Progression

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Placement for All. All for Placement

This Video Completely covers the problems on"Progression" which is more than sufficient for all kind of placement Exams eg: TCS/WIPRO/AMCAT/ELITMUS/CoCubes and all other placement Exams.

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Progression:

Arithmetic Progression: is a sequence in which each term except the first is obtained by adding a fixed number (positive or negative) to the preceding term.

Or, Arithmetic Progression is a series of numbers, such that difference between the consecutive number is constant.

a, a+d, a+2d , a+3d ....., a+(n-1)d

Formula's:

1. n^{th} term, Tn = a + (n-1)d

Where a = first term and d= common difference

2. Sum of n terms

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

Sn = $\frac{n}{2}$ [a + l] , where l= last term

Progression:

Arithmetic Progression: is a sequence in which each term except the first is obtained by adding a fixed number (positive or negative) to the preceding term.

* If a, b, c are in AP then

b= $\frac{a+c}{2}$.

* If a, b, c are in AP then

b – a = c – b

- Sum of first N natural numbers= $\frac{n(n+1)}{2}$
- Sum of Squares of first N natural numbers= $\frac{n(n+1)(2n+1)}{6}$
- Sum of Cubes of first N natural numbers= $\left[\frac{n(n+1)}{2}\right]^2$

Progression:

Q1. How many terms are there in the A.P given by 15,21,27,..... ,279.

A) 85 B)55 C)43 D)45

15, 21, 27, ---- 279 --- AP

6 6

$a = 15$

$t_n = 279$

$d = 6$

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

$\Rightarrow 279 = 15 + (n-1)6$

$\Rightarrow 279 = 15 + 6n - 6$

$\Rightarrow 279 = 9 + 6n$

$6n = 270$

$n = \frac{270}{6} = 45$

Progression:

Q2 What will be the 20th term in the given sequence.

-50, -47, -44 , ...

A) -10 B)10 C) -7 D)7

2, 4, 6 --- AP

$d = 4-2 = 2$

$6-4 = 2$

[2, 4, 6, 8, 10 --- A.P

[-4, -6, -8, -10 --- A.P

[-10, -8, -6, -4 - A.P

[5, 4, 3, 2, - AP

-1 -1 -1

-50, -47, -44 , ---- t_{20}

$a = -50$

$d = -47 - (-50)$

$= -47 + 50$

$= 3$

$t_{20} = a + (n-1)d$

$\Rightarrow -50 + (20-1) \times 3$

$\Rightarrow -50 + 19 \times 3$

$-50 + 57 = 7$

Progression:

Q3. If the 3rd term of a AP is 7 and 6th term is 13 then find the sum of first 5 terms.

A) 31 B) 35 C) 36 D)39

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

$t_3 = a + (3-1)d$

$7 = a + 2d$ -(1)

$t_6 = a + 5d$

$13 = a + 5d$ -(2)

(2) - (1) $\Rightarrow a + 5d = 13$

$a + 2d = 7$

$3d = 6$

$d = 2$

$a = 3$

$d = 2$

$7 = a + 2 \times 2$

$a = 7 - 4 = 3$

3, 5, 7, 9, 11

15 + 20 = 35

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

$\Rightarrow S_5 = \frac{5}{2}[2 \times 3 + (5-1) \times 2]$

$\frac{5}{2}[6+8] = \frac{5}{2} \times 14 = 35$

Progression:

Q4. If the 2nd term of a AP is 16 and 4th term is 26 then find the sum of first 5 terms.

A) 95 B) 105 C) 96 D)99

$t_2 = a+d$ $\quad t_4 = a+3d$

$16 = a+d$ $\quad 26 = a+3d$ $\quad -(2)$ $\quad (2)-(1) \Rightarrow$

$16 = a+5$ $\quad -(1)$ $\quad a+3d = 26$

$a = 11,\ d = 5$ $\quad a+d = 16$

$S_n = \frac{n}{2}[2a+(n-1)d]$ $\quad 2d = 10$

$S_5 = \frac{5}{2}[2\times 11+(5-1)5]$ $\quad d = 5$

$\frac{5}{2}[22+20] = \frac{5}{\cancel{2}} \times \frac{21}{\cancel{42}} = 105$ ✓

Progression:

Q5. Pratik got Job in Tcs with starting salary of 16000 per month. He will get an increment of 100rs per month. [What will be his salary after 20month.]

