Mathematician of the week

Alexander Craig Aitken
Born: 1st April 1895 in Dunedin, New Zealand
Died: 3rd Nov 1967 in Edinburgh, Scotland

Alec's father, William Aitken, was a grocer in Dunedin. Alec was the eldest of seven children.

At school he won a scholarship to Otago University to study languages and mathematics with the intention of becoming a school teacher but his university career was interrupted by World War I.

In 1915 he enlisted in the New Zealand Expeditionary Force and served in Gallipoli, Egypt, and France, being wounded at the battle of the Somme. His war experiences were to haunt him for the rest of his life. After three months in hospital in Chelsea, London, he was sent back to New Zealand in 1917.

Aitken followed his original intention and became a school teacher at his old school Otago Boys' High School in New Zealand. His mathematical genius bubbled under the surface. Finally, Aitken came to Scotland in 1923 and studied for a Ph.D. at Edinburgh under Whittaker.

He was appointed to lecture at Edinburgh University in 1925 where he spent the rest of his life. Aitken had an incredible memory (he knew π to 2000 places!) and could instantly multiply, divide and take roots of large numbers.

His incredible memory however did not help when it came to the harrowing memories of the Somme. He tried to forget by writing a book about the Somme but it did not help him. These memories were a cause of the recurrent ill health he suffered. He eventually died from this illness.

In algebra he made contributions to the theory of determinants in matrices.

Aitken wrote several books, including *The theory of canonical matrices* (1932), *Determinants and matrices* (1939) and *Statistical Mathematics* (1939). In 1962 he published an article very dear to his heart, namely *The case against decimalisation.*

Alec Aitken spent much of his mathematical life working on Matrices.

A *matrix* is two dimensional "box" of numbers.
There are (easy) rules for adding and subtracting and multiplying matrices of the same shape.
Matrices are very useful in enlarging or rotating or reflecting a shape and so are used a lot in cartoons and movies.

Adding:

$$\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} + \begin{pmatrix} 2 & 4 \\ 3 & 5 \end{pmatrix} = \begin{pmatrix} 1+2 & 2+4 \\ 3+3 & 4+5 \end{pmatrix} = \begin{pmatrix} 3 & 6 \\ 6 & 9 \end{pmatrix}$$

Subtracting

$$\begin{pmatrix} 8 & 6 \\ 4 & 7 \end{pmatrix} - \begin{pmatrix} 2 & 4 \\ 3 & 5 \end{pmatrix} = \begin{pmatrix} 8-2 & 6-4 \\ 4-3 & 7-5 \end{pmatrix} = \begin{pmatrix} 6 & 2 \\ 1 & 2 \end{pmatrix}$$

Multiplying

$$\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \times \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 1 \times x + 2 \times y \\ 3 \times x + 4 \times y \end{pmatrix} = \begin{pmatrix} 1x + 2y \\ 3x + 4y \end{pmatrix}$$

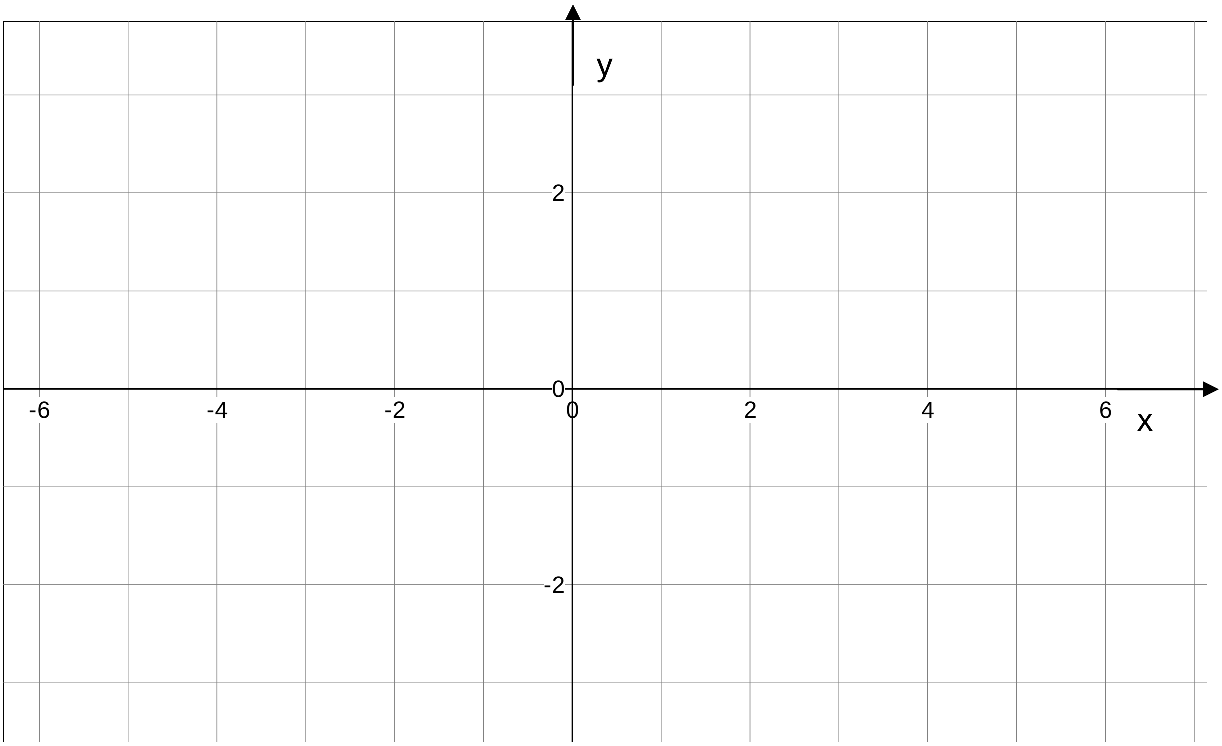
$$\begin{pmatrix} 3 & 0 \\ 0 & 2 \end{pmatrix} \times \begin{pmatrix} 3 \\ 4 \end{pmatrix} = \begin{pmatrix} 3 \times 3 + 0 \times 4 \\ 0 \times 3 + 2 \times 4 \end{pmatrix} = \begin{pmatrix} 9 \\ 8 \end{pmatrix}$$

Try this one:

$$\begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix} \times \begin{pmatrix} 3 \\ 4 \end{pmatrix} =$$

Alexander Aitken's quiz

Plot and join the following points on the graph below.
(2,0) (2,2) (1,2) (1,1)



1. Now write each point as a matrix for example (3,0) becomes $\begin{pmatrix} 3 \\ 0 \end{pmatrix}$
2. Multiply each point by the matrix $\begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$. You should have 4 more points.
3. What has happened to the picture when you plot the new points?
4. Try the following other matrices in the same way $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ and
5. $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$
6. Can you find a matrix that does not alter the shape at all?

Alexander Aitken's quiz answers

Matrix transformations

1. Matrix $\begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$ enlarges the shape by a scale factor of 2 about the origin
2. Matrix $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ reflects the shape in the x-axis
3. Matrix $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ reflects the shape in the y-axis
4. The identity matrix $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ does not change or move the shape at all.