AI1110 Assignment 1

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Q2 (C): In an Arithmetic Progression, the fourth and sixth terms are 8 and 16 respectively.Find :
i) common difference
ii) first term
iii) sum of the first 20 terms

Solution: Let a_i denote the i th term of the AP , d denote the common diff,
S_{20} denote the sum of first 20 terms

TABLE I
VARIABLES

Symbol	value
a_i	8
a_j	14
a_1	?
d	?
S_{20}	?

For any general a_i , a_j :

$$\begin{aligned}
(i) \qquad & a_i + (j-i)d = a_j \\
\Rightarrow \qquad & (j-i)d = a_j - a_i \\
\Rightarrow \qquad & (j-i)d = 14 - 8 \\
\Rightarrow \qquad & (j-i)d = 6 \\
\Rightarrow \qquad & d = \tfrac{6}{(j-i)}
\end{aligned}$$

$$\begin{aligned}
(ii) \qquad & a_1 + (i-1)d = a_i \\
\Rightarrow \qquad & a_1 = a_i - (i-1)d \\
\Rightarrow \qquad & a_1 = a_i - \tfrac{(i-1)6}{(j-i)} \\
\Rightarrow \qquad & a_1 = \tfrac{a_i(j-1) - 6(i-1)}{(j-i)}
\end{aligned}$$

$$\begin{aligned}
iii) S_{20} &= a_1 + a_2 + ... + a_{20} \\
&= \tfrac{n \times [2a_1 + (n-1)d]}{2} \\
&= \frac{20 \times \left[2 \times \frac{a_i(j-1) - 6(i-1)}{(j-i)} + 19 \times \frac{6}{(j-i)}\right]}{2} \\
&= 10 \times \left[2 \times \tfrac{a_i(j-1) - 6(i-1)}{(j-i)} + 19 \times \tfrac{6}{(j-i)}\right] \\
&= \tfrac{20[\, a_i(j-1) - 6(i-1)\,] + 1140}{(j-i)}
\end{aligned}$$