A) 16900 B) 17900 C) 18000 D)20000

A.P

16,000, 16100, 16200, 16300 ---- t_{20}

100 100 100

$a = 16,000$

$d = 100$

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

$t_{20} = a+(20-1)d$

$= 16000 + 19\times 100$

$= 16000 + 1900$

$= 17900$

21st 18000

20th

Progression:

Q6. Find t_8 for the Arithmetic progression where [Placement]

$t_4 = 25$ and $t_{19} = -20$

A) 11 B) 12 C) 13 D)14

$t_4 = 25$ $\quad t_{19} = -20$

$a+3\times(-3) = 25$ $\quad a+3d = 25$ $\quad a+18d = -20$ $\quad -(2)$

$a-9 = 25$ $\quad -(1)$

$a = 34$

$(2)-(1) \Rightarrow$

$a+18d = -20$

$a+3d = 25$

$15d = -45$

$d = -3$ ✓

$d = -3$

$a = 34$

$t_8 = a+7d$

$= 34+7\times(-3)$

$= 34-21$

$= 13$

Progression:

Q7. Find the sum of first 100 terms of the A.P.

1, 4, 6, 5, 11, 6.....

A) 7600 B) 7500 C) 7400 D)8000

1, 4, 6, 5, 11, 6 - - - × (A.P)

3 2 -1

a=1, d=5, n=50

⇒ 1, 6, 11 - - - A.P

1, 6, 11 - - - 50 terms

$S_{50} = \frac{50}{2}[2\times1 + 49\times5]$

$25[2+245] = 25\times247$

$25\times(200+40+7) = 5000+1000+175 = 6175$

4, 5, 6 - - - - AP

a=4, d=1, n=50

4, 5, 6 - - - 50 terms

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

$\frac{50}{2}[2\times4+(50-1)1]$

$25[8+49]$

25×57

$= 25\times(50+7)$

$= 1250+175$

$= 1425$ ✓

Total sum = 6175 + 1425 = 7600 ✓

Progression:

Q7. Find the sum of first 100 terms of the A.P.

1, 4, 6, 5, 11, 6.....

A) 7600 B) 7500 C) 7400 D)8000

⇒ (1, 4), (6, 5), (11, 6) - - - 100 terms

⇒ 5, 11, 17 - - - 50 terms

6 6

n=50, a=5, d=6

$S_{50} = \frac{n}{2}[2a+(n-1)d]$

$\Rightarrow \frac{50}{2}[2\times5+(50-1)6]$

$\Rightarrow 25[10+49\times6]$

$25[10+294]$

304

$\Rightarrow 25\times304$

$\Rightarrow 25\times(300+4)$

$= 7500+100 = 7600$

Progression:

Q8. If the 3rd and 9th terms of arithmetic progression are 4 and -8 respectively, then which term will be zero?

a)4th b)5th c)6th d)7th [Capgemini]

$t_3 = 4, \quad t_9 = -8$

$\Rightarrow a+2d=4 \quad -①$

$a+8d=-8 \quad -②$

$a+2\times(-2)=4$

$a-4=4$

$a=4+4=8$

② − ①:

$a+8d=-8$

$a+2d=4$

$6d=-12$

$d=-2$

a = 8, d = -2

$t_n = a+(n-1)d = 0$

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

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

$8=2(n-1)$

$n-1=4$

$n=5$

Progression:

Q9. In a cricket tournament, 16 school teams participated. A sum of Rs.8000 is to be awarded among them as prize money. If the team placed last is award Rs.275 as prize money and the award increases by the same amount for successive finishing places, how much will the team place first receive?

A) 725 B) 730 C) 740 D)750

TCS Exam

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

$t_{16} = a + (16-1)d$

$275 = a + 15x$

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

$S_{16} = \frac{16}{2}[a + a + (n-1)d]$

$8000 = 8[a + a + 15x]$

$1000 = a + 275$

$a = 1000 - 275 = 725$

last: 275, 275 + x, 275 + 2x ... (AP)

Progression:

Q10. How long it will take to pay off a debt of Rs.8800 if Rs.250 is paid in the first month, Rs.270 is paid in the second month, Rs.290 in the third month and so on?

A) 20months B) 24*month* C) 18*months* D)36months

250, 270, 290 .... (AP); 8800 debt

$a = 250$, $d = 20$, $S = 8800$

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

$8800 = \frac{n}{2}[2 \times 250 + (n-1)20]$

$8800 = \frac{n}{2}[500 - 20 + 20n]$

$8800 = \frac{n}{2}[480 + 20n]$

$8800 = 240n + 10n^2$

$8800 = 240 \times 20 + 10 \times 400 = 4800 + 4000 = 8800$

Progression:

Geometric Progression: is a sequence in which each term except the first is obtained by multiplying the previous term by a non-zero constant called the common ratio. Let us consider a G.P. with first non-zero term a and common ratio r,

i.e., $a, ar, ar^2, \ldots, ar^{n-1}, \ldots$

The general term or n th term of G.P. is given by $a_n = ar^{n-1}$

Where a= first term, r= common ratio

- Last term l of a G.P. is same as the n th term and is given by $l = ar^{n-1}$
- The sum Sn of the first n terms is given by $S_n = \frac{a(r^n-1)}{(r-1)}$, **r > 1.**
- Sum of Infinite terms = $\frac{a}{(1-r)}$, **r <1**
- **If a, b, c are in GP**

  $b = \sqrt{ac}$

Progression:

Q11. What will be the 12th term in the given sequence.

