**Summary:**

25000 variations. First order linear recurrence relation.

**Question:**

The number of numbats in an area near Perth has been dropping by <EFOFEX>
id:fxe{b5c1589d-e590-4c63-8082-5427f3829b4c}
FXGP:DP-55D824e
FXData:

</EFOFEX> per year. Researchers have determined that the current population of numbats is <EFOFEX>
id:fxe{f4761584-dbb0-4e1b-8b26-91d3854494e1}
FXGP:DP-55D824e
FXData:

</EFOFEX>. The researchers start trialling a program where <EFOFEX>
id:fxe{e91e4af4-9e3d-4c63-bb56-0318a89c8d99}
FXGP:DP-55D824e
FXData:

</EFOFEX> numbats are introduced into the area each year.

The population of numbats can be modelled using a first-order linear recurrence relation.

<EFOFEX>
id:fxe{730ab6b3-2042-4a7f-9968-b8a475bc0852}
FXGP:DP-55D824e
FXData:

</EFOFEX>

where *Tn* is the number of numbats in the area at the beginning of the nth year.

1. Explain the coefficient <EFOFEX>
   id:fxe{0cde582f-778a-4d63-9f0a-91b094aca61f}
   FXGP:DP-55D824e
   FXData:

   </EFOFEX> in the context of the situation.
2. State the value of a in the equation.
3. Graph the number of numbats numbers in the area for every 3 year period (commencing at n = 0) up to the 30th year on the axes below.

<EFOFEX>
id:fxd{331c258a-63ea-481c-86e3-9de1261602f0}
FXGP:DP-55D824e
FXData:

</EFOFEX>

1. Using your graph, comment on how the population of numbats is changing over time.
2. To the nearest whole number, what is the long-term effect of the repopulation program.

**Solution:**

1. <EFOFEX>
   id:fxe{32baf8ad-9a72-496b-b297-c7fb6e189aac}
   FXGP:DP-55D824e
   FXData:

   </EFOFEX> is the ratio of numbats remaining in the area each year. This is equivalent to a percentage of <EFOFEX>
   id:fxe{eeb2ca63-969b-4e2e-9cdf-d26f14c8c141}
   FXGP:DP-55D824e
   FXData:

   </EFOFEX>
2. a = <EFOFEX>
   id:fxe{cf7e26dd-7e9f-4ee1-a214-c0d4bf597707}
   FXGP:DP-55D824e
   FXData:

   </EFOFEX>. This is the number of numbats added to the population each year.

<EFOFEX>
id:fxd{465c1eaf-09ba-4da2-858e-0eb9d8a1bb82}
FXGP:DP-55D824e
FXData:

</EFOFEX>

1. The population of numbats is <EFOFEX>
   id:fxe{25492fd0-1b71-429b-afb3-5ecc5d24a62d}
   FXGP:DP-55D824e
   FXData:

   </EFOFEX>. The population is levelling out over time.
2. <EFOFEX>
   id:fxe{afd7668f-d50a-4e36-b1c0-420c2a44ab5a}
   FXGP:DP-55D824e
   FXData:

   </EFOFEX>

The population of numbats will settle to approximately <EFOFEX>
id:fxe{cb8f2d92-917e-45e9-9bf8-8e96e3e086fd}
FXGP:DP-55D824e
FXData:

</EFOFEX>.