

1. Workout the following matrices

a) $\begin{bmatrix} -2 & 4 & 0 \\ 7 & -1 & -4 \\ 3 & 8 & 6 \end{bmatrix} + \begin{bmatrix} 4 & -5 & -1 \\ 2 & -4 & -4 \\ 1 & 1 & 1 \end{bmatrix}$

b) $\begin{bmatrix} -2 & -4 & 5 \\ 1 & 0 & 3 \end{bmatrix} \times \begin{bmatrix} 1 & 2 \\ -3 & 1 \\ 2 & 1 \end{bmatrix}$

2. Briefly describe why matrices are important to computing projects, use an **example** to assist your answer.

3. If $A = \begin{bmatrix} 3 & 6 \\ -2 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 5 \\ -3 & -4 \end{bmatrix}$ find the following.

- a) $2A$
 b) $2A - B$
 c) $A \times 3B$

4. If $A = \begin{bmatrix} 4 & -1 \\ 3 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 2 \\ -5 & 1 \end{bmatrix}$ find the following.

- a) $A + B$
 b) Determinant of $A - B$
 c) AB

5. If $A = \begin{bmatrix} 1 & 5 \\ 3 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$ find the following.

- a) $A + B$
 b) B^{-1}
 c) AB

6. Find the inverse of the following matrix.

$$\begin{bmatrix} -2 & 4 & -1 \\ -3 & -1 & -3 \\ 0 & 5 & 2 \end{bmatrix}$$

7. Solve the following simultaneous equations using matrices, clearly mentioned all the steps and workings.

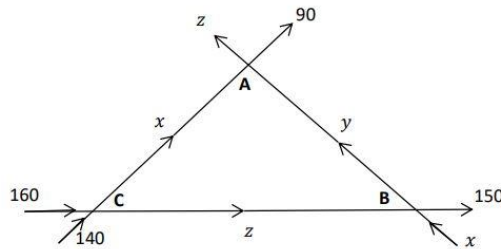
a) $4x + 6y = 18$
 $3x - 2y = 33$

b) $x + y = 5$
 $x - y = 1$

c) $2x + y = 4$
 $x - 2y = -3$

d) $3x - y + z = 8$
 $X - 3y + 2z = 9$
 $-x + y - 4z = -1$

8. The following diagram shows the flow of traffic in one-way roads (indicated by arrows) in a city. The flow of traffic in and out of the city is measured in terms of vehicles per hour (vph). The average number of vehicles entering and leaving each intersection per hour appears on each road. Answer the questions given below.
- Construct a mathematical model that describes the traffic flow in the city. (3 marks)
 - Find the respective flows of traffic by applying matrix inversion on the linear system comprising three equations that describe traffic flows at intersections A, B and C. (10 marks)



9. There are three types of passengers who visit three separate social service counters at an airport in Sri Lanka (note any passenger can go to any counter). Three types of passengers are local, Europe and Asia. To receive the service, passengers need to deposit an advance amount at each counter and once the service completes, they will receive the deposit back again once they leave. The total deposits for each counter, calculating separately, are different for three types of passengers. When passengers come into the counter, the total deposit at the counter will increase and when a passenger leaves, the same amount will reduce from the total deposit at the counter.

At the first counter, one Local and 3 Asians arrived and one European leaves, first counter total deposit value at the moment is \$ 5. At the second counter, one Local, one European and 6 Asians arrived, and no one leaves, second counter total deposit value at the moment is \$ 12. At the third counter, three Local and two Asians arrived and two Europeans leave, third counter total deposit value at the moment is \$10.

Construct three simultaneous equations for the above scenario and solve the equations using matrices to find the three different amounts for Local, Europe and Asia.