

## Matrix Multiplication

Is it possible to multiply the matrices shown?

(a)  $\begin{pmatrix} 2 \\ 0 \\ 4 \end{pmatrix} \times \begin{pmatrix} 5 & -1 \\ 4 & 0 \end{pmatrix}$

(b)  $(-7 \ 4) \times \begin{pmatrix} 2 \\ 6 \end{pmatrix}$

(c)  $\begin{pmatrix} 1 & 0 \\ 4 & -3 \end{pmatrix} \times \begin{pmatrix} 3 & 2 & 5 \\ 6 & 0 & -1 \end{pmatrix}$

(a)  $(3 \times 1) \times (2 \times 2)$  NO

(b)  $(1 \times 2) \times (2 \times 1)$  YES

(c)  $(2 \times 2) \times (2 \times 3)$  YES

Work out:

(a)  $\begin{pmatrix} 4 \\ 2 \end{pmatrix} \times (-2 \ 5)$

(b)  $\begin{pmatrix} 0 & 3 \\ 2 & 5 \end{pmatrix} \times \begin{pmatrix} -1 & 3 \\ 0 & 6 \end{pmatrix}$

(c)  $(4 \ 7 \ -2) \times \begin{pmatrix} 0 \\ 1 \\ 5 \end{pmatrix}$

(d)  $\begin{pmatrix} 1 & -2 \\ 3 & 7 \end{pmatrix} \times \begin{pmatrix} -1 & 4 \\ 0 & -2 \end{pmatrix}$

(e)  $\begin{pmatrix} 0 & 2 \\ -5 & 3 \end{pmatrix} \times \begin{pmatrix} 1 & 6 \\ -3 & 0 \end{pmatrix}$

(f)  $\begin{pmatrix} -2 & 1 \\ 8 & 0 \end{pmatrix} \times \begin{pmatrix} -3 & 5 \\ 1 & 2 \end{pmatrix}$

(a)  $\begin{pmatrix} -8 & 20 \\ -4 & 10 \end{pmatrix}$

(b)  $\begin{pmatrix} 0 & 18 \\ -2 & 36 \end{pmatrix}$

(c)  $(-3)$

(d)  $\begin{pmatrix} -1 & 8 \\ -3 & -2 \end{pmatrix}$

(e)  $\begin{pmatrix} -6 & 0 \\ -14 & -30 \end{pmatrix}$

(f)  $\begin{pmatrix} 7 & -8 \\ -24 & 40 \end{pmatrix}$

(a) Given that

$$\begin{pmatrix} -2 & a \\ -4 & 3 \end{pmatrix} \begin{pmatrix} 3 \\ 7 \end{pmatrix} = \begin{pmatrix} 22 \\ 9 \end{pmatrix}$$

work out the value of  $a$ .

(b) Matrix  $P = \begin{pmatrix} 2 & 3 \\ a & b \end{pmatrix}$

Matrix  $Q = \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$

You are given that  $PQ = QP$ . Work out the values of  $a$  and  $b$ .

$$\begin{aligned} \text{(a)} \quad -6 + 7a &= 22 \\ 7a &= 28 \\ a &= 4 \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad \begin{pmatrix} 2 & 3 \\ a & b \end{pmatrix} \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix} &= \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 2 & 3 \\ a & b \end{pmatrix} \\ \begin{pmatrix} 2 & 5 \\ a & a+b \end{pmatrix} &= \begin{pmatrix} 2+a & 3+b \\ a & b \end{pmatrix} \end{aligned}$$

$$a = 0 \quad b = 2$$