# Worksheet: getting comfortable with matrix indexing 

All of these problems use " $a_{i j}$ " for the entry in row $i$ and column $j$ of a matrix $A$.
Do these problems with a group, if possible!
I. Write down the 3 by 3 matrix $A$ whose entries are given by
(a) $\quad a_{i j}=$ minimum of $i$ and $j$
(b) $a_{i j}=(-1)^{i+j}$
(c) $a_{i j}=i / j$
II. What words would you use to describe each of these classes of matrices? Give a 3 by 3 example in each class. Which matrix belongs to all four classes?
(a) $a_{i j}=0$ if $i \neq j$
(b) $a_{i j}=0$ if $i<j$
(c) $a_{i j}=a_{j i}$
(d) $a_{i j}=a_{1 j}$
III. Write a sum in terms of entries $a_{i j}$ and $b_{i j}$. Don't look-up the formula!
(a) Suppose $A$ is $m \times n$ and $B$ is $n \times p$. Let $C=A B$. Write a formula for each entry of $C$ : $c_{i j}=$
(b) Suppose $A$ is $m \times 1$ and $B$ is $1 \times p$, so $A$ is actually a column vector and $B$ is actually a row vector. Again let $C=A B$, and write a formula for $c_{i j}$. (This time it is very simple! You are writing-out how the outer product works.)
$c_{i j}=$

