

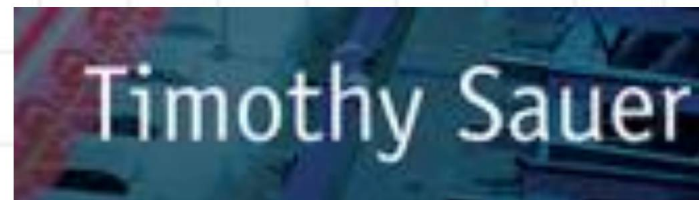
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Practice Problems For Permutation Matrices

5 & 6, 7 Chapter 2.4 Exercises

Data for the practice problems for Permutation matrices



5. Write down a 5×5 matrix P such that multiplication of another matrix by P on the left causes rows 2 and 5 to be exchanged.

P_{15342}
 5×5

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 \end{bmatrix}
 \begin{bmatrix} a & b & c & d & e \\ F & G & H & I & J \\ K & L & M & N & O \\ P & Q & R & S & T \\ U & V & W & X & Y \end{bmatrix}
 =
 \begin{bmatrix} a & b & c & d & e \\ U & V & W & X & Y \\ K & L & M & N & O \\ P & Q & R & S & T \\ F & G & H & I & J \end{bmatrix}$$

P
 $\begin{matrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{matrix} \rightarrow \begin{matrix} 1 \\ 5 \\ 3 \\ 4 \\ 2 \end{matrix}$

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}
 \begin{matrix} \rightarrow \\ \rightarrow 2 \\ \rightarrow \\ \rightarrow 5 \end{matrix}$$

Same
 Same

Practice problem -5

6. (a) Write down the 4×4 matrix P such that multiplying a matrix on the left by P causes the second and fourth rows of the matrix to be exchanged. (b) What is the effect of multiplying on the *right* by P ? Demonstrate with an example.

4×4 $I = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

Part (a)

Practice problem -6-part a

P
1
2
3
4

P
1
4
3
2

$\downarrow$ P_{1432}

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

$$\begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \\ 13 & 14 & 15 & 16 \end{bmatrix} = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 13 & 14 & 15 & 16 \\ 9 & 10 & 11 & 12 \\ 5 & 6 & 7 & 8 \end{bmatrix}$$

6. (a) Write down the 4×4 matrix P such that multiplying a matrix on the left by P causes the second and fourth rows of the matrix to be exchanged. (b) What is the effect of multiplying on the *right* by P ? Demonstrate with an example.

$$\begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \\ 13 & 14 & 15 & 16 \end{bmatrix} \begin{matrix} P_{1432} \\ \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix} = \begin{bmatrix} 1 \\ 5 \\ 9 \\ 13 \end{bmatrix}$$

First Column remains

Practice problem -6-part b.

$$\begin{matrix} C_{1234} \\ \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \end{matrix}$$

6. (a) Write down the 4×4 matrix P such that multiplying a matrix on the left by P causes the second and fourth rows of the matrix to be exchanged. (b) What is the effect of multiplying on the *right* by P ? Demonstrate with an example.

$$\begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \\ 13 & 14 & 15 & 16 \end{bmatrix} \begin{matrix} P_{1432} \\ \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix} = \begin{bmatrix} 1 & 4 \\ 5 & 8 \\ 9 & 12 \\ 13 & 16 \end{bmatrix}$$

First Column remains
Last Column becomes 2nd CL

6. (a) Write down the 4×4 matrix P such that multiplying a matrix on the left by P causes the second and fourth rows of the matrix to be exchanged. (b) What is the effect of multiplying on the *right* by P ? Demonstrate with an example.

$$\begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \\ 13 & 14 & 15 & 16 \end{bmatrix} \begin{matrix} P_{1432} \\ \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix} = \begin{bmatrix} 1 & 4 & 3 \\ 5 & 8 & 7 \\ 9 & 12 & 11 \\ 13 & 16 & 15 \end{bmatrix}$$

First Column remains
 Last Column becomes 2 CL
 Third Column remains

The first, second and third columns-
 practice problem -6-part b.

6. (a) Write down the 4×4 matrix P such that multiplying a matrix on the left by P causes the second and fourth rows of the matrix to be exchanged. (b) What is the effect of multiplying on the *right* by P ? Demonstrate with an example.

$$\begin{array}{c} A \\ \begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \\ 13 & 14 & 15 & 16 \end{bmatrix} \end{array}
 \begin{array}{c} P_{1432} \\ \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix} \end{array}
 =
 \begin{bmatrix} 1 & 4 & 3 & 2 \\ 5 & 8 & 7 & 6 \\ 9 & 12 & 11 & 10 \\ 13 & 16 & 15 & 14 \end{bmatrix}$$

First Column remains
Last Column becomes 2 CL

Third Column remains
2nd Column $\rightarrow$ become Last

Final arrangements of columns -Practice problem-part b.

7. Change four entries of the leftmost matrix to make the matrix equation correct:

$$\begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} 1 & 2 & 3 & 4 \\ 3 & 4 & 5 & 6 \\ 5 & 6 & 7 & 8 \\ 7 & 8 & 9 & 0 \end{bmatrix} = \begin{bmatrix} 5 & 6 & 7 & 8 \\ 3 & 4 & 5 & 6 \\ 7 & 8 & 9 & 0 \\ 1 & 2 & 3 & 4 \end{bmatrix}.$$

P
 $1 \rightarrow 4$
 $2 \rightarrow 2$
 $3 \rightarrow 1$
 $4 \rightarrow 3$

$$\begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} 1 & 2 & 3 & 4 \\ 3 & 4 & 5 & 6 \\ 5 & 6 & 7 & 8 \\ 7 & 8 & 9 & 0 \end{bmatrix} \Rightarrow \begin{bmatrix} 5 & 6 & 7 & 8 \\ \text{same} \\ 7 & 8 & 9 & 0 \\ 1 & 2 & 3 & 4 \end{bmatrix}$$

Practice problem-7 for permutation matrix