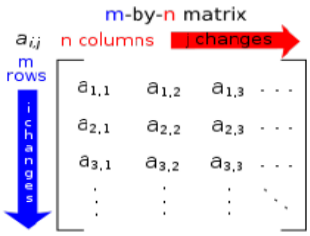
Week 05
Term 1
2014

Learning Brief

MM1: Numbers, Patterns, Relations, Functions

Goals



By the end of this week, you should be able to:

- understand the structure, properties and behaviour of matrices
- be competent in basic manipulations of matrices
- explain and find the identity matrix
- explain and find what is a determinant
- explain and find the multiplicative inverse
- use the CAS to find the determinant and multiplicative inverse, and to solve matrix equations
- use matrices to solve problems

Theoretical Components

STEP 1
Matrices – read the following examples and make notes:
Section 7C Maths Quest 11 Mathematical Methods e-book Examples 7 – 10

Example 7
http://content.jacplus.com.au/faces/pages/resourceviewer.xhtml?resourceId=152454&category=eLesson&pk=975dc5506287fa54&isbn=1118310586

Example 9
http://content.jacplus.com.au/faces/pages/resourceviewer.xhtml?resourceId=152455&category=eLesson&pk=bd71103c00a2c1c3&isbn=1118310586

Do you have a CAS calculator yet?
A CAS is essential for Mathematical Methods !!

Practical Components

STEP 2

✓ ***Important to remember:***

$AX = B$ **$XA = B$**
$X = A^{-1}B$ **$X = BA^{-1}$**

Section 7C Maths Quest 11 Mathematical Methods e-book
Exercise 7C
Questions: 1a, c, f; 2 – 5; 6a, c; 8(Use CAS); 9 – 14; 18(Use CAS); 22
Solve the following simultaneous linear equations by matrix methods.

A
$3x + 7y = 65$
$9x + 6y = -15$

B
$3x + 2y = 9$
$6x + 4y = 22$

C
$x + 2y = 0$
$6x + 14y = 2$

D Use a CAS calculator and matrix methods to solve the following system of equations.
$2x + y + 4z = 17$
$3x - y = 3$
$x + 4y + 5z = 7$

Exercises 7A and 7B
Attempt every second or third question or attempt as many questions as you feel you need to learn, consolidate or revise matrix operations and concepts.
Keep your notes up-to-date. Complete the investigation after Step 1 and Step 2 for Jacqueline to check - see the next page.

QFO
Quiz/Forum/Other

No quiz or forum this week.

Have you received the code for the new e-book available on Jacplus?

Investigation

STEP 3
*Please make **neat setting out and clear explanations** a focus of your work this week**.***

PART A:

- Write this system of linear equations in matrix form:

  $2x - y = 4$ and $4x - 2y = 12$

- Calculate the determinant of the following matrix:

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

- Sketch, with the aid of your CAS, the following linear equations. (A good sketch should include the x and y-intercepts on your neatly drawn diagram. Use a ruler, label diagram clearly.)

  $2x - y = 4$ and $4x - 2y = 12$

- What do you notice about these straight lines?

- Explain why there is no unique solution to these equations.

- If the determinant of a matrix is zero then the inverse of the matrix *does/does no*t exist.
  This matrix is known as a _____ matrix. (circle one)

- State the rule between the value of the determinant and the solution of a system of linear equations.

PART B

Tickets for a one-way trip on a Melbourne to Sydney passenger train can be purchased as either adult, child (under 15 years old) or pensioner. The table below shows the number of passengers and the total takings for three trips.

Number of adult passengers	Number of child passengers	Number of pensioner passengers	Total takings ($)
145	103	121	20 260
130	110	90	18 400
142	115	80	19 200

a. Let *x* equal the cost of an adult's ticket. Let *y* equal the cost of a child's ticket. Let *z* equal the cost of a pensioner's ticket. Construct three equations in terms of *x*, *y* and *z*.
b. Using matrices, express the equations in the form $AX = B$.
c. Use your CAS calculator to find A^{-1}.
d. Use your CAS calculator to determine the costs of a train ticket for an adult, a child and a pensioner.

SHOW THE INVESTIGATION TO BE CHECKED ONLY AFTER YOU HAVE COMPLETED STEPS 1 AND 2. Have your notes and exercises ready to show me before you show me the Investigation.

The THEORETICAL and PRACTICAL need to be done before the Investigation will be signed off.