# 10.5.3.15

EE23BTECH11062 - V MANAS

**Question**:
A contract on construction job specifies a penalty for delay of completion beyond a certain date as follows: ₹200 for the first day, ₹250 for the second day, ₹300 for the third day, etc., the penalty for each succeeding day being ₹50 more than for the preceding day. How much money the contractor has to pay as penalty, if he has delayed the work by 30 days?

**Solution**:
Since the penalty is increasing ₹50 per day we can use the formula of an arithmetic progression.The formula for sum of first n numbers of an arithmetic progression is:

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

| Variable | Description | Value |
|---|---|---|
| x(N) | General term($N_{th}$ term) | $x(0) + N \times d$ |
| x(0) | First term of AP | 200 |
| n | number of terms in the AP | 30 |
| d | common difference in the AP | 50 |

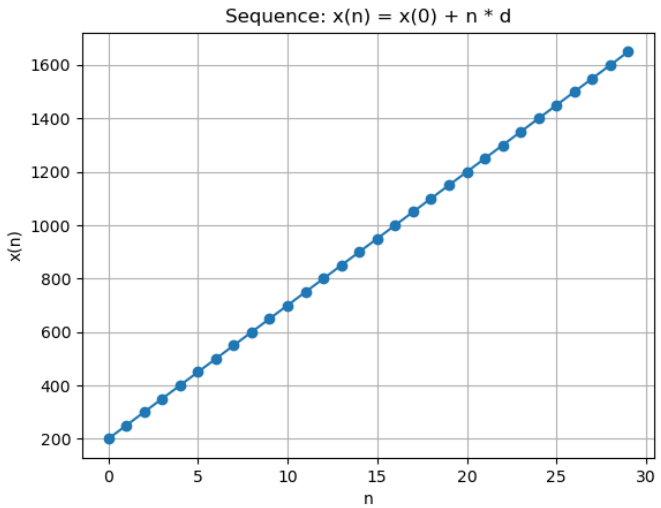


Fig. 0. Stem Plot of x(n)

$$S_n = \frac{30}{2}[2 \times 200 + (30-1) \times 50] \tag{2}$$
$$S_n = 15[400 + 29 \times 50] \tag{3}$$
$$S_n = 15[400 + 1450] \tag{4}$$
$$S_n = 15[1850] \tag{5}$$
$$S_n = 27750 \tag{6}$$

∴The total amount of money that the contractor has to pay as penalty for the delay is ₹27750