



Interpreting transition matrices

Year 12 General Maths
Units 3 and 4

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Learning Objectives

By the end of the lesson, I would hope that you have an understanding and be able to apply to questions the following concepts:

- To be able to interpret a transition matrix and a transition diagram.



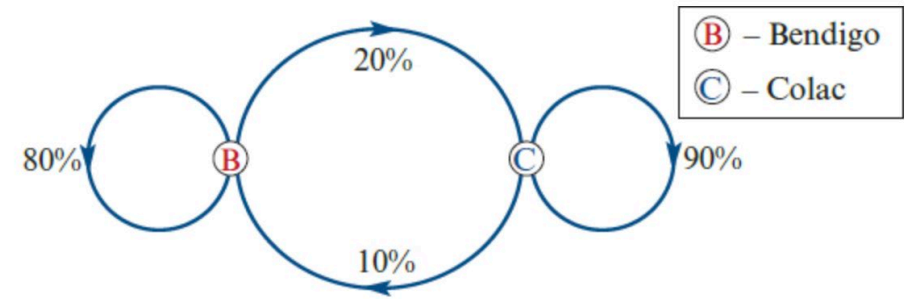
Recap

In the last lesson we looked at how we can describe certain real world situations as a transition diagram and a transition matrix.

It basically shows what percentage change in states will take place.

So, we looked at car hires and looked at the percentages of cars which will move between certain towns week by week.

We are going to build on this further in this lesson such that we can interpret a transition matrix. **This is a really important lesson and it is the basis for everything which is coming.**



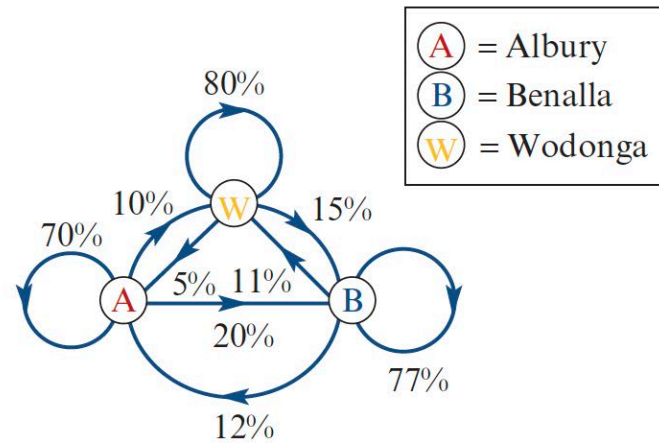
			Rented in
		<i>Bendigo</i>	<i>Colac</i>
Returned to	<i>Bendigo</i>	0.8	0.1
	<i>Colac</i>	0.2	0.9



Let's interpret some matrices!

The following transition matrix, T , and its transition diagram can be used to describe the weekly pattern of rental car returns in three locations: Albury, Wodonga and Benalla.

$$T = \begin{matrix} & \begin{matrix} A & W & B \end{matrix} \\ \begin{matrix} A \\ W \\ B \end{matrix} & \begin{bmatrix} 0.7 & 0.05 & 0.12 \\ 0.1 & 0.8 & 0.11 \\ 0.2 & 0.15 & 0.77 \end{bmatrix} \end{matrix} \begin{matrix} A \\ W \\ B \end{matrix} \text{ Returned to}$$



Use the transition matrix T and its transition diagram to answer the following questions.

a What percentage of cars rented in Wodonga each week are predicted to be returned to:

- i** Albury? **ii** Benalla? **iii** Wodonga?

5%

15%

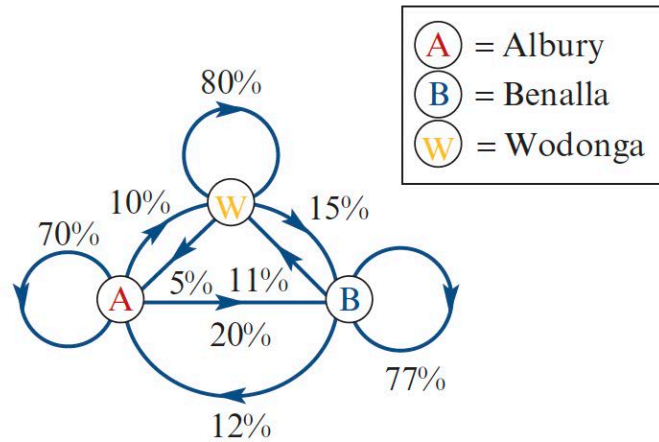
80%



Let's interpret some matrices!

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$$T = \begin{matrix} & \begin{matrix} A & W & B \end{matrix} \\ \begin{matrix} A \\ W \\ B \end{matrix} \text{ Returned to} & \begin{bmatrix} 0.7 & 0.05 & 0.12 \\ 0.1 & 0.8 & 0.11 \\ 0.2 & 0.15 & 0.77 \end{bmatrix} \end{matrix}$$



200 cars

70% of 200

20% of 200

10% of 200

Use the transition matrix T and its transition diagram to answer the following questions.

b Two hundred cars were rented in Albury this week. How many of these cars do we expect to be returned to:

- i Albury? ii Benalla? iii Wodonga?

140

40

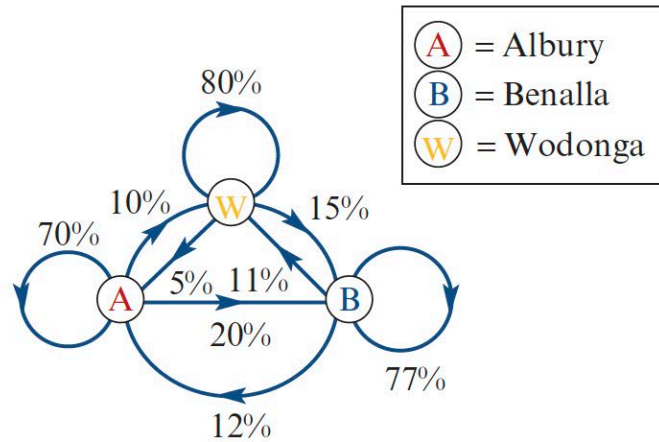
20



Let's interpret some matrices!

The following transition matrix, T , and its transition diagram can be used to describe the weekly pattern of rental car returns in three locations: Albury, Wodonga and Benalla.

$$T = \begin{matrix} & \begin{matrix} A & W & B \end{matrix} \\ \begin{matrix} A \\ W \\ B \end{matrix} \text{ Returned to} & \begin{bmatrix} 0.7 & 0.05 & 0.12 \\ 0.1 & 0.8 & 0.11 \\ 0.2 & 0.15 & 0.77 \end{bmatrix} \end{matrix}$$



Use the transition matrix T and its transition diagram to answer the following questions.

- What percentage of cars rented in Benalla each week **are not** expected to be returned to Benalla?

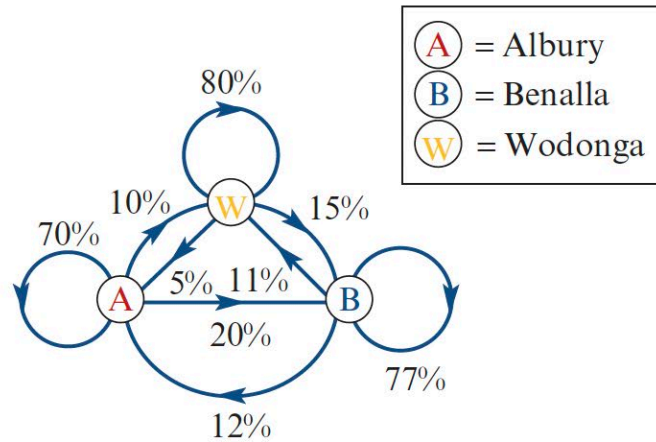
89%



Let's interpret some matrices!

The following transition matrix, T , and its transition diagram can be used to describe the weekly pattern of rental car returns in three locations: Albury, Wodonga and Benalla.

$$T = \begin{array}{c} \begin{array}{ccc} A & W & B \\ \begin{bmatrix} 0.7 & 0.05 & 0.12 \\ 0.1 & 0.8 & 0.11 \\ 0.2 & 0.15 & 0.77 \end{bmatrix} \end{array} \begin{array}{l} A \\ W \\ B \end{array} \end{array} \text{ Returned to}$$



160 cars.

Use the transition matrix T and its transition diagram to answer the following questions.

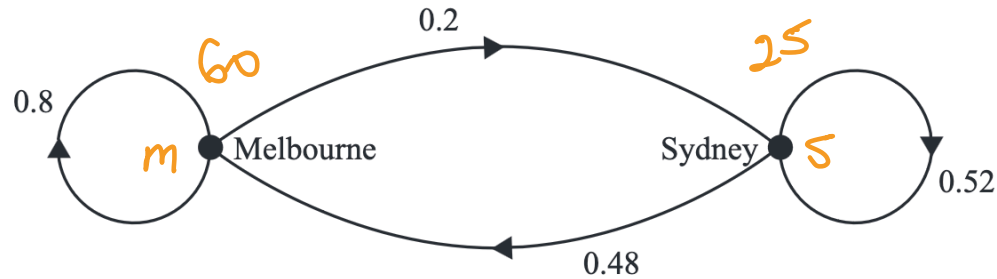
- d** One hundred and sixty cars were rented in Albury this week. How many of these cars are expected to be returned to either Benalla or Wodonga?

$$30\% \text{ of } 160 = \underline{\underline{48 \text{ cars}}}$$



VCAA Questions

An airline parks all of its planes at Sydney airport or Melbourne airport overnight.
The transition diagram below shows the change in the location of the planes from night to night.



There are always m planes parked at Melbourne airport.
There are always s planes parked at Sydney airport.

Of the planes parked at Melbourne airport on Tuesday night, 12 had been parked at Sydney airport on Monday night.

How many planes does the airline have?

- A. 25
- B. 37
- C. 62
- D. 65
- E. 85**

$$48\% \text{ of } s = 12$$

$$\frac{48}{100} \times s = 12$$

$$20\% \text{ of } m = 12$$

$$m = \underline{\underline{60}}$$

2019 Further Maths
Paper 1
Question 8
Correct: 15%



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