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Maths 101

1) Arithmetic progression

Let the three terms be

$$x, x+d \text{ and } x+2d$$

$$\text{where } T_1 = x$$

$$T_2 = x+d$$

$$T_3 = x+2d$$

$$T_1 + T_2 + T_3 = 18$$

$$x + (x+d) + (x+2d) = 18$$

$$3x + 3d = 18, \quad x + d = 6$$

$$\therefore d = 6 - x \quad \text{--- (i)}$$

$$T_1^2 + T_2^2 + T_3^2 = 206$$

$$x^2 + (x+d)^2 + (x+2d)^2 = 206$$

$$x^2 + (x^2 + 2dx + d^2) + (x^2 + 4dx + 4d^2) = 206$$

$$3x^2 + 6dx + 5d^2 = 206$$

$$3x^2 + 6dx + 5d^2 = 206 \quad \text{--- (ii)}$$

Substitute eqn (i) into equation (ii)

$$3x^2 + 6x(6-x) + 5(6-x)^2 = 206$$

$$3x^2 + 36x - 6x^2 + 5(36 - 12x + x^2) = 206$$

$$3x^2 + 36x - 6x^2 + 180 - 60x + 5x^2 = 206$$

$$2x^2 - 24x + 180 = 206$$

$$2x^2 - 24x - 26 = 0$$

$$x^2 - 12x - 13 = 0$$

$$x(x-13) + 1(x-13) = 0$$

$$(x-13)(x+1) = 0$$

$$x-13=0 \quad \text{or} \quad x+1=0$$

$$x=13 \quad \text{or} \quad x=-1$$

Put  $x=13$  or  $x=-1$  into eqn (1)

when  $x=13$

$$d = 6 - 13$$

$$d = -7$$

Therefore

using  $x=13$  and  $d=-7$

$$T_1 = 13$$

$$T_2 = 13 - 7 = 6$$

$$T_3 = 13 + 2(-7) = 13 - 14 = -1$$

$\therefore$  The terms are 13, 6, -1

2) For a G.P

Let the three terms be  $T_1, T_2$  and  $T_3$   
where  $T_1 = a$

$$T_2 = ar$$

$$T_3 = ar^2$$

$$* T_1 + T_2 + T_3 = 28$$

$$a + ar + ar^2 = 28 \quad \text{--- (i)}$$

$$* T_1 \times T_2 \times T_3 = 512$$

$$a \times ar \times ar^2 = 512$$

$$a^3 r^3 = 512 \quad \text{--- (ii)}$$

$$(ar)^3 = 512$$

$$ar = 8$$

$$ar = 8 \quad \text{--- (iii)}$$

$$a = 8/r \quad \text{--- (iii)}$$

Put equation (iii) into equation



e<sub>1</sub>)

$$a(1+r+r^2) = 28$$

$$8 \frac{(1+r+r^2)}{r} = 28$$

$$8 + 8r + 8r^2 = 28r$$

$$8r^2 + 8r - 28r + 8 = 0$$

$$8r^2 - 20r + 8 = 0$$

$$2r^2 - 5r + 2 = 0$$

$$2r^2 - 4r - r + 2 = 0$$

$$2r(r-2) - 1(r-2) = 0$$

$$(r-2)(2r-1) = 0$$

$$(r-2)(2r-1) = 0$$

$$r-2=0 \text{ or } 2r-1=0$$

$$r=2 \text{ or } 2r=1$$

$$r=2 \text{ or } r=1/2$$

Substitute  $r=2$  or  $r=1/2$  into equation (iii)

$$a = 8r$$

$$\rightarrow r=2$$

$$a = \frac{8}{2}, a = 4$$

$$\rightarrow r=1/2$$

$$a = \frac{8}{1/2}$$

$$a = 16$$

$\therefore$  when  $r=2$ ,  $a=4$

$$T_1 = 4$$

$$T_2 = 4 \times 2 = 8$$

$$T_3 = 8 \times 2 = 16$$

The terms are 4, 8, 16