



CSE230: Discrete Mathematics

SET - B

Semester: Spring 2024
Examination: Quiz 5

Time: 20 minutes
Full marks: 20

Name: _____ ID: _____ Section: _____

(There are 2 questions total. You must answer **both**.
Feel free to use the back of the question paper, if needed.)

Q1. Assume that the population of the world in 2013 was 6.7 billion and is growing at the rate of 1.2% per year.

- (a) Set up a recurrence relation for the population of the world n years after 2013.
(b) Find an explicit formula for the population of the world n years after 2013.

[3+7=10 Marks]

Q2. For the following list of integers: 0, 2, 6, 12, 20, 30, 42, 56, 72, 90, ...

- (a) Provide a simple formula that generates the terms of this integer sequence. ($a_n = ?$)
(b) Using your formula for a_n , calculate $\sum_{i=10}^{14} a_i$ by evaluating the individual terms.

[7+3=10 Marks]

End

1.a) Population in ~~2013~~ n years after 2013 is denoted by a_n
 $a_0 = 6.7$, $a_1 = 6.7 * (1.2)$, $a_2 = 6.7 * (1.2) * (1.2)$
 $\therefore a_n = a_{n-1} * (1.2)$

1.b) Here,
 $a_0 = 6.7 = 6.7 * (1.2)^0$
 $a_1 = 6.7 * (1.2) = 6.7 * (1.2)^1$
 $a_2 = 6.7 * (1.2) * (1.2) = 6.7 * (1.2)^2$
 $a_3 = 6.7 * (1.2) * (1.2) * (1.2) = 6.7 * (1.2)^3$
 $\therefore a_n = 6.7 * (1.2)^n$
Let P_n be population after in n years after 2015.
Population in 2015 = $P_0 = a_2 = 6.7 * (1.2)^2$
 $\therefore P_1 = a_3 = 6.7 * (1.2)^3 \dots P_n = a_{n+2} = 6.7 * (1.2)^{n+2}$

Q.2 a) .

$$\begin{aligned}
 a_0 &= 0 = 0+0 = 0+0^2 \\
 a_1 &= 2 = 1+1 = 1+1^2 \\
 a_2 &= 6 = 2+4 = 2+2^2 \\
 a_3 &= 12 = 3+9 = 3+3^2 \\
 a_4 &= 20 = 4+16 = 4+4^2 \\
 a_5 &= 30 = 5+25 = 5+5^2 \\
 &\vdots \\
 a_n &= n + n^2
 \end{aligned}$$

b)

$a_{10} = 10 + 10^2 =$	110
$a_{11} = 11 + 11^2 =$	132
$a_{12} = 12 + 12^2 =$	156
$a_{13} = 13 + 13^2 =$	182
$a_{14} = 14 + 14^2 =$	210

$$\sum_{i=10}^{14} a_i = \sum_{i=10}^{14} i + i^2 = 110 + 132 + 156 + 182 + 210 = \boxed{790}$$