Final Exam
PMATH-I-I: ARITHMETICS I
Fall 2024

Points of attention:

- o For each question, the maximum earned points are specified in the question.
- o Write clearly! Answers that are not readable are not marked and don't earn marks!
- o All answers should be written in English using **blue or black pens** only.
- o Use the pencil only for diagrams and graphs.
- o Show all the calculation steps in the given space.
- o When finished, submit the question paper, together with the answer scripts and the signed cover page to the invigilator.
- o Any cheating/copying may result in an instant failing of the examination.

Exam Duration: 2 hours	
Instructor's Name: Muhammad Kazam Razaq	**40**
Exam Date: 09/01/2025	**10**
Program: LTM	

Student Information		
Name:		ID:
Signature:		

Invigilator	
Initials:	☐ Student ID checked
Time received:	

Question 1   **[5 marks]**

Refer to the matrices, A, B and C given below

$$A = \begin{bmatrix} 3 & -2 & 4 \\ 6 & 1 & 0 \\ -5 & 9 & 5 \end{bmatrix}, \ B = \begin{bmatrix} 1 & 5 & 0 \\ 4 & 4 & 7 \\ 2 & 3 & -9 \end{bmatrix} \text{ and } C = \begin{bmatrix} 3 & -2 & -7 \\ -4 & 5 & 1 \\ 3 & 0 & 6 \end{bmatrix}$$

Evaluate $A(3B + 2C)$.

Question 2   **[8 marks]**

Aramex processes three types of parcels, small, medium, and large using three vehicles x, y, and z. The time in hours required to transport one unit of each parcel by vehicle is given in the table below.

	Small	Medium	Large
Vehicle x	3	1	2
Vehicle y	1	2	1
Vehicle z	2	4	1

Vehicle x is available for 440 hours, vehicle y for 310 hours, and vehicle z for 560 hours. Use Cramer's rule or Gauss -Jordan method to calculate the number of parcels of each type to fully utilize the vehicles.

Question 3   **[4 marks]**

Given below a supply equation and a demand equation for a product. If p represents price per unit in dollars and q represents the number of units per unit of time, calculate the equilibrium point.

Supply: $p = \sqrt{q + 10}$ Demand: $p = 20 - q$

Question 4   **[5 marks]**

A startup invests $25,000 in creating a new mobile app. The variable cost is $4.50 per download, and the app is sold for $12.50 per download.

a. Calculate the number of downloads required to break even.   **(2 marks)**

b. Calculate the number of downloads required to ensure the loss is not more than

   $10,000.   **(3 marks)**

Question 5 [5 marks]

A woman invests $6500 in an account that pays 6% interest per year, compounded semiannually.

a. Calculate the amount after 2 years. **(1 mark)**

b. How long will it take for the amount to be $8000? **(4 marks)**

Question 6   **[5 marks]**

A company considers two projects:

Project X: Requires an investment of $17000 and provides $25000 after 4 years.

Project Y: Requires an investment of $15000 and provides $22000 after 3 years.

Use Net present value to determine which project should the company invest in if the annual market rate of interest is 5%.

Question 7   **[8 marks]**
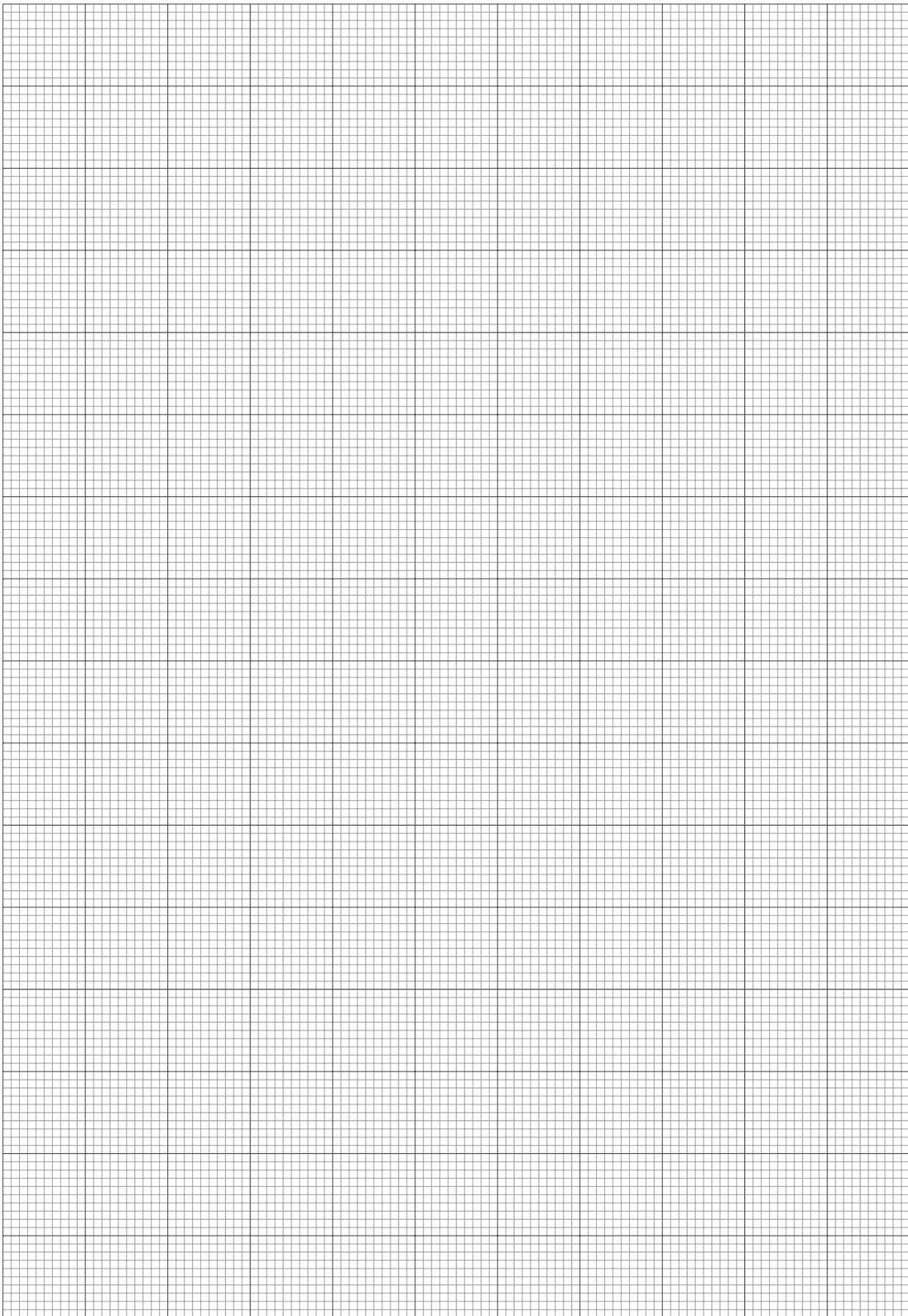
Maximize $P = 150x + 100y$

subject to

$2x + y \leq 70$

$4x + y \leq 130$

$x + y \geq 45$

$x \geq 0$

$y \geq 0$

Formula sheet

Quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Simple interest formula

$$I = Prt$$

Compound interest formula

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

Present value

$$P = A\left(1 + \frac{r}{n}\right)^{-nt}$$