 16^{\text{th}} \text{ term})$$



$$16 + 2(8 + 4 + 2 + \dots - 64\frac{1}{2})$$

$$16 + 2 \left(\frac{8 \cdot (1 - (\frac{1}{2})^6)}{1 - (\frac{1}{2})} \right)$$

$$16 + 2 \left(\frac{8 \cdot \left(\frac{64-1}{64} \right)}{\frac{1}{2}} \right)$$

$$16 + 2 \left(\frac{8 \times 2^1}{1} \left(\frac{63}{64} \right) \right)$$

$\frac{32}{64}$
 $\frac{16}{4}$

$$16 + 2 \left(\frac{31.5}{2} \right)$$

$$\begin{array}{r} 31.5 \\ 16.0 \\ \hline 47.5 \end{array}$$

$$31.5 + 16$$

$$S_n = 47.5$$

A ball is dropped from a height of 12m. On every successive bounce, the ball bounces to a height that is $\frac{2}{3}$ of the previous height. Find the total vertical distance that the ball has travelled when it hits the ground for 8th time?

$$\frac{16}{3} \times \frac{2}{3} = \frac{32}{9}$$

$$12 + 2 \left(8 + \frac{16}{3} + \frac{32}{9} + \dots \right)$$

$$\frac{16^2}{3} \times \frac{1}{8}$$

$$12 + 2 \left(\frac{8 \cdot (1 - (\frac{2}{3})^8)}{1 - \frac{2}{3}} \right)$$

$$\frac{2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3}{9 \cdot 9 \cdot 9 \cdot 9}$$

$$12 + 16 \left[\frac{6561 - 256}{3 - 2} \right]$$

$$\frac{81 \times 81}{181}$$

$$\begin{array}{r} 181 \\ 648 \\ \hline 6561 \end{array}$$

$$12 + \frac{16 \times 3}{1} \left[\frac{6305}{1} \right]$$

$$\frac{6561}{256} \times \frac{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2}{9 \cdot 9 \cdot 9 \cdot 9}$$

$$\frac{16 \times 16}{196}$$

$$\begin{array}{r} 196 \\ 16 \\ \hline 256 \end{array}$$

continue

After striking a floor, a certain ball rebounds $\frac{4}{5}$ th of the height from which it has fallen. What is the total distance that it travels before coming to rest, if it is gently dropped from a height of 120 meters

$$120 + 2 \left(96 + 96 \times \frac{4}{5} + \dots \infty \right)$$

~~$$120 + 2 \left[96 \left(1 + \frac{4}{5} + \frac{16}{25} + \dots \right) \right]$$~~

$$S_{\infty} = \frac{a}{1-r}$$

$$120 + 2 \left(\frac{96}{1 - \frac{4}{5}} \right)$$

$$\frac{960}{120} = 8$$

$$120 + 2 \left(\frac{96}{\frac{1}{5}} \right)$$

$$120 + 10 \times 96$$

$$\underline{1080 \text{ m}}$$

$$\frac{30}{120} \times 8$$

$$3 \times 50 \times 5$$

$$120 \times \frac{4}{5}$$