Graphs for a longitudinal wave

*(g)* compare transverse and longitudinal waves

*(h)* analyse and interpret graphical representations of transverse and longitudinal waves

The diagram shows a row of 20 undisplaced particles. By tracing the motion of each particle, generate graphs of displacement versus distance and pressure versus distance.



* Copy the diagram accurately along the top of a sheet of graph paper.
* Number each particle from 1 to 20 starting from the left.

The Table below lists the displacement of particles 1 to 10 at equal time intervals as they as disturbed by a longitudinal wave travelling from left to right. The unit of displacement is one small graph-paper square, and displacements to the right are positive.



Use the table above to help you to plot the positions of particles at successive time intervals (as shown in the next diagram) up to ‘time 20’.

You might want to extend the table above by adding more rows and columns. Notice that after ‘time 10’ particles to the right of no. 10 will be disturbed.

**On the bottom row of your plot (showing particles at ‘time 20’)**

* identify the compressions and rarefactions, and label them C and R;
* add arrows to indicate the size and direction of each particle’s displacement.



On axes like those below plot the displacement of each particle at ‘time 20’. Plot positive displacements upwards and negative displacements downwards. Take care to plot each particle above or below its *equilibrium* position (not its displaced position).



Sketch a graph showing how pressure varies with distance along the row of particles at ‘time 20’.

Describe in words the phase relationship between your two graphs.