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MATHEMATICS 1
(SM015)

ASSIGNMENT 1
(Individual Assignment)

GENERAL INSTRUCTIONS TO CANDIDATE :

1. This question paper consists of **5 QUESTIONS**.
2. Answer **ALL** questions.
3. All steps must be shown clearly.
4. All diagrams, figures, tables and graphs must be drawn or carefully sketched and labelled clearly.
5. Numerical answers can be given in the form of π, e, surd, fractions or up to three significant figures, where appropriate unless stated otherwise in the question.
6. Submission dates have been decided by : Friday, 23rd September 2022.
7. Each submission must be attached to the cover page provided.

CHAPTER 3
(Problem Solving : 20 marks)

1. The sum of the first *n* terms of a sequence is given by $S_n = 1 - \left(\frac{3}{5}\right)^n$

   (a) Find the value of a constant *k* such that the n^{th} term is $k\left(\frac{3}{5}\right)^n$. [3 *marks*]

   (b) Find the sum of the infinite series, S_∞. [4 *marks*]

2. (a) Expand $\sqrt[3]{1+3x}$ in ascending power of x up to and including the term in x^3.

   Hence, approximate the value of $\sqrt[3]{8.024}$ correct to 3 decimal places.

   (*Ignore the validity of the expansion).* [6 *marks*]

   (b) Express $\frac{1}{\sqrt{16-8x}}$ in the form of $a(1+bx)^n$ and hence expand $\frac{1}{\sqrt{16-8x}}$ as a series of ascending power of *x*, up to the term in x^2. [4 *marks*]

   (c) Given that the third term in the expansion $(1+3x)^{\frac{1}{3}}(16-8x)^{-\frac{1}{2}}$ has a coefficient of *p*. By using the expansions obtained in part (a) and part (b), find *p*. [3 *marks*]

CHAPTER 4
(Problem Solving : 30 marks)
(Numeracy Skill : 5 marks)

3. Given the matrices $A=\begin{bmatrix} 5 & 3 & x \\ y & 2 & 4 \\ 4 & 3 & z \end{bmatrix}$ and $B=\begin{bmatrix} 4 & -6 & 0 \\ -4 & 4 & 2 \\ -1 & 3 & -1 \end{bmatrix}$, and $AB = 2I$ where x, y, z are constant and I is the 3 x 3 identity matrix. Find the values of x, y and z. Hence, find B^{-1}. [6 *marks*]

4. Zikri, Zahrin and Zharif took a ride on a Merry-go-round, Bumper Car and Ferris wheel in a funfair. Below is a table showing the number of rides they took for each of the games.

	Merry-go-round	***Bumper car***	***Ferris Wheel***
Zikri	3	2	2
Zahrin	4	***k***	2
Zharif	5	3	***k***

The total cost Zikri, Zahrin and Zharif spent on their rides are RM44, RM54 and RM68 respectively. Let ***x***, ***y*** and ***z*** represent the price of each ride respectively.

(a) Write down a system of linear equations which represent the above information. [1 *mark*]

(b) Write the system of linear equations in the augmented matrix form $\left(A|B\right)$. [1 *mark*]

(c) By using the *Gauss elimination method*, show that the augmented matrix in (ii) can be reduced to

$$\left[\begin{array}{ccc|c} 3 & 2 & 2 & 44 \\ 0 & 3k-8 & -2 & -14 \\ 0 & 0 & 3k^2-18k+26 & -16k+38 \end{array}\right]$$

[4 *marks*]

(d) Hence, solve the system of linear equations for $k = 3$ and state the cost of each game. [3 *marks*]

5. In a market survey three commodities, **P, Q** and **R** were considered**.** In finding out the index number, some fixed weights(weightages) were assigned to three varieties ; Variety **I**, Variety **II** and Variety **III** in each of the commodities above**.**

The information regarding the consumption units of three commodities according to the three varieties and also the total weight (RM) received by each commodity is provided below.

P : 1, 2 and 3, Total weight of 11

Q : 2, 4 and 5, Total weight of 21

R : 3, 5 and 6, Total weight of 27

(Assume the weights assigned to the three varieties be RM *x*, RM *y* and RM *z*)

(a) Summarize the above information in a suitable table. [2 *marks*]

(b) Construct a system of linear equations to represent the given information and write it in the form of a matrix equation, $\boldsymbol{AX = B}$. [3 *marks*]

(c) (i) Find the determinant of $\boldsymbol{A}$**.** [2 *marks*]

(ii) Hence, conclude the type of solution to the system of linear equations above. [1 *mark*]

(d) Determine the weights assigned to the three varieties by using Cramer's rule. [4 *marks*]

(e) If a new report from a related organization claims that the consumption variety and total weight of commodity **Q** should be 2, 4 and 6 and 21.

Compare and comment on your finding with (c)(i).

Hence, is it possible the claim is accepted? [3 *marks*]