

| Question | Scheme | Marks | AOs |
|---|--|----------|--------------|
| 2 | Profit in 2017 is $0.99 \times £39.15\text{m} = £38.7585\text{m}$ | B1 | 2.2a |
| | Let x = number of visitors to park A in 2016, y = number of visitors to park B in 2016 and z = number of visitors to park C in 2016. So $0.5x + 1.25y + 1.15z = 1.35 \times 10^6$ | M1 | 3.1b |
| | $30x + 26y + 33z = 39.15 \times 10^6$ | A1 | 1.1b |
| | $15x + 32.5y + 37.95z = 38.7585 \times 10^6$ | | |
| | Hence $\begin{pmatrix} 0.5 & 1.25 & 1.15 \\ 30 & 26 & 33 \\ 15 & 32.5 & 37.95 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 1.35 \times 10^6 \\ 39.15 \times 10^6 \\ 38.7585 \times 10^6 \end{pmatrix}$ | M1 A1 | 3.1a 1.1b |
| | $\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 0.5 & 1.25 & 1.15 \\ 30 & 26 & 33 \\ 15 & 32.5 & 37.95 \end{pmatrix}^{-1} \begin{pmatrix} 1.35 \times 10^6 \\ 39.15 \times 10^6 \\ 38.7585 \times 10^6 \end{pmatrix} = \begin{pmatrix} \dots \\ \dots \\ \dots \end{pmatrix}$ | M1 | 1.1b |
| | $\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 400331.75\dots \\ 593257.41\dots \\ 355010.74\dots \end{pmatrix}$ | A1 | 1.1b |
| So in 2016 park A had 400 000 visitors, park B had 590 000 visitors and park C had 360 000 visitors to 2 s.f. | A1ft | 3.2a | |
| | | (8) | |

(8 marks)

Notes:

B1: Deduces correct total profit for 2017.

M1: Attempts to set up equations in the three unknowns using the information given.

A1: At least two equations correct, with appropriate variables defined.

M1: Sets up a matrix equation from their three equations.

A1: Correct matrix equation (or equivalent).

M1: Solves the equation using the inverse of their matrix (found from calculator or otherwise) to obtain at least one value of x , y or z .

A1: Correct answer as a vector.

A1ft: Interprets their answer in the context of the question with figures quoted to 2 s.f. Withhold this mark if answers not given to 2 s.f.

Note Accept equivalents throughout with the rows in a different order.

Note If the $\times 10^6$ is missing throughout, allow the Ms but not the As as they have not interpreted the context (but if units are later sorted out and correct answer reached, full marks can be awarded).

Note
$$\begin{pmatrix} 0.5 & 1.25 & 1.15 \\ 30 & 26 & 33 \\ 15 & 32.5 & 37.95 \end{pmatrix}^{-1} = \begin{pmatrix} 0.4916\dots & 0.0576\dots & -0.0650\dots \\ 3.6871\dots & -0.0098\dots & -0.1031\dots \\ -3.3519\dots & -0.0143\dots & 0.1403\dots \end{pmatrix}$$