# Computer Project 2
# Daniel Studenmund
with(LinearAlgebra):
with(plots):

# Import data below. This .csv file contains two columns. The first is a list of years from 1922 to 2013, and the second shows the number of tourists who departed from New Zealand in that year.
M := ImportMatrix("/u/ma/dhs/Downloads/NZ_data.csv");

\[
\begin{bmatrix}
92 \\
N \times 2 \text{ Matrix} \\
\text{Data Type: anything} \\
\text{Storage: rectangular} \\
\text{Order: Fortran_order}
\end{bmatrix}
\]

# Check to make sure the data looks reasonable. See if there's a surge in tourism around the time the Lord of the Rings movies came out.
plots[pointplot](M);

# Do some setup so we can apply the methods in class to solve this problem:
b := M.(0, 1);
\[ b := \begin{bmatrix}
1 & \ldots & 92 \\
\text{Vector}_{\text{column}} \n\end{bmatrix}
\]

Data Type: anything
Storage: rectangular
Order: Fortran_order

> \( A := \langle \text{Vector}(\text{column}, \text{RowDimension}(M), 1)|M.(1, 0) \rangle; \)

\[ A := \begin{bmatrix}
92 & \times & 2 \\
\text{Matrix} \n\end{bmatrix}
\]

Data Type: anything
Storage: rectangular
Order: Fortran_order

> # After some work (not shown here) we find that the vector \( x \) that comes closest to solving \( Ax=b \) is:

\[ x := \begin{bmatrix}
-373496346176 \\
9269 \\
384076857 \\
18538 
\end{bmatrix}
\]

> \( y := x(1) + x(2) \cdot t; \)

\[ y := -\frac{373496346176}{9269} + \frac{384076857}{18538} \cdot t \]

> \text{display}\{\text{plot}(y, t = 1920..2015), \text{plots}[\text{pointplot}](M)\};
> # Now let's compare our line of best fit to Maple's:
> with(Statistics):
> z := LinearFit([1, t], M, t);
> z := -4.02952148210165 \times 10^7 + 20718.3545689935 \times t \quad (6)
> y - z
> 0.00101648271083832 + 0.000000100648685474880 \times t \quad (7)
> # This is very close to zero, so it looks like what we did is the same (or close to the same) as what Maple did.