# Questions: Introduction to matrices

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**Summary**

A selection of questions on matrices.

Before attempting these questions, it is highly recommended that you read [Guide: Introduction to matrices].

# Q1

You are given the following matrices:

$$A = \begin{bmatrix} 2 & -1 & \sqrt{3} \\ 0 & 4 & -\pi \end{bmatrix} \;, \quad B = \begin{bmatrix} 2 & -2 \\ 3 & -4 \end{bmatrix} \;, \quad C = \begin{bmatrix} 0 & -1 & 2 & 3 \\ 4 & -\sqrt{2} & 1 & -5 \\ 6 & \pi & -7 & 0 \end{bmatrix} \;, \quad D = \begin{bmatrix} 3 & -1 \\ \sqrt{5} & x \\ y & 1/2 \end{bmatrix} \;,$$

$$E = \begin{bmatrix} 1 & -2 & \sqrt{7} \\ 1 & 3 & -4 \\ 5 & -6 & 7 \end{bmatrix} \;, \quad F = \begin{bmatrix} -2 & 3/4 & -1 \\ \pi & -\sqrt{3} & x^2 \\ 7 & 0 & -5 \end{bmatrix} \;, \quad G = \begin{bmatrix} -1 \\ 5 \\ 1 \\ 8 \\ 3 \end{bmatrix} \;, \quad H = \begin{bmatrix} \sqrt{2} & -3 & 4 \\ 5 & -1 & 2/3 \\ x & \pi & -7 \\ 8 & 9 & -10 \end{bmatrix} \;.$$

## Q1.1

Give the dimensions of all matrices A-H.

## Q1.2

Give the values of the following entries:

a. $a_{11}$

b. $g_{41}$

c. $d_{12}$

d. $f_{32}$

e. $b_{21}$

f. $a_{12}$

g. $c_{23}$

h. $e_{23}$

i. $h_{31}$

j. $h_{13}$

k. $e_{32}$

l. $g_{11}$

## Q1.3

Give the main diagonals of the matrices A, C, E, and G.

## Q2

You are given the following matrices:

$$I = \begin{bmatrix} 3 \\ -\sqrt{5} \\ 2 \\ \pi \end{bmatrix} \,, \quad J = \begin{bmatrix} -1 \\ 5 \\ 2/3 \\ -\sqrt{7} \end{bmatrix} \,, \quad K = \begin{bmatrix} 1 & -2 & 3 \\ 4 & 1 & -5 \\ 6 & -7 & \pi \end{bmatrix} \,, \quad L = \begin{bmatrix} \sqrt{3} & -4 & 5/2 \\ -6 & 7 & -8 \\ 9 & -1 & 10 \end{bmatrix} \,,$$

$$M = \begin{bmatrix} 1 & -2 & 3 & 4 \\ 5 & -1 & \sqrt{2} & -6 \end{bmatrix} \,, \quad N = \begin{bmatrix} -\pi & 3/4 & -1 & 2 \\ 0 & -\sqrt{5} & x & 7 \end{bmatrix} \,, \quad O = \begin{bmatrix} 1 & -2 \\ 3 & 4 \\ -5 & 1 \end{bmatrix} \,, \quad P = \begin{bmatrix} \sqrt{3} & -4 \\ \pi & 5 \\ -6 & 7 \end{bmatrix} .$$

Calculate the following questions using matrix addition, subtraction, and scalar multiplication:

a.   $I + J$

b.   $L - K$

c.   $N + M$

d.   $O - P$

e.   $3I$

f.   $-2J$

g.   $xK$

h.   $-4L$

i.   $yM$

j.   $7N$

k.   $(1/2)O$

l.   $-4P$

m.   $3I + J$

n.   $-2(K + L)$

o.   $N - 4M$

# Q3

You are given the following matrices:

$$Q = \begin{bmatrix} 2 & 3 & 1 & 4 \end{bmatrix}, \quad R = \begin{bmatrix} -1 \\ 3 \\ \pi \\ 5 \end{bmatrix}, \quad S = \begin{bmatrix} 1 & -2 & 5 \\ -3 & 4 & -1 \end{bmatrix}, \quad T = \begin{bmatrix} 5 & -6 \\ 7 & 2 \\ 0 & 8 \end{bmatrix},$$

$$U = \begin{bmatrix} -1 & 2 \\ 3 & -4 \end{bmatrix}, \quad V = \begin{bmatrix} \sqrt{2} & -1/2 \\ 3 & 7 \end{bmatrix}, \quad W = \begin{bmatrix} 0 & -1 & 2 & \pi \\ 3 & -4 & 5 & -6 \\ 1 & \sqrt{7} & -8 & 9 \end{bmatrix}, \quad X = \begin{bmatrix} 4 \\ 1/2 \end{bmatrix}.$$

Finally calculate the following using matrix multiplication:

a. $QR$

b. $RQ$

c. $ST$

d. $TS$

e. $UV$

f. $VU$

g. $WR$

h. $SW$

i. $TU$

j. $TV$

k. $TX$

l. $UX$

m. $VX$

n. $XQ$

o. $VV$

p. $UU$

q. $UXQ$

r. $U^3$

s. $STV$

t. $TXQR$

u. $3UX$

v. $(ST) - 2U$

w. $WR + TX$

x. $-RQR$

y. $(V + U)X$

z. $4U^2 + V^2$

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After attempting the questions above, please click this link to find the answers.

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## Version history

v1.0: initial version created 04/25 by Jessica Taberner as part of a University of St Andrews VIP project.