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Question 3

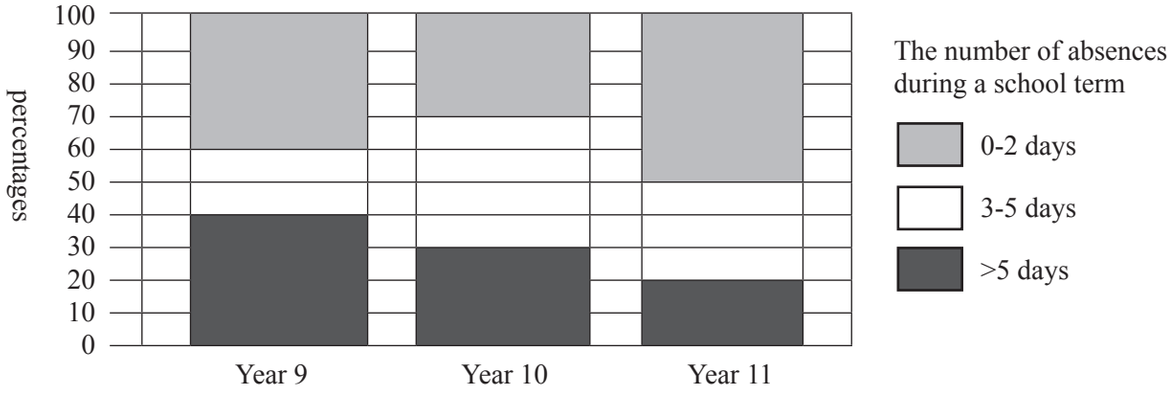
A statistically minded athlete has evaluated her 400 metre efforts. She has noticed that the data shows a bell shaped distribution with a mean of 65.2 seconds and a standard deviation of 1.3 seconds.

If she then runs a time of 66.8 seconds, which of the following statements is closest to summarising her effort?

A. This time is in the top 16% of her efforts.
B. This time is in the bottom 16% of her efforts.
C. This time is close to the average of her efforts.
D. This time is in the top 2% of her efforts.
E. This time is in the bottom 2% of her efforts.

Question 4

The segmented bar chart below shows the distribution of the number of days absent over one term for secondary students at particular year levels.



From these results, the percentage of Year 11 students who were absent for at least 3 days in the term is

A. 20
B. 30
C. 50
D. 70
E. 100

Question 5

Joan received a test score of 72. The class standard deviation for this test was 12.
If Joan's z-score was 1, the class average was

A. 13
B. 73
C. 84
D. 60
E. 71

MODULE 5 / NETWORKS AND DECISION MATHEMATICS

Question 1: C

- 5 + 4 + 3 + 2 + 1 = 15 (The 6th vertex must join to **5** others, 5th vertex joins to **4** others since it is already connect to the 6th vertex … etc for the other vertices).
- Otherwise you can use the formula $\boldsymbol{n(n-1)/2}$ for $\boldsymbol{n}$ vertices

Question 2: D

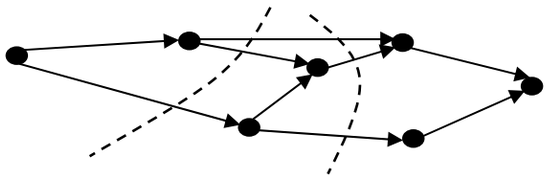
- D is correct
  Vertex A has 1 edge going to B and D Vertex B has 1 edge going to A, B, C and D
  Vertex C has 1 edge to B and 2 edges to D Vertex D has 1 edge going to A, B and C
- Note: An Adjacency matrix is symmetrical along the diagonal; this leaves only A and D as possibilities.

Question 3: A

- To have an Euler circuit all degrees must be even. This network has two odd degrees at A(3) and D(3).
- Adding an edge between A and D will increase both degrees by one.

Question 4: C

- There are two cuts that give 16

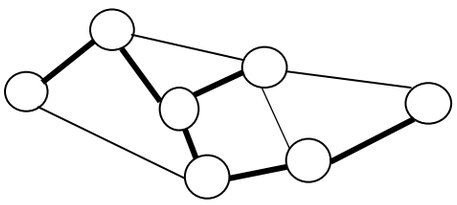


Question 5: E

- Towns BEDG will give a total distance 12 + 16 + 25 + 11 = 64 km
- Please note: if all towns were to be considered, the words "Hamiltonian Circuit" would be required.

Question 6: A

- 11 + 22 + 12 + 11 + 16 + 37 = 109
- Using Prim's algorithm (i.e. start with lowest edge, AC with 11, **from** either of these vertices select the lowest edge, AB with 22 etc., taking care not to form any circuits).
  The minimum tree is highlighted below:



Question 7: B

- $D^1 = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 \end{bmatrix}$ $D^2 = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 2 & 0 \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}$ where D^1 and D^2 are 1 and 2 step adjacency matrices Then add along each row gives

Alternatively

TEAM	1-step	2-step	Dominance
A	1 (AC)	1(ACB)	2
B	2(BA,BD)	3(BAC,BDA,BDC)	5*
C	1(CB)	2(CBA, CBD)	3
D	2(DA,DC)	2(DAC,DCB)	4

With a dominance value of 5, Team B is the winner.

Question 8: C

- The critical path is the 'longest' path because all activities must be completed before you start the next one.
- ACFI, 3 + 5 + 9 + 3 = 20 hrs

Question 9: B

- Need to look along all activities on the critical path.
- Option A reduces ACFI to 18 hours but now BEHI and ADGHI are 19 (new critical path)
- Option B reduces ACFI to 18 hours but now BEHI and ADGHI are reduced to 18* (satisfies project)
- Option C reduces ACFI to 18 hours but now BEHI with 19 is new critical path
- Option D reduces ACFI to 17 hours but now BEHI with 19 is new critical path
- Option E ignores the fact that we are looking at the longest paths not shortest

MODULE 6 / MATRICES

Question 1: E

- A^2 can't be done.
- When multiplying, the number of columns on the 1st matrix must equal the number of rows on the 2nd matrix. This eliminates all but E.

Question 2: B

- Inverse of C is $C^{-1} = \frac{1}{4}\begin{bmatrix} 1 & 1 \\ 2 & -2 \end{bmatrix}$
- All others are true

Question 3: D

- $RT = \begin{bmatrix} 1+2m & 4-m \\ 2n & -n \end{bmatrix} = \begin{bmatrix} -1 & 5 \\ 4 & -2 \end{bmatrix}$

$\therefore$ 1+2m = -1
2m = -2 (-1 BS)
m = -1
$\therefore$ 2n = 4
n = 2 (÷2 BS)

ALTERNATIVELY using calculator

let $A = \begin{bmatrix} -1 & 5 \\ 4 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 4 \\ 2 & -1 \end{bmatrix}$

$RT = \begin{bmatrix} -1 & 5 \\ 4 & -2 \end{bmatrix}$ $\therefore$ $R = \begin{bmatrix} -1 & 5 \\ 4 & -2 \end{bmatrix} T^{-1}$

cont. overleaf