SPTA
Higher Homework
Recurrence Relations (A)

1. A recurrence relation is given as $U_{n+1} = 0.2U_n + 4$ where $U_0 = 6$. Find the value of U_3. **(2)**

2. The first three terms of a linear recurrence relation $t_{n+1} = mt_n + k$ are 10, 7 and 4 in order.

   Find the values of m and k. **(3)**

3. A sequence is defined by the recurrence relation $U_{n+1} = 0.6U_n + 50$

   (a) Explain why this sequence has a limit

   (b) Calculate this limit. **(3)**

4. A job offers a starting salary of £30,000 with an annual percentage increase of 3.5% plus an annual increment of £1,500.

   (a) Find a recurrence relation for the total annual salary.

   (b) Calculate the expected salary 5 years after starting. **(3)**

5. A garden centre needs a lot of water to keep their plants alive. Therefore they have a 60 litre water tank on site, but unfortunately it is leaking. Every day it loses 22% of its volume.
   At the start of each day the owner puts an extra 5 litres into the tank.

   (a) Find a recurrence Relation to describe this. **(1)**

   (b) Calculate the volume of water in the tank after 1 week. **(2)**

   (c) If the water in the tank falls below 20 litres the centre will not have enough water for the plants.

   In the long run will the Garden centre have enough water? **(3)**