

FAST FIBRE

Internet connections have become widespread and more stable over the last decade.

Fast Fibre is a telecommunications company looking to replace the current cable infrastructure for six straight-line connections with fibre optic technology. These connections are named alpha, beta, gamma, delta, epsilon and zeta. Using satellite imagery, multiple aerial diagrams have been plotted to help carry out the upgrade in infrastructure.

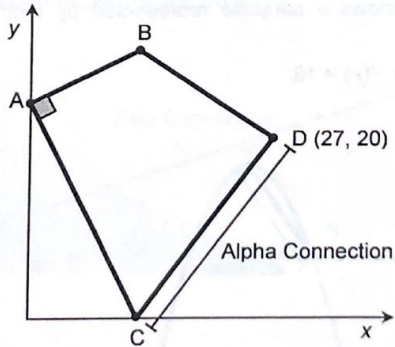
~~The total cost for the six connections cannot exceed 64 million dollars. The cost will depend on the total length of the six connections and the following rule. All distances are in kilometres.~~

~~$C(\ell) = -0.1[-4(\ell - 1.5)] + 0.8$ where ℓ represents the total length of the six connections (in km) and $C(\ell)$ represents the total cost (in millions \$).~~

You must determine one possible set of coordinates for point Z for the Zeta Connection.

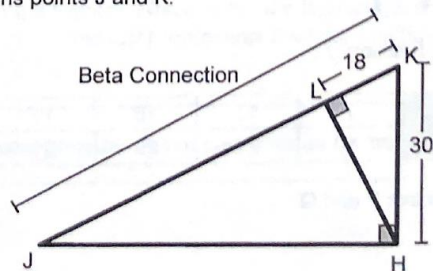
The Alpha Connection

The Alpha Connection joins points C and D in the diagram below. Line segment AB and AC are perpendicular. Points A and C are on the axes. The equation associated with line segment AB is $x - 2y + 48 = 0$.



The Beta Connection

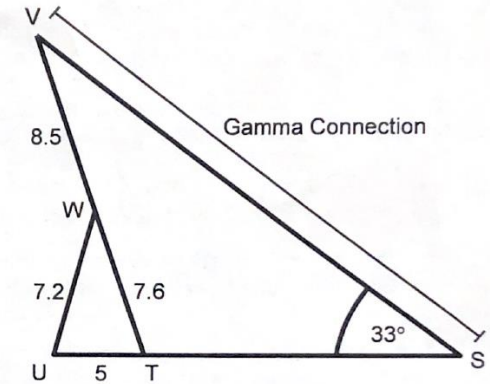
In the diagram below, JHK is a right triangle. Point L is on segment JK such that segment HL is perpendicular to segment JK. Segment KH is 30 km long, whereas segment LK is 18 km long. The Beta Connection joins points J and K.



The Gamma Connection

The diagram below shows triangles UWT and TVS. Points W and T are on segments TV and US respectively. The Gamma Connection joins points V and S.

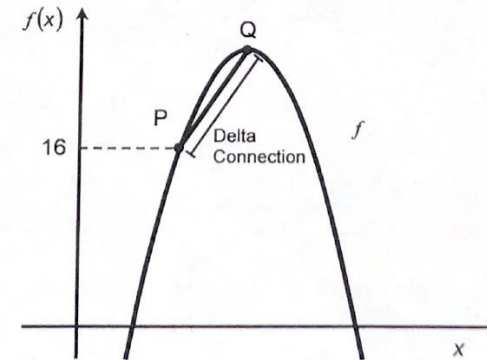
- $m\overline{VW} = 8.5$ km
- $m\overline{UW} = 7.2$ km
- $m\overline{UT} = 5$ km
- $m\overline{WT} = 7.6$ km
- $m\angle VST = 33^\circ$



The Delta Connection

The Cartesian plane below shows a parabola represented by function f with a vertex at point Q.

Point P is on function f where $f(x) = 16$.



The following table describes function f .

x	7	11	15	19
$f(x)$	9	21	25	21

The Delta Connection joins points P and Q.

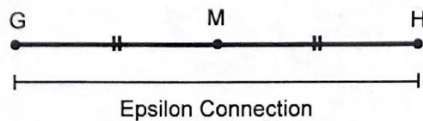
The total length of all the connections must be less than 159.5 km

The Epsilon Connection

The Epsilon Connection consists of one long connection from point G to point H. A monitoring station, represented by point M, is located on segment GH such that segment GM is equivalent to segment MH.

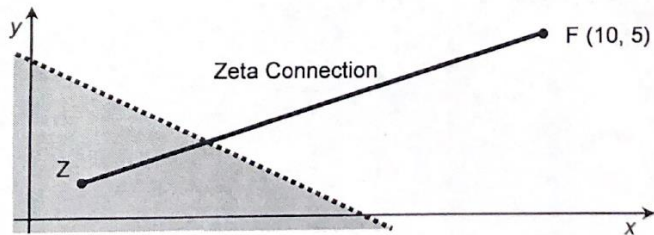
The measure of segment GM is $\frac{3n+20}{n-4}$ kilometres.

The measure of segment MH is $\frac{3n^2+16n+5}{n^2-25}$ kilometres.



The Zeta Connection

The Zeta Connection will join points Z and F as shown in the diagram below. Point Z has positive integer coordinates and is located in the solution region of the inequality $2x + 3y - 13 < 0$. Point Z is not located on the axes.



The Cost of Connections

The total cost can be determined using the following rule:

$C(\ell) = -0.1[-4(\ell - 1.5)] + 0.8$ where ℓ represents the total length of the six connections (in km) and $C(\ell)$ represents the total cost (in millions \$)

You must determine one possible set of coordinates for point Z for the Zeta Connection.