$2, 1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}$ .....

A) $\frac{1}{1024}$ B) $\frac{1}{512}$ C) $\frac{1}{2048}$ D)None of these

GP

$2, 1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}$ --- GP

$a = 2, \; r = \frac{1}{2}$

$a_{12} = a \cdot r^{(n-1)}$ $2^{10} = 1024$

$= 2 \times \left(\frac{1}{2}\right)^{(12-1)}$

$= 2 \times \left(\frac{1}{2}\right)^{11}$

$2^1 \times 2^{-11} = 2^{-10} = \left(\frac{1}{2}\right)^{10}$

$\Rightarrow \left(\frac{1}{2}\right)^{10}$

$\frac{1}{2} = r$

$\frac{1}{2} : r$

$\frac{1}{4} : \frac{1}{2} = \frac{1}{2} : r$

$\frac{1}{4} \times \frac{2}{1} = \frac{1}{2} : r$

$= \frac{1}{1024}$

Progression:

Q12. The arithmetic mean of 2 numbers is 34 and their geometric mean is 16. One of the numbers will be?

a. 4 b. 16 c. 18 d. 12

Placement

A.M = Average

Let two number a, b

$\Rightarrow \frac{a+b}{2} = 34$ ✓ $64 + b = 68$

$b = 4$

GM: $\sqrt{ab} = 16$ ✓

Square $ab = 256$ ✓

$b = \frac{256}{a}$

$a + b = 68$

$a + \frac{256}{a} = 68$

$a^2 + 256 = 68a$ ✓

$\Rightarrow a^2 - 68a + 256 = 0$

$a^2 - 64a - 4a + 256 = 0$

$a(a-64) - 4(a-64) = 0$

$a = 64, a = 4$

$a = 64, b = 4$ | $a = 4, b = 64$

Progression:

Questions: $3 \times (4^4 + 4^3 + 4^2 + 4 + 1)$. ✓

a)1024 b) 1025 c) 1023 d)1030

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

$a = 1$

common ratio $= 4$

$= \frac{4}{1} = 4$

$\frac{4^2}{4} = 4$

3×1023

3

1023

$\Rightarrow 3 \times (4^4 + 4^3 + 4^2 + 4 + 1)$

$3 \times (1 + 4 + 4^2 + 4^3 + 4^4)$

$S_5 = \frac{1(4^5 - 1)}{4-1} \Rightarrow$

$1 \times \frac{(1024-1)}{3} = \frac{1023}{3}$

$4 \times 4 \times 4 \times 4$

2 | 256

2 | 64

2 | 16

2 | 8

2 | 4

2 | 2

1

$256 \times 4 = 1024$

Progression:

Harmonic Progression:

$\frac{1}{1}, \frac{1}{3}, \frac{1}{5}, \ldots$ HP

$\frac{1}{a}, \frac{1}{a+d}, \frac{1}{a+2d}, \ldots \frac{1}{a+(n-1)d}$

$t_{n/l} = \frac{1}{a+(n-1)d}$

$\frac{1}{a}, \frac{1}{h}, \frac{1}{b}$ are in HP

$\frac{1}{h} = \frac{\frac{1}{a}+\frac{1}{b}}{2} \Rightarrow \frac{a+b}{2ab}$

$h = \frac{2ab}{a+b}$ (H.M)

a, b, c in HP

$b = \sqrt{ac}$

A.P

1, 3, 5, ---- A.P

2 2

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

a, a+d, a+2d --- a+(n-1)d

a, b, c are in AP

$b = \frac{a+c}{2}$ (A.M)

Progression:

Q13. $t_7 = \frac{1}{10}$, $t_{12} = \frac{1}{25}$, $t_{20} =$, *if the series is in HP.*

$t_{20} = \frac{1}{49}$

AP diffic

(A.P) $t_7 = 10$, $t_{12} = 25$, $t_{20} = ? = 49$

$a+6d = 10$ ①

$a+11d = 25$ ②

② − ① ⇒

$a+11d = 25$

$a+6d = 10$

$5d = 15$

$d = 3$

$a = -8$, $d = 3$

$a+6\times3 = 10$

$a = 10-18$

$= -8$

$t_{20} = a+(n-1)d$

$t_{20} = -8+(20-1)\times3$

$= -8+19\times3$

$= -8+57$

$= 49$