Exercise 15A: Solutions

1 a Number of rows $\times$ number of columns $= 2 \times 2$

b Number of rows $\times$ number of columns $= 2 \times 3$

c Number of rows $\times$ number of columns $= 1 \times 4$

d Number of rows $\times$ number of columns $= 4 \times 1$

2 a There will be 5 rows and 5 columns to match the seating. Every seat of both diagonals is occupied, and so the diagonals will all be ones, and the rest of the numbers, representing unoccupied seats, will all be 0.

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 & 1 \end{bmatrix}$$

b If all seats are occupied, then every number in the matrix will be 1.

$$\begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix}$$

3 a $i = j$ for the leading diagonal only, so the leading diagonal will be all ones, and the rest of the numbers 0.

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

b
$$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 1 & 1 & 0 \end{bmatrix}$$

c
$$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \end{bmatrix}$$

4 We can present this as a table with the girls on the top row, and the boys on the bottom row, in order of year level, i.e. years $7, 8, 9, 10, 11$ and 12 going from left to right.

$$\begin{bmatrix} 200 & 180 & 135 & 110 & 56 & 28 \\ 110 & 117 & 98 & 89 & 53 & 33 \end{bmatrix}$$

Alternatively, girls and boys could be the two columns, and year levels could run down from year 7 to 12, in order. This would give:

$$\begin{bmatrix} 200 & 110 \\ 180 & 117 \\ 135 & 98 \\ 110 & 89 \\ 56 & 53 \\ 28 & 33 \end{bmatrix}$$

5 a Matrices are equal only if they have the same number of rows and columns, and all pairs of corresponding entries are equal. The first two matrices have the same dimensions, but the top entries are not equal, so the matrices cannot be equal.
The last two matrices have the same dimensions and equal first (left) entries, so they will be equal if $x = 4$.

Thus, $\begin{bmatrix} 0 & x \end{bmatrix} = \begin{bmatrix} 0 & 4 \end{bmatrix}$ if $x = 4$.

b The first two matrices cannot be equal because corresponding entries are not equal, nor can the second and third for the same reason.
The last matrix cannot equal any of the others because it has different dimensions. The only two that can be equal are the first and third.

$\begin{bmatrix} 4 & 7 \\ 1 & -2 \end{bmatrix} = \begin{bmatrix} x & 7 \\ 1 & -2 \end{bmatrix}$ if $x = 4$

c All three matrices have the same dimensions and all corresponding numerical entries are equal. They could all be equal.

$$\begin{bmatrix} 2 & x & 4 \\ -1 & 10 & 3 \end{bmatrix} = \begin{bmatrix} y & 0 & 4 \\ -1 & 10 & 3 \end{bmatrix} = \begin{bmatrix} 2 & 0 & 4 \\ -1 & 10 & 3 \end{bmatrix}$$

if $x = 0, y = 2$

6 a The entry corresponding to x is 2, and the entry corresponding to y is 3, so $x = 2$ and $y = 3$.

b The entry corresponding to x is 3, and the entry corresponding to y is 2, so $x = 3$ and $y = 2$.

c The entry corresponding to x is 4, and the entry corresponding to y is -3, so $x = 4$ and $y = -3$.

d The entry corresponding to x is 3, and the entry corresponding to y is -2, so $x = 3$ and $y = -2$.

7 Write it as set out, with each row representing players A, B, C, D and E respectively, and columns showing points, rebounds and assists respectively.

$$\begin{bmatrix} 21 & 5 & 5 \\ 8 & 2 & 3 \\ 4 & 1 & 1 \\ 14 & 8 & 60 \\ 0 & 1 & 2 \end{bmatrix}$$