VCE General Mathematics Unit 1

Learning activity: Matrices

Introduction

This learning activity explores how pairs of people in a network can communicate with each other.

Part 1

Consider four employees in a company. Because of their positions and level of power within the company, not every level of employment communicates with the other.

For example;

* The CEO (Charles) speaks to the General Manager (Greta) about financial planning.
* The Assistant Manager (Abbey) speaks to the General Manager about protocol.
* The clerk (Ken) speaks to the General Manager to ask if he wants any jobs done.
* The General Manager on any given workday will talk to the CEO, the Assistant Manager and the clerk.

The information could be represented by a diagram called a social network.



We can see that, for example, the CEO does not communicate directly with the Assistant Manager on any given workday, but communicates with the General Manager. This is called a **one-step communication link**.

We assume communication is a two-way process. So, if C communicates with G, then G communicates with C.

We can form a  matrix to represent the one-step communications.

In the matrix representing the connections, we use a 1 to indicate that two people

directly communicate and 0 if they do not.



a. What information is given by the element ?

b. What information is given by the element ?

c.What information is given by the sum of column G?

Part 2

Two-step communication

The CEO can communicate with the Assistant Manager by sending a message via the General Manager, who we can see speaks to both of them. This is called a **two-step communication link**.

While we can use a diagram to work out the one-step and two-step communication links, it is convenient to show the two-step links and the total of one-step and two-step links in matrices.

The matrix gives the number of two-step communications between the workers.



So, if we look at the first column, we can see that Charles can talk to Abbey and Ken via one other person (Greta).

There is also a 1 for element . Initially this may not appear very meaningful that Charles can talk to himself; however, it could be interpreted that the two-step communication link for Charles back to himself represents (for example) him asking one other person (Greta) to remind him of something at a future time.

a. What information is given by the element ?

b. What information is given by the element?

c.Why is there a 3 for element ?

Part 3

It may also be useful to determine the total, , of the one and two step links in a communication matrix system.

For this example,







There are no 0 elements in the matrix. What does this indicate?

Areas of study

The following content from the areas of study is addressed through this learning activity.

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| **Unit 1** |
| **Area of study** | **Topic** | **Content dot points** |
| Discrete mathematics | Matrices  | 1, 3, 4 |

Outcomes

The following outcomes, key knowledge and key skills are addressed through this task.

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| **Unit 1** |
| **Outcome** | **Key knowledge dot point** | **Key skills dot point** |
| 1 | 1, 3, 5 | 3, 4 |
| 2 | 1, 2, 3 | 1, 2, 3, 4 |
| 3 | 1, 4, 5 | 3, 4, 5, 7, 10, 12 |