

Author: Naga Karthik

This step-by-step solution guide has been created by **Naga Karthik** for educational purposes. While we have made every effort to ensure the accuracy of the information presented, it is possible that there may be errors or omissions. We encourage users to critically evaluate and verify the content. BF Maths and the author cannot be held responsible for any errors or inaccuracies in this guide.

If you find any mistakes or have any suggestions for improvements, please contact us at bfmathshello@gmail.com. Your feedback is invaluable in helping us maintain the quality and accuracy of our resources. Please specify *which exercise and which question* in the email.

Thank you for using BF Maths for your maths revision!

Ch-3: Sequences and Series

SET A

BRONZE:

Given: $a_{16} = a + 15d = 25$; $a_{25} = a + 24d = 47.5$

$$\begin{array}{l} a) \quad a + 24d = 47.5 \\ \quad a + 15d = 25 \\ \hline \quad \quad 9d = 22.5 \end{array} \quad \begin{array}{l} d = 2.5 \\ \Rightarrow a + 15(2.5) = 25 \\ \Rightarrow a = -12.5 \end{array}$$

b) $S_n = 712.5$ $S_n = \frac{n}{2}(2a + (n-1)d)$

$$\Rightarrow 712.5 = \frac{n}{2}(2(-12.5) + (n-1)(2.5)) \Rightarrow 1425 = n(-25 + 2.5n - 2.5)$$

$$\Rightarrow 1425 = -27.5n + 2.5n^2 \Rightarrow 2.5n^2 - 27.5n - 1425 = 0$$

$$\boxed{n=30}, n > 0 \quad (n-30)(n+19) = 0$$

SILVER:

$p + 2p + 3p + \dots + 200$ $S_n = 1700$

$$\Rightarrow a = p \quad d = p(2p - p) \quad l = 200 \quad S_n = \frac{n}{2}(a + l) \quad n = ?$$

$$\Rightarrow 200 = a + (n-1)d \Rightarrow 200 = p + (n-1)p \Rightarrow 200 = \cancel{p} + pn - \cancel{p}$$

$$\boxed{n = \frac{200}{p}} \Rightarrow 1700 = \frac{200}{\frac{p}{2}}(p + 200) \Rightarrow 1700 = \frac{100}{p}(p + 200)$$

$$\Rightarrow 1700p = 100p + 20000 \Rightarrow 1600p = 20000 \quad \boxed{p = 12.5}$$

GOLD:

$a = 3k + 2$ $a_2 = 5k + 7$ $a_3 = 7k + 12$

$d = 5k + 7 - 3k - 2 = 2k + 5$ $\Rightarrow 3k + 118k + 2 + 295 > 0$

$\Rightarrow 121k + 297 > 0$

$\Rightarrow k > -\frac{297}{121} = k > -\frac{27}{11}$

Set B

BRONZE:

$$\sum_{r=8}^{\infty} 3 \times \left(\frac{1}{2}\right)^r \Rightarrow S_{\infty} = \frac{a}{1-r} \Rightarrow r=8 = \frac{3}{256} \rightarrow ar^8$$

$$r=9 = \frac{3}{512} \rightarrow ar^9$$

$$r=10 = \frac{3}{1024}$$

$$\Rightarrow \frac{ar^9}{ar^8} = r = \frac{3}{512} \times \frac{256}{3} = \frac{1}{2}$$

$$S_8 = \frac{3(1 - (1/2)^8)}{1 - 1/2} = \frac{765}{128}$$

$$S_{\infty} = \frac{a}{1-r} = \frac{3}{0.5} = 6$$

$$\Rightarrow 6 - \frac{765}{128} = \frac{3}{128}$$

SILVER:

$$\sum_{r=8}^k (2r-5) = 299 \Rightarrow a = 2(8) - 5 = 11 \quad l = 2k - 5$$

$$S_n = 299 \quad S_n = \frac{n}{2}(a+l) \Rightarrow 299 = \frac{n}{2}(11+2k-5)$$

$$n = k - 8 + 1 = k - 7 \Rightarrow 598 = \frac{k-7}{2}(6+2k) \Rightarrow 598 = 6k + 2k^2 - 42 - 14k$$

$$\Rightarrow 2k^2 - 8k - 640 = 0$$

$$\Rightarrow (k-20)(k+16) = 0 \quad \boxed{k=20}, k > 0$$

GOLD:

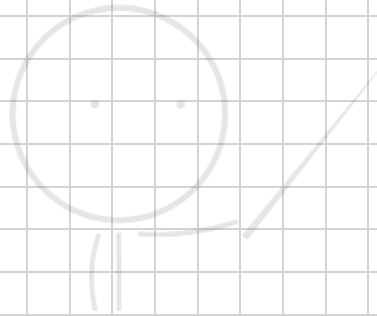
$$\sum_{r=1}^{16} (3r + 2^r + k) = 131550 \quad \rightarrow a_{16} = 3 + 15(3) = 48$$

$$\sum_{r=1}^{16} 3r = \frac{n}{2}(a_1 + l) \Rightarrow a = 3 \quad l = 48 \Rightarrow \frac{16}{2}(3+48) = 408$$

$$\sum_{r=1}^{16} 2^r = \frac{a(r^n - 1)}{r - 1} = \frac{2(2^{16} - 1)}{2 - 1} = 131070$$

$$\sum_{k=1}^{16} k = 16k \Rightarrow 408 + 131070 + 16k = 131550$$

$$k = \frac{72}{16} = \frac{9}{2}$$



BF MATHS
