MATRICES 2013

MULTIPLE CHOICE REVISION

Module 6: Matrices

Before answering these questions you must **shade** the Matrices box on the answer sheet for multiple-choice questions and write the name of the module in the box provided.

Question 1

The matrix below shows the airfares (in dollars) that are charged by Zeniff Airlines to fly between Adelaide (A), Melbourne (M) and Sydney (S).

$$\begin{array}{cc} & \textit{from} \\ & \begin{array}{ccc} A & M & S \end{array} \\ & \begin{bmatrix} 0 & 85 & 89 \\ 85 & 0 & 99 \\ 97 & 101 & 0 \end{bmatrix} \begin{array}{c} A \\ M \\ S \end{array} \quad \textit{to} \end{array}$$

The cost to fly from Melbourne to Sydney with Zeniff Airlines is

A. $85

B. $89

C. $97

D. $99

E. $101

Question 2

If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$ and $C = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$, then $AB + 2C$ equals

A. $\begin{bmatrix} 0 \\ 3 \end{bmatrix}$

B. $\begin{bmatrix} 3 \\ 0 \end{bmatrix}$

C. $\begin{bmatrix} 1 \\ 2 \end{bmatrix}$

D. $\begin{bmatrix} 2 \\ 0 \end{bmatrix}$

E. $\begin{bmatrix} 2 \\ 3 \end{bmatrix}$

Question 3

Each of the following four matrix equations represents a system of simultaneous linear equations.

$$\begin{bmatrix} 1 & 3 \\ 0 & 2 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ 8 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 1 \\ 2 & 2 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ 3 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ 8 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 3 \\ 0 & 2 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 6 \\ 12 \end{bmatrix}$$

How many of these systems of simultaneous linear equations have a unique solution?

A. 0
B. 1
C. 2
D. 3
E. 4

Question 4

Matrix A is a 3×4 matrix.
Matrix B is a 3×3 matrix.
Which one of the following matrix expressions is defined?

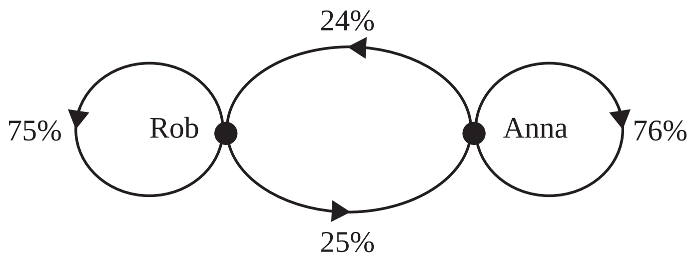
A. BA^2
B. $BA - 2A$
C. $A + 2B$
D. $B^2 - AB$
E. A^{-1}

Use the following information to answer Questions 5 and 6.

Two politicians, Rob and Anna, are the only candidates for a forthcoming election. At the beginning of the election campaign, people were asked for whom they planned to vote. The numbers were as follows.

Candidate	**Number of people who plan to vote for the candidate**
Rob	5692
Anna	3450

During the election campaign, it is expected that people may change the candidate that they plan to vote for each week according to the following transition diagram.



Question 5

The total number of people who are expected to change the candidate that they plan to vote for one week after the election campaign begins is

A. 828

B. 1423

C. 2251

D. 4269

E. 6891

Question 6

The election campaign will run for ten weeks.

If people continue to follow this pattern of changing the candidate they plan to vote for, the expected winner after ten weeks will be

A. Rob by about 50 votes.

B. Rob by about 100 votes.

C. Rob by fewer than 10 votes.

D. Anna by about 100 votes.

E. Anna by about 200 votes.

Question 7

Each night, a large group of mountain goats sleep at one of two locations, A or B.
On the first night, equal numbers of goats are observed to be sleeping at each location.
From night to night, goats change their sleeping locations according to a transition matrix T.
It is expected that, in the long term, more goats will sleep at location A than at location B.

