

PAPER FOLDING A PARABOLA

The SKA will have thousands of radio telescopes all working together. All radio telescopes have the same shape dish. This shape is called a *paraboloid*. You can make a *paraboloid* by getting a *parabola* and rotating it around its centre.

Whilst it is fairly easy to plot and draw a parabola on graph paper, it is not the only way to do it. You can make a parabola by repeatedly folding a piece of paper. This activity makes use of the definition of a parabola as “the locus of points that are equidistant from a line and a point not on the line”. That line is called the *directrix*, and the point is called the *focus*.

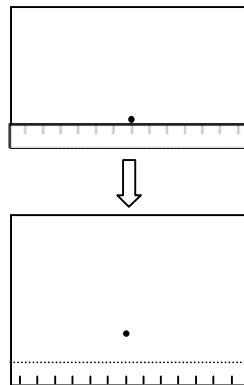
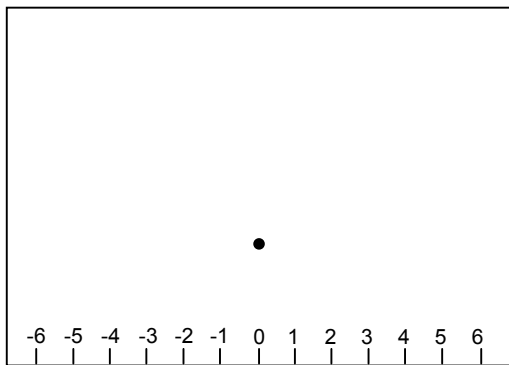
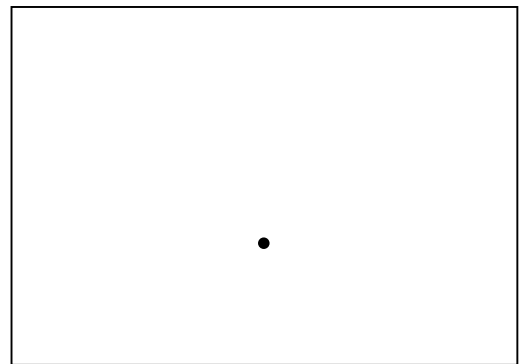
You will need

- A piece of A4 paper
- A pencil
- Ruler

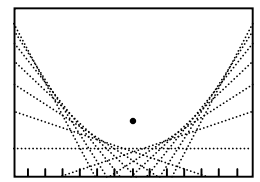
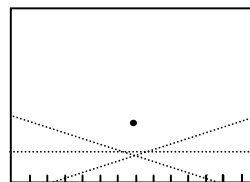
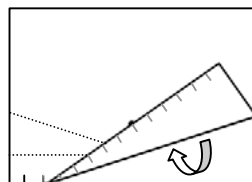
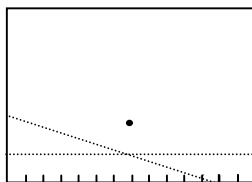
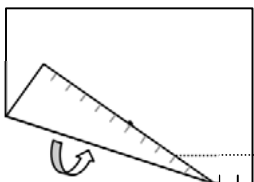
What you need to do

Mark a spot near the middle of the piece of paper. This mark will be the focus of the parabola.

Along the bottom of the piece of paper, mark a series of equidistant points. In this example, we've used 13 dashes. If you're using lined paper, then it is already marked, and you could use every alternate line. For ease, the marks can be labelled, with 0 directly under the focus.



Fold the paper so that the point 0 is directly over the focus. Score the paper, and unfold it. This score is the *perpendicular bisector* of a line from the