

## Questions

1. Given  $A = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 4 & -1 \\ 2 & -2 & 5 \end{pmatrix}$  and  $B = \begin{pmatrix} -2 & 0 & 1 \\ 1 & 3 & 4 \\ 6 & -1 & 2 \end{pmatrix}$ .

- Find  $AB$
- Show that  $(AB)^T = B^T A^T$

2. Given the matrices  $P = \begin{pmatrix} 3 & 6 & 3 \\ 3 & -3 & 0 \\ 9 & 3 & 3 \end{pmatrix}$  and  $Q = \begin{pmatrix} -1 & -1 & 4 \\ -1 & -2 & 5 \\ 1 & 1 & -3 \end{pmatrix}$ . Find  $PQ^T$ . Hence,

find  $P^{-1}$ .

3. Given that matrix  $A = \begin{pmatrix} 4 & -1 & 6 \\ y & 9 & 3 \\ x & 1 & 4 \end{pmatrix}$  and its cofactor matrix is  $\begin{pmatrix} 33 & 2 & -17 \\ 10 & 4 & -6 \\ -57 & -6 & 37 \end{pmatrix}$ .

Show that  $x = 2$

Hence, find

- The value of  $y$
- The determinant,  $|A|$
- The adjoint matrix,  $\text{Adj}(A)$
- The inverse matrix,  $A^{-1}$

4. Given  $A = \begin{pmatrix} 1 & 2 & 0 \\ 3 & 2 & 1 \\ 2 & 4 & 1 \end{pmatrix}$  and  $B = \begin{pmatrix} 2 & 2 & -2 \\ 1 & -1 & 1 \\ -8 & 0 & 4 \end{pmatrix}$

- Show that  $AB = 4I$
- Hence
  - Determine  $A^{-1}$
  - Solve the following system of linear equations
 
$$x + 2y = 5$$

$$3x + 2y + z = 10$$

$$2x + 4y + z = 13$$

5. a) If  $P = \begin{pmatrix} 1 & 5 & 10 \\ 0 & 1 & 4 \\ 1 & 6 & 15 \end{pmatrix}$  and  $Q = \begin{pmatrix} -9 & -15 & 10 \\ 4 & 5 & -4 \\ -1 & -1 & 1 \end{pmatrix}$ , find  $PQ$

hence, determine  $P^{-1}$

b) Ahmad is vegetable seller. On a certain day, his regular customer, Ah Chong paid sum of RM120 for 1 kg potatoes, 5kg cucumbers and 10kg cabbages. Another customer, Samy paid RM38 for 1kg cucumbers and 4 kg cabbages. The total price of 1 kg potatoes, 6kg cucumbers and 15kg cabbages is RM166. Let  $x, y$  and  $z$  represents the price of 1 kg potatoes, 1 kg cucumbers and 1 kg cabbages respectively

- i) write a system of linear equations to represent the above information
- ii) write system of linear equations in the form of matrix equation
- iii) by using the result from part (a), solve the matrix equation and hence determine the price of 1 kg for each vegetable that is sold

### Final Answers:

1. a)  $AB = \begin{pmatrix} 18 & 3 & 15 \\ -2 & 13 & 14 \\ 24 & -11 & 4 \end{pmatrix}$

2.  $PQ^T = 3I, P^{-1} = \frac{1}{3}Q^T$

3. b) i)  $A^{-1} = \frac{1}{4} \begin{pmatrix} 2 & 2 & -2 \\ 1 & -1 & 1 \\ -8 & 0 & 4 \end{pmatrix}$ , ii)  $x = 1, y = 2, z = 3$

4. a)  $y = 1$

b) 28

c)  $adj(A) = \begin{pmatrix} 33 & 10 & -57 \\ 2 & 4 & -6 \\ -17 & -6 & 37 \end{pmatrix}$  d)  $A^{-1} = \frac{1}{28} \begin{pmatrix} 33 & 10 & -57 \\ 2 & 4 & -6 \\ -17 & -6 & 37 \end{pmatrix}$

5. a)  $PQ = I, P^{-1} = Q$

b) i)  $x + 5y + 10z = 120$

$$y + 4z = 38$$

$$x + 6y + 15z = 166$$

ii) 
$$\begin{bmatrix} 1 & 5 & 0 \\ 0 & 1 & 4 \\ 1 & 6 & 15 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 120 \\ 38 \\ 166 \end{bmatrix}$$

- iii) price of 1 kg potatoes = RM10  
price of 1 kg cucumbers = RM6  
price of 1 kg cabbages = RM8