Assuming the total number of goats remains constant, a transition matrix T that would predict this outcome is

A.

$$\begin{array}{cc} & \textit{this night} \\ & \begin{array}{cc} A & B \end{array} \\ T= & \begin{bmatrix} 0.8 & 0.4 \\ 0.2 & 0.6 \end{bmatrix} \end{array} \begin{array}{c} A \\ B \end{array} \textit{ next night}$$

B.

$$\begin{array}{cc} & \textit{this night} \\ & \begin{array}{cc} A & B \end{array} \\ T= & \begin{bmatrix} 0.7 & 0.1 \\ 0.3 & 0.9 \end{bmatrix} \end{array} \begin{array}{c} A \\ B \end{array} \textit{ next night}$$

C.

$$\begin{array}{cc} & \textit{this night} \\ & \begin{array}{cc} A & B \end{array} \\ T= & \begin{bmatrix} 0.5 & 0.5 \\ 0.5 & 0.5 \end{bmatrix} \end{array} \begin{array}{c} A \\ B \end{array} \textit{ next night}$$

D.

$$\begin{array}{cc} & \textit{this night} \\ & \begin{array}{cc} A & B \end{array} \\ T= & \begin{bmatrix} 0.6 & 0.2 \\ 0.4 & 0.8 \end{bmatrix} \end{array} \begin{array}{c} A \\ B \end{array} \textit{ next night}$$

E.

$$\begin{array}{cc} & \textit{this night} \\ & \begin{array}{cc} A & B \end{array} \\ T= & \begin{bmatrix} 0.1 & 0.8 \\ 0.9 & 0.2 \end{bmatrix} \end{array} \begin{array}{c} A \\ B \end{array} \textit{ next night}$$

Question 8

Consider the following matrix A.

$$A = \begin{bmatrix} 3 & k \\ -4 & -3 \end{bmatrix}$$

A is equal to its inverse A^{-1} for a particular value of k.

This value of k is

A. –4

B. –2

C. 0

D. 2

E. 4

Question 9

Matrix A is a 3×3 matrix. Seven of the elements in matrix A are zero.
Matrix B contains six elements, none of which are zero.

Assuming the matrix product AB is defined, the minimum number of zero elements in the product matrix AB is

A. 0

B. 1

C. 2

D. 4

E. 6

END OF MULTIPLE-CHOICE QUESTION BOOK

Module 6: Matrices

Before answering these questions you must **shade** the Matrices box on the answer sheet for multiple-choice questions and write the name of the module in the box provided.

Question 1

The order of the matrix $\begin{bmatrix} 2 & 2 \\ 2 & 2 \\ 2 & 2 \end{bmatrix}$ is

A. 2×2

B. 2×3

C. 3×2

D. 4

E. 6

Question 2

Peter bought only apples and bananas from his local fruit shop.

The matrix

$$\begin{array}{cc} & \begin{array}{cc} A & B \end{array} \\ N = & \begin{bmatrix} 3 & 4 \end{bmatrix} \end{array}$$

lists the number of apples (A) and bananas (B) that Peter bought.

The matrix

$$C = \begin{array}{c} \begin{bmatrix} 0.37 \\ 0.43 \end{bmatrix} \end{array} \begin{array}{c} A \\ B \end{array}$$

lists the cost (in dollars) of one apple and one banana respectively.

The matrix product, NC, gives

A. the total amount spent by Peter on the fruit that he bought.

B. the total number of pieces of fruit that Peter bought.

C. the individual amounts that Peter spent on apples and bananas respectively.

D. the total number of pieces of fruit that Peter bought and the total amount that he spent.

E. the individual number of apples and bananas that Peter bought and the individual amounts that Peter spent on these apples and bananas respectively.

Question 3

The total cost of one ice cream and three soft drinks at Catherine's shop is $9.

The total cost of two ice creams and five soft drinks is $16.

Let x be the cost of an ice cream and y be the cost of a soft drink.

The matrix $\begin{bmatrix} x \\ y \end{bmatrix}$ is equal to

A. $\begin{bmatrix} 1 & 3 \\ 2 & 5 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix}$

B. $\begin{bmatrix} 1 & 3 \\ 2 & 5 \end{bmatrix}\begin{bmatrix} 9 \\ 16 \end{bmatrix}$

C. $\begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix}\begin{bmatrix} 9 \\ 16 \end{bmatrix}$

D. $\begin{bmatrix} -5 & 2 \\ 3 & -1 \end{bmatrix}\begin{bmatrix} 9 \\ 16 \end{bmatrix}$

E. $\begin{bmatrix} -5 & 3 \\ 2 & -1 \end{bmatrix}\begin{bmatrix} 9 \\ 16 \end{bmatrix}$

Question 4

Which matrix expression results in a matrix that contains the sum of the numbers 2, 5, 4, 1 and 8?

A. $\begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{bmatrix} \times \begin{bmatrix} 2 & 5 & 4 & 1 & 8 \end{bmatrix}$

B. $\begin{bmatrix} 2 & 5 & 4 & 1 & 8 \end{bmatrix} \times \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$

C. $\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} 2 & 0 & 0 & 0 & 0 \\ 0 & 5 & 0 & 0 & 0 \\ 0 & 0 & 4 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 8 \end{bmatrix}$

D. $\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} 2 \\ 5 \\ 4 \\ 1 \\ 8 \end{bmatrix}$

E. $\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} + \begin{bmatrix} 2 & 0 & 0 & 0 & 0 \\ 0 & 5 & 0 & 0 & 0 \\ 0 & 0 & 4 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 8 \end{bmatrix}$

Question 5

A system of three simultaneous linear equations is written in matrix form as follows.

$$\begin{bmatrix} 1 & -2 & 0 \\ 1 & 0 & 3 \\ 0 & 2 & -1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 4 \\ 11 \\ -5 \end{bmatrix}$$

One of the three linear equations is

A. $x - 2y + z = 4$

B. $x + y + 3z = 11$

C. $2x - y = -5$

D $x + 3z = 11$

E. $3y - z = -5$

Question 6

Vince, Nev and Rani all service office equipment.

The matrix T shows the time that it takes (in minutes) for each of Vince (V), Nev (N) and Rani (R) to service a photocopier (P), a fax machine (F) and a scanner (S).

$$T = \begin{array}{c} \begin{array}{ccc} V & N & R \end{array} \\ \begin{bmatrix} 12 & 15 & 14 \\ 8 & 7 & 8 \\ 20 & 19 & 17 \end{bmatrix} \end{array} \begin{array}{c} \\ P \\ F \\ S \end{array}$$

The matrix U below displays the number of photocopiers, fax machines and scanners to be serviced in three schools, Alton (A), Borton (B) and Carlon (C).

$$U = \begin{array}{c} \begin{array}{ccc} P & F & S \end{array} \\ \begin{bmatrix} 5 & 3 & 2 \\ 4 & 4 & 3 \\ 6 & 1 & 2 \end{bmatrix} \end{array} \begin{array}{c} \\ A \\ B \\ C \end{array}$$

A matrix that displays the time that it would take each of Vince, Nev and Rani, working alone, to service the photocopiers, fax machines and scanners in each of the three schools is

A.
$$\begin{bmatrix} 17 & 18 & 16 \\ 12 & 11 & 11 \\ 26 & 20 & 19 \end{bmatrix}$$

B.
$$\begin{bmatrix} 204 & 110 & 97 \\ 116 & 60 & 53 \\ 278 & 153 & 131 \end{bmatrix}$$

C.
$$\begin{bmatrix} 124 & 134 & 128 \\ 140 & 145 & 139 \\ 120 & 135 & 126 \end{bmatrix}$$

D.
$$\begin{bmatrix} 7 & 12 & 12 \\ 4 & 3 & 5 \\ 14 & 18 & 15 \end{bmatrix}$$

E.
$$\begin{bmatrix} 60 & 15 & 28 \\ 32 & 35 & 24 \\ 120 & 19 & 34 \end{bmatrix}$$

Question 7

A new colony of several hundred birds is established on a remote island. The birds can feed at two locations, *A* and *B*. The birds are expected to change feeding locations each day according to the transition matrix

$$\begin{array}{cc} & \textit{this day} \\ & \begin{array}{cc} A & B \end{array} \\ T = & \begin{bmatrix} 0.4 & 0.3 \\ 0.6 & 0.7 \end{bmatrix} \begin{array}{c} A \\ B \end{array} \textit{ next day} \end{array}$$

In the beginning, approximately equal numbers of birds feed at each site each day.

Which of the following statements is **not** true?

A. 70% of the birds that feed at *B* on a given day will feed at *B* the next day.

B. 60% of the birds that feed at *A* on a given day will feed at *B* the next day.

C. In the long term, more birds will feed at *B* than at *A*.

D. The number of birds that change feeding locations each day will decrease over time to zero.

E. In the long term, some birds will always be found feeding at each location.

Question 8

m and *n* are positive whole numbers.

Matrix *P* is of order $m \times n$.

Matrix *Q* is of order $n \times m$.

The matrix products *PQ* and *QP* are both defined

A. for no values of *m* and *n*.

B. when *m* is equal to *n* only.

C. when *m* is greater than *n* only.

D. when *m* is less than *n* only.

E. for all values of *m* and *n*.

Question 9

Robbie completed a test of four multiple-choice questions.

Each question had four alternatives, *A*, *B*, *C* or *D*.

Robbie randomly guessed the answer to the first question.

He then determined his answers to the remaining three questions by following the transition matrix

$$
\begin{array}{cc}
 & \textit{this question} \\
 & \begin{array}{cccc} A & B & C & D \end{array} \\
T = & \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \end{bmatrix} \begin{array}{c} A \\ B \\ C \\ D \end{array} \quad \textit{next question}
\end{array}
$$

Which of the following statements is **true**?

A. It is impossible for Robbie to give the same answer to all four questions.

B. Robbie would always give the same answer to the first and fourth questions.

C. Robbie would always give the same answer to the second and third questions.

D. If Robbie answered *A* for question one, he would have answered *B* for question two.

E. It is possible that Robbie gave the same answer to exactly three of the four questions.

END OF MULTIPLE-CHOICE QUESTION BOOK

Module 6: Matrices

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Question 1

$3\begin{bmatrix} 2 & 1 \\ 0 & 3 \end{bmatrix} + 2\begin{bmatrix} -1 & 0 \\ 2 & -7 \end{bmatrix}$ equals

A. $\begin{bmatrix} 4 & 3 \\ 4 & -5 \end{bmatrix}$

B. $6\begin{bmatrix} 1 & 1 \\ 2 & -4 \end{bmatrix}$

C. $\begin{bmatrix} 4 & 3 \\ 4 & 2 \end{bmatrix}$

D. $5\begin{bmatrix} 1 & 1 \\ 2 & -4 \end{bmatrix}$

E. $\begin{bmatrix} 3 & 6 \\ 7 & 4 \end{bmatrix}$

Question 2

The matrix $\begin{bmatrix} 12 & 15 & 3 \\ -6 & 0 & 24 \end{bmatrix}$ can also be written as

A. $[12 \quad 15 \quad 3] + [-6 \quad 0 \quad 24]$

B. $\begin{bmatrix} 12 \\ -6 \end{bmatrix} + \begin{bmatrix} 15 \\ 0 \end{bmatrix} + \begin{bmatrix} 3 \\ 24 \end{bmatrix}$

C. $\begin{bmatrix} 3 \\ 6 \end{bmatrix}\begin{bmatrix} 4 & 5 & 1 \\ -1 & 0 & 4 \end{bmatrix}$

D. $\frac{1}{3} \times \begin{bmatrix} 4 & 5 & 1 \\ -2 & 0 & 8 \end{bmatrix}$

E. $3 \times \begin{bmatrix} 4 & 5 & 1 \\ -2 & 0 & 8 \end{bmatrix}$

Question 3

The number of people attending the morning, afternoon and evening sessions at a cinema is given in the table below. The admission charges (in dollars) for each session are also shown in the table.

	session		
	morning	**afternoon**	**evening**
number of people attending	25	56	124
admission charge ($)	12	15	20

A column matrix that can be used to list the number of people attending each of the three sessions is

A. $\begin{bmatrix} 25 & 56 & 124 \end{bmatrix}$

B. $\begin{bmatrix} 25 \\ 56 \\ 124 \end{bmatrix}$

C. $\begin{bmatrix} 12 & 15 & 20 \end{bmatrix}$

D. $\begin{bmatrix} 12 \\ 15 \\ 20 \end{bmatrix}$

E. $\begin{bmatrix} 25 & 56 & 124 \\ 12 & 15 & 20 \end{bmatrix}$

Question 4

The matrix equation $\begin{bmatrix} 4 & 2 & 8 \\ 2 & 0 & 3 \\ 0 & 3 & -1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 7 \\ 2 \\ 6 \end{bmatrix}$ can be used to solve the system of simultaneous linear equations

A. $4x + 2y + 8z = 7$
$2x + 3y = 2$
$3x - y = 6$

B. $4x + 2y + 8z = 7$
$2x + 3y = 2$
$3y - z = 6$

C. $4x + 2y + 8z = 7$
$2y + 3z = 2$
$3x - z = 6$

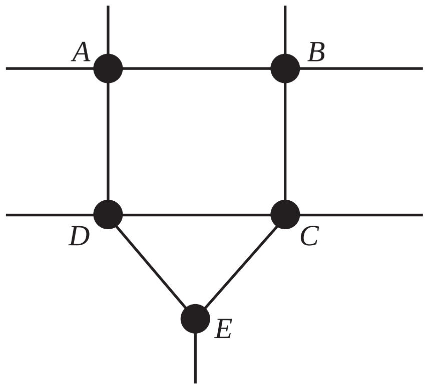
D. $4x + 2y + 8z = 7$
$2x + 3z = 2$
$3y - z = 6$

E. $4x + 2y + 8z = 7$
$2x + 3z = 2$
$3x - z = 6$

Question 5

A, B, C, D and E are five intersections joined by roads as shown in the diagram below.

Some of these roads are one-way only.



The matrix below indicates the direction that cars can travel along each of these roads.

In this matrix

- 1 in column A and row B indicates that cars can travel directly from A to B
- 0 in column B and row A indicates that cars cannot travel directly from B to A (either it is a one-way road or no road exists).

$$\begin{array}{c} \text{from intersection} \\ \begin{array}{ccccc} A & B & C & D & E \end{array} \\ \begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 \end{bmatrix} \end{array} \begin{array}{l} \\ \\ A \\ B \\ C \quad \text{to intersection} \\ D \\ E \end{array}$$

Cars can travel in both directions between intersections

A. A and D

B. B and C

C. C and D

D. D and E

E. C and E

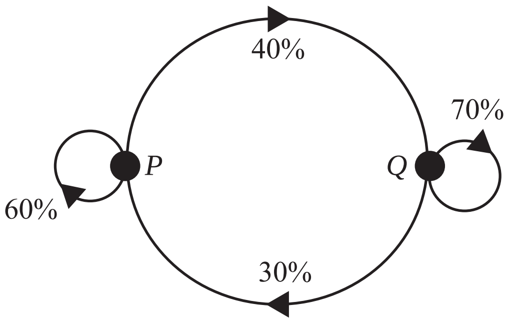
Question 6

T is a transition matrix, where

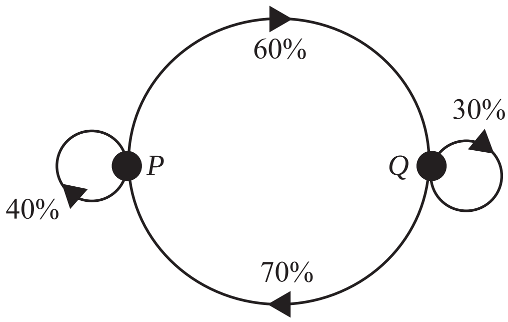
$$T = \begin{array}{c} \text{from} \\ \begin{array}{cc} P & Q \end{array} \\ \begin{bmatrix} 0.6 & 0.7 \\ 0.4 & 0.3 \end{bmatrix} \end{array} \begin{array}{l} \\ \\ P \\ Q \end{array} \text{ to}$$

An equivalent transition diagram, with proportions expressed as percentages, is

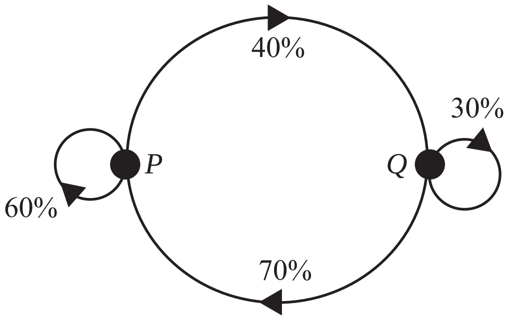
A.



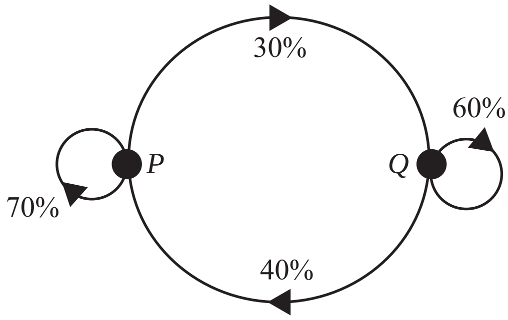
B.



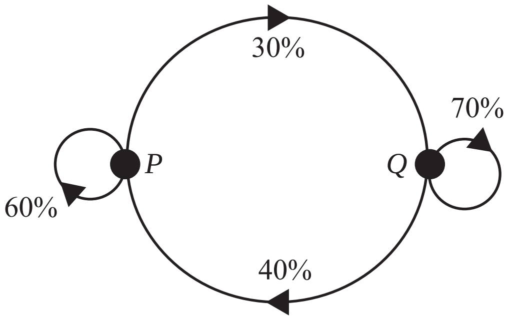
C.



D.



E.



The following information relates to Questions 7 and 8.

In a country town, people only have the choice of doing their food shopping at a store called Marks (M) or at a newly opened store called Foodies (F).

In the first week that Foodies opened, only 300 of the town's 800 shoppers did their food shopping at Marks. The remainder did their food shopping at Foodies.

Question 7

A state matrix S_1 that can be used to represent this situation is

A. $S_1 = \begin{array}{c} \begin{bmatrix} 300 \\ 800 \end{bmatrix} \end{array}\begin{array}{l} M \\ F \end{array}$

B. $S_1 = \begin{array}{c} \begin{bmatrix} 500 \\ 300 \end{bmatrix} \end{array}\begin{array}{l} M \\ F \end{array}$

C. $S_1 = \begin{array}{c} \begin{bmatrix} 800 \\ 300 \end{bmatrix} \end{array}\begin{array}{l} M \\ F \end{array}$

D. $S_1 = \begin{array}{c} \begin{bmatrix} 300 \\ 500 \end{bmatrix} \end{array}\begin{array}{l} M \\ F \end{array}$

E. $S_1 = \begin{array}{c} \begin{bmatrix} 800 \\ 500 \end{bmatrix} \end{array}\begin{array}{l} M \\ F \end{array}$

Question 8

A market researcher predicts that

- of those who do their food shopping at Marks this week, 70% will shop at Marks next week and 30% will shop at Foodies
- of those who do their food shopping at Foodies this week, 90% will shop at Foodies next week and 10% will shop at Marks.

A transition matrix that can be used to represent this situation is

A. $T = \begin{array}{c} \text{this week} \\ \begin{array}{cc} M & F \end{array} \\ \begin{bmatrix} 0.7 & 0.9 \\ 0.3 & 0.1 \end{bmatrix} \end{array} \begin{array}{l} \\ \\ M \\ F \end{array} \text{ next week}$

B. $T = \begin{array}{c} \text{this week} \\ \begin{array}{cc} M & F \end{array} \\ \begin{bmatrix} 0.7 & 0.1 \\ 0.3 & 0.9 \end{bmatrix} \end{array} \begin{array}{l} \\ \\ M \\ F \end{array} \text{ next week}$

C. $T = \begin{array}{c} \text{this week} \\ \begin{array}{cc} M & F \end{array} \\ \begin{bmatrix} 0.3 & 0.7 \\ 0.9 & 0.1 \end{bmatrix} \end{array} \begin{array}{l} \\ \\ M \\ F \end{array} \text{ next week}$

D. $T = \begin{array}{c} \text{this week} \\ \begin{array}{cc} M & F \end{array} \\ \begin{bmatrix} 0.7 & 0.3 \\ 0.1 & 0.9 \end{bmatrix} \end{array} \begin{array}{l} \\ \\ M \\ F \end{array} \text{ next week}$

E. $T = \begin{array}{c} \text{this week} \\ \begin{array}{cc} M & F \end{array} \\ \begin{bmatrix} 0.3 & 0.9 \\ 0.7 & 0.1 \end{bmatrix} \end{array} \begin{array}{l} \\ \\ M \\ F \end{array} \text{ next week}$

Module 6: Matrices

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Question 1

If $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} + \begin{bmatrix} 3 & 7 \\ 8 & d \end{bmatrix} = \begin{bmatrix} 4 & 7 \\ 8 & 11 \end{bmatrix}$ then d is equal to

A. –11

B. –10

C. 7

D. 10

E. 11

Question 2

Apples cost $3.50 per kg, bananas cost $4.20 per kg and carrots cost $1.89 per kg.

Ashley buys 3 kg of apples, 2 kg of bananas and 1 kg of carrots.

A matrix product to calculate the total cost of these items is

A. $\begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix} \begin{bmatrix} 3.50 \\ 4.20 \\ 1.89 \end{bmatrix}$

B. $\begin{bmatrix} 3 & 2 & 1 \end{bmatrix} \begin{bmatrix} 3.50 & 4.20 & 1.89 \end{bmatrix}$

C. $\begin{bmatrix} 3.50 \times 2 & 4.20 \times 3 & 1.89 \times 1 \end{bmatrix}$

D. $\begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix} \begin{bmatrix} 3.50 & 4.20 & 1.89 \end{bmatrix}$

E. $\begin{bmatrix} 3.50 & 4.20 & 1.89 \end{bmatrix} \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix}$

Question 3

The cost prices of three different electrical items in a store are \$230, \$290 and \$310 respectively.

The selling price of each of these three electrical items is 1.3 times the cost price plus a commission of \$20 for the salesman.

A matrix that lists the selling price of each of these three electrical items is determined by evaluating

A. $1.3\times\begin{bmatrix}230\\290\\310\end{bmatrix}+\begin{bmatrix}20\end{bmatrix}$

B. $1.3\times\begin{bmatrix}230\\290\\310\end{bmatrix}+1.3\times 20$

C. $1.3\times\begin{bmatrix}230\\290\\310\end{bmatrix}+\begin{bmatrix}20\\20\\20\end{bmatrix}$

D. $1.3\times\begin{bmatrix}230\\290\\310\end{bmatrix}+1.3\times\begin{bmatrix}20\\20\\20\end{bmatrix}$

E. $1.3\times\begin{bmatrix}230+20\\290+20\\310+20\end{bmatrix}$

Question 4

Matrix A is a 1×3 matrix.

Matrix B is a 3×1 matrix.

Which one of the following matrix expressions involving A and B is defined?

A. $A + \frac{1}{3}B$

B. $2B \times 3A$

C. A^2B

D. B^{-1}

E. $B - A$

Question 5

The determinant of $\begin{bmatrix}3 & 2\\6 & x\end{bmatrix}$ is equal to 9.

The value of x is

A. –7

B. –4.5

C. 1

D. 4.5

E. 7

Question 6

The solution of the matrix equation $\begin{bmatrix} 0 & -3 & 2 \\ 1 & 1 & 1 \\ -2 & 0 & 3 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 11 \\ 5 \\ 8 \end{bmatrix}$ is

A. $\begin{bmatrix} 1 \\ 24 \\ 2 \end{bmatrix}$

B. $\begin{bmatrix} 2 \\ -1 \\ 4 \end{bmatrix}$

C. $\begin{bmatrix} 2 \\ 1 \\ 3 \end{bmatrix}$

D. $\begin{bmatrix} -11 \\ \frac{4}{3} \\ 8 \end{bmatrix}$

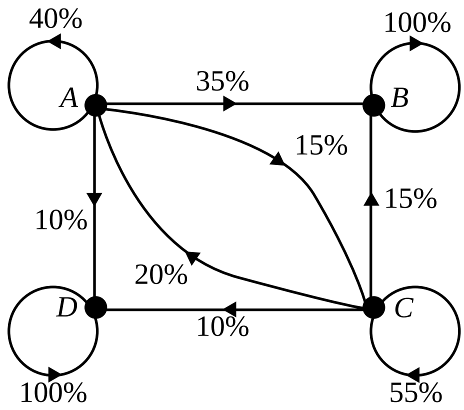
E. $\begin{bmatrix} 11 \\ 5 \\ 8 \end{bmatrix}$

The following information relates to Questions 7, 8 and 9.

A large population of mutton birds migrates each year to a remote island to nest and breed. There are four nesting sites on the island, *A*, *B*, *C* and *D*.

Researchers suggest that the following transition matrix can be used to predict the number of mutton birds nesting at each of the four sites in subsequent years. An equivalent transition diagram is also given.

$$\begin{array}{c} \textit{this year} \\ T = \begin{array}{c} \begin{array}{cccc} A & B & C & D \end{array} \\ \begin{bmatrix} 0.4 & 0 & 0.2 & 0 \\ 0.35 & 1 & 0.15 & 0 \\ 0.15 & 0 & 0.55 & 0 \\ 0.1 & 0 & 0.1 & 1 \end{bmatrix} \end{array} \begin{array}{c} A \\ B \\ C \\ D \end{array} \quad \textit{next year} \end{array}$$



Question 7

Two thousand eight hundred mutton birds nest at site *C* in 2008.

Of these 2800 mutton birds, the number that nest at site *A* in 2009 is predicted to be

A. 560
B. 980
C. 1680
D. 2800
E. 3360

Question 8

This transition matrix predicts that, in the long term, the mutton birds will

A. nest only at site *A*.
B. nest only at site *B*.
C. nest only at sites *A* and *C*.
D. nest only at sites *B* and *D*.
E. continue to nest at all four sites.

Question 9

Six thousand mutton birds nest at site *B* in 2008.

Assume that an equal number of mutton birds nested at each of the four sites in 2007. The same transition matrix applies.

The total number of mutton birds that nested on the island in 2007 was

A. 6 000
B. 8 000
C. 12 000
D. 16 000
E. 24 000

END OF MULTIPLE-CHOICE QUESTION BOOK