# NCERT Discrete - 11.9.1.8

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**Question 11.9.1.8:**

1) Find the seventh term of the sequence where the nth term is given by $a_n = \frac{n^2}{2^n}$

**Solution:** Let $x(n) = a_{n+1}$

$$x(n) = \frac{(n+1)^2}{2^{(n+1)}}u(n) \tag{1}$$

| Parameter | Value |
|---|---|
| $x(n)$ | $\frac{(n+1)^2}{2^{(n+1)}}u(n)$ |
| $x(6)$ | ? |

TABLE 1
INPUT PARAMETERS

Seventh term of the sequence is given by

$$x(6) = \frac{(6+1)^2}{2^{(6+1)}} \tag{2}$$

$$x(6) = \frac{49}{128} \tag{3}$$

The Z transform of x(n) is given by

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)z^{-n} \tag{4}$$

$$X(z) = \sum_{n=-\infty}^{\infty} \frac{(n+1)^2}{2^{(n+1)}}u(n)z^{-n} \tag{5}$$

$$X(z) = \sum_{n=0}^{\infty} \frac{(n+1)^2}{2^{(n+1)}}z^{-n} \tag{6}$$

Using differentiation and scaling property

$$X(z) = \frac{(1+(2z)^{-1})}{2(1-(2z)^{-1})^3}; ROC \quad |z| > \frac{1}{2} \tag{7}$$

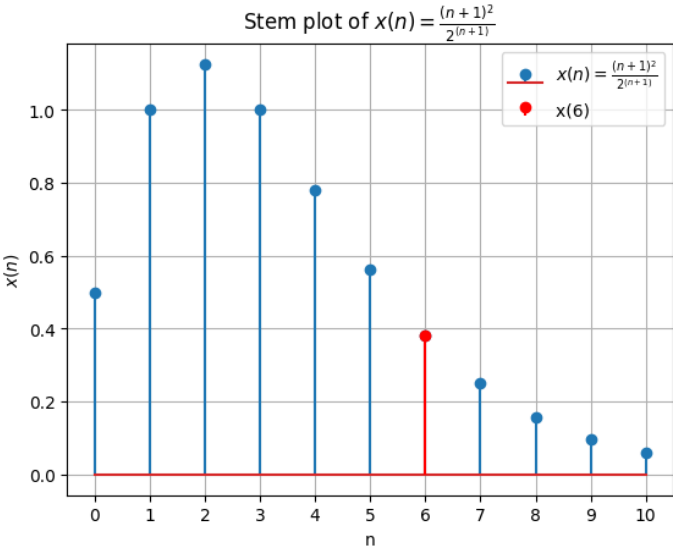


Fig. 1. stem plot of $x(n)$