4 MUST KNOW QUESTIONS TO *CONQUER*

MATRICES

1

Given that $A = \begin{pmatrix} 2 & -3 \\ 0 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & p \\ q & 4 \end{pmatrix}$, find

(a) A^2

(b) p and q if $AB = 4B$

Ans: (a) $\begin{pmatrix} 4 & -18 \\ 0 & 16 \end{pmatrix}$ (b) $p = -6$ and $q = -\frac{2}{3}$

2

Three types of tickets are sold for a musical held in a school studio, namely Golden, Silver and Platinum. The following table indicates the number of tickets sold in a weekend and the cost of each type of tickets for a particular weekend performance.

	Golden	**Silver**	**Platinum**
Saturday	120	40	20
Sunday	105	24	18
Cost	20	16	10

(a) Write down two matrices whose product shows the total sales for each day.

(b) Evaluate this product of matrices.

(c) Write down three matrices whose product shows the total sales for the weekend.

Ans: (a) $\begin{pmatrix} 120 & 40 & 20 \\ 105 & 24 & 18 \end{pmatrix}\begin{pmatrix} 20 \\ 16 \\ 10 \end{pmatrix}$ (b) $\begin{pmatrix} 3240 \\ 2664 \end{pmatrix}$

(d) $\begin{pmatrix} 1 & 1 \end{pmatrix}\begin{pmatrix} 120 & 40 & 20 \\ 105 & 24 & 18 \end{pmatrix}\begin{pmatrix} 20 \\ 16 \\ 10 \end{pmatrix}$ or $\begin{pmatrix} 120 & 40 & 20 \\ 105 & 24 & 18 \end{pmatrix}\begin{pmatrix} 20 \\ 16 \\ 10 \end{pmatrix}\begin{pmatrix} 1 & 1 \end{pmatrix}$

3

A bubble tea shop sells 3 flavours of bubble tea. The table below shows the number of cups sold on each day and the price of each flavour.

	Milk Tea	Honey Green Tea	Passion Fruit Tea
Day 1	45	36	55
Day 2	55	46	50
Price of each cup	\$2.20	\$1.75	\$1.50

It is given that $Q = \begin{pmatrix} 45 & 36 & 55 \\ 55 & 46 & 50 \end{pmatrix}$ and $P = \begin{pmatrix} 2.20 \\ 1.75 \\ 1.50 \end{pmatrix}$.

(i) Evaluate $S = QP$.

(ii) State what the elements of S represent.

(iii) Evaluate $R = \begin{pmatrix} 1 & 1 \end{pmatrix} S$.

(iv) State what the elements of R represent.

In celebration of its 10^{th}, anniversary, on 1^{st} August, the shop decided to give a discount of 25% on Milk Tea, a 20% discount on Honey Green Tea and a 10% discount on Passion Fruit Tea. Given that $D = TP$ and D is the matrix that represents the promotional prices, in dollars, of the 3 flavours of bubble tea,

(a) find the value of k such that $T = \begin{pmatrix} 0.75 & 0 & 0 \\ 0 & 0.8 & 0 \\ 0 & 0 & k \end{pmatrix}$

(b) Evaluate D.

(c)By using matrix multiplication, find the total revenue from the sale of bubble tea on 1st August given that the number of cups of Milk Tea, Honey Green Tea and Passion Fruit Tea sold on that day were $85, 66$, and 60 respectively.

Ans: (i) $\begin{pmatrix} 244.5 \\ 276.5 \end{pmatrix}$ (ii) The sales/revenue of the bubble tea shop for each day.
(iii) (521) (iv) The total sales of the bubble tea shop for the two days. (v)(a) $k = 0.9$
(b) $\begin{pmatrix} 1.65 \\ 1.40 \\ 1.35 \end{pmatrix}$ (c) Total revenue $= \$313.65$

4 A chocolate bar distributor supplies to 3 different supermarkets in Singapore. The number of chocolate bars supplied per delivery to each supermarket, the sizes and cost price are shown in the table below.

	Number of chocolate bar per delivery			Number of deliveries in one month
Size of each bar	200 g	350 g	450 g	
Supermarket A	80	35	10	3
Supermarket B	70	55	10	4
Supermarket C	100	50	20	6
Price per bar	\$1	\$1.50	\$2	

(a) If $P = (100 \quad 50 \quad 20)$, describe what is represented by the elements of P.
(b) If $Q = \begin{pmatrix} 80 & 35 & 10 \\ 70 & 55 & 10 \\ 100 & 50 & 20 \end{pmatrix}$ and $R = \begin{pmatrix} 1 \\ 1.50 \\ 2 \end{pmatrix}$ evaluate QR.
Describe what is represented by the elements of QR.
(c) (i) Write down a matrix W, such that when multiplied with QR, gives the total amount of money the distributor will receive from the three supermarkets in one month.
(ii) Hence using matrix multiplication, find the matrix that shows the total amount of money the distributor will receive from the three supermarkets in one month.

Ans: (a) It represented the number of chocolate bars of each size delivered to Supermarket C per delivery.
(b) $QR = \begin{pmatrix} 152.50 \\ 172.50 \\ 215 \end{pmatrix}$ (c)(i) $W = (3 \quad 4 \quad 6)$ (c)(ii) (2437.50)