The Expanding Rail Line

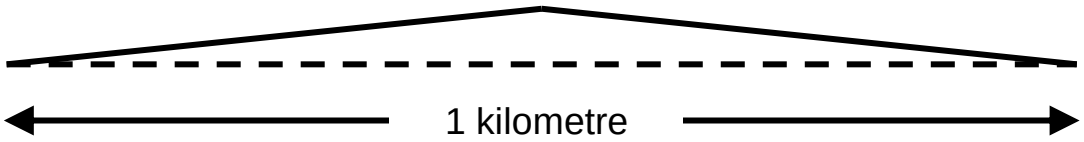
INVESTIGATE:

Imagine that there is a section of railway line one kilometre long, made without gaps, and fixed at each end so that it cannot take up the expansion on a hot day.

The temperature at this spot reaches down to freezing point, 0ºC, and up to 40ºC. Steel expands by 0.000011 of its length for each Celsius degree rise in temperature.

On a hot day, the track bows upwards. Assume that the curve can be modelled as an isosceles triangle, so that two right-angled triangles are involved.

At the midpoint of this piece of track, justify if you could:



(a) slide a piece of paper under it?

(b) crawl under it?

(c) walk under it?

(d) put a large building under it?