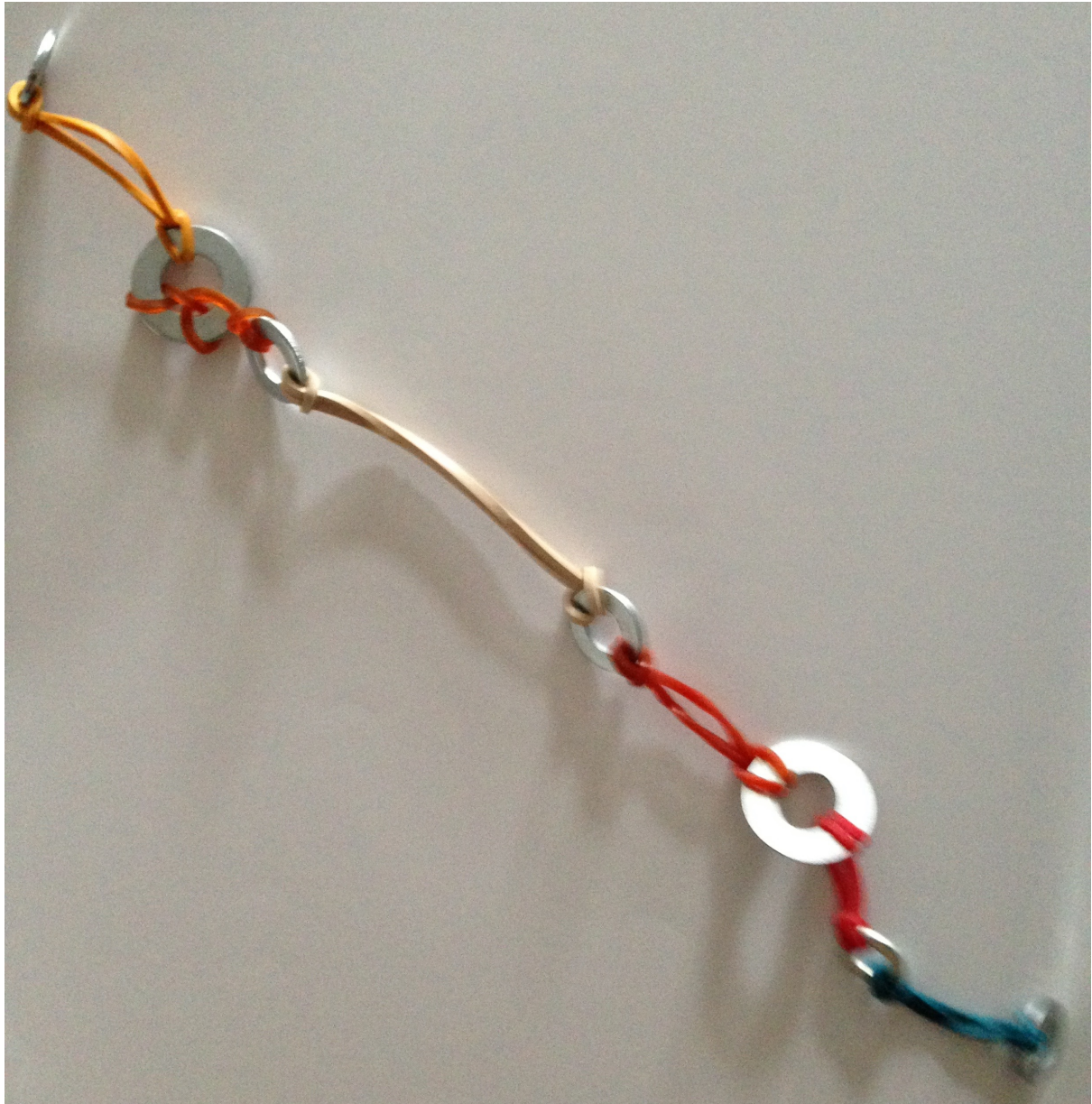


## Rubber Universe: Making your Universe

You are going to make a model of the Universe with the help of your partner. Use metal washers as galaxies, and rubber bands for the spacetime that holds the Universe together. Make a long line of galaxies of different sizes, and with different distances between them.



### Expanding the Universe

If you pull at each end of your string of galaxies, spacetime will stretch, and you can see how the Universe expands, with every galaxy getting further away from every other galaxy. It does not matter which galaxy we live in, they all move further away from us.

# Rubber Universe: Measuring your Universe

Choose one of the metal washers to be our galaxy - The Milky Way. Mark it with a pen so you remember which one is ours. Mark all the other galaxies with names or numbers. Lay your rubber universe out in a line, fix it in position, and measure the distance from our galaxy to each other one.

SCALE: Make every centimetre be 1 billion km

Write the measurements in the first two columns in the table below:

Galaxy name	Start distance from Milky Way (billion km)	Final distance from Milky Way (billion km)	Change in distance (billion km)	Speed (km/s)

Stretch the rubber universe and fix it in its new position. Measure the new distance to each galaxy and write this in the third column of the table above.

Calculate how much further away the galaxies are now, by calculating the difference in the distances before and after the Universe expanded. Write these values in the fourth column.

Let's say your expansion of the Univers took 5 billion seconds (that's about 158 years).

Calculate the speed at which each galaxy is moving away from us:

$$\text{Speed} = \frac{\text{Change in distance}}{\text{Time}}$$

Write these speed answers in the final column in the table.

Astronomers have used this method, with real galaxies, to find out that our Universe is 13.8 billion years old.