# Questions: Introduction to matrices

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**Summary**

A selection of questions for the study guide on introduction to matrices.

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

## Q1

You are given the following matrices:

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

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

1.1. Give the dimensions of all matrices $A - H$.

1.2. 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. $[G]_{11}$

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

# Q2

You are given the following matrices:

$$X = \begin{bmatrix} 3 \\ -\sqrt{5} \\ 2 \\ \pi \end{bmatrix}, \quad Y = \begin{bmatrix} -1 \\ 5 \\ 2/3 \\ -\sqrt{7} \end{bmatrix}, \quad Z = \begin{bmatrix} 1 & -2 & 3 \\ 4 & 1 & -5 \\ 6 & -7 & \pi \end{bmatrix}, \quad W = \begin{bmatrix} \sqrt{3} & -4 & 5/2 \\ -6 & 7 & -8 \\ 9 & -1 & 10 \end{bmatrix},$$

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

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

2.1. $X + Y$

2.2. $Z - W$

2.3. $N + M$

2.4. $O - P$

2.5. $3X$

2.6. $-2Y$

2.7. $xZ$

2.8. $-4W$

2.9. $yM$

2.10. $7N$

2.11. $(1/2)O$

2.12. $-4P$

2.13. $3X + Y$

2.14. $-2(Z + W)$

2.15. $N - 4M$

# Q3

You are given the following matrices:

$$Q = \begin{bmatrix} 2 & 3 & 1 & 4 \\ 0 & 3 & 1 & 4 \\ 0 & 0 & 1 & 4 \\ 0 & 0 & 0 & 4 \end{bmatrix}, \quad R = \begin{bmatrix} -1 & 1 \\ 3 & -3 \\ \pi & -2\pi \\ 5 & 15 \end{bmatrix}, \quad S = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 4 & -1 \\ 0 & 0 & 3 \end{bmatrix}, \quad T = \begin{bmatrix} 5 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 8 \end{bmatrix},$$

Give their main diagonals, and state whether each of the matrices are:

3.1. square;

3.2. upper triangular;

3.3. lower triangular;

3.4. diagonal.

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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.