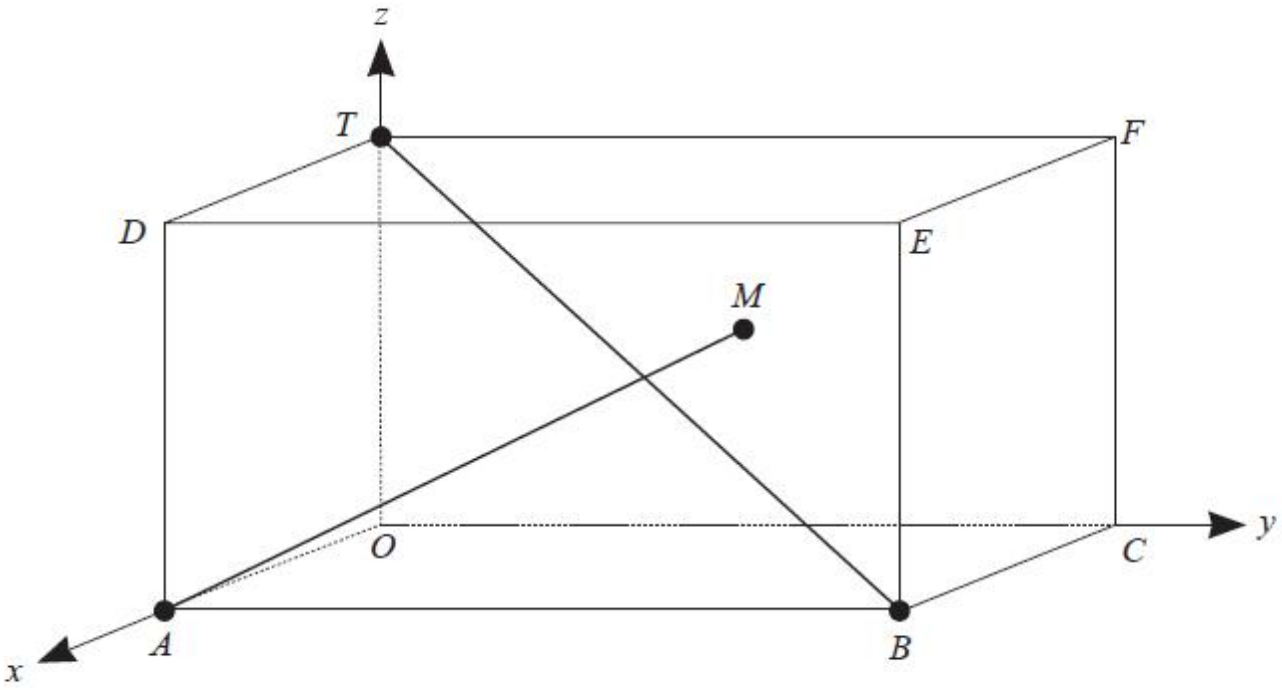
Question 16 **(8 marks)**

A rectangular prism is defined using the coordinate system shown with $A\,(2,\,0,\,0)$, $C\,(0,\,4,\,0)$ and $T\,(0,\,0,\,3)$. Point M is the centre of the planar face $OCFT$ with coordinates $(0,\,2,\,1.5)$.



(a) Determine the vector equation for the prism's main diagonal $\overleftrightarrow{BT}$. (2 marks)

(b) Determine the Cartesian equation of the sphere that contains all vertices of the rectangular prism. (3 marks)

(c) Prove, using a vector method, that line $\overleftrightarrow{AM}$ does **not** intersect $\overleftrightarrow{BT}$. (3 marks)

(d) Explain the geometric interpretation of the equations and the simultaneous solution. (2 marks)

Now assume that the price for an adult is greater than the price for a child and that the price for a pensioner is the lowest priced ticket.

(e) Determine the ticket prices for adults, children and pensioners on DollarDay. (3 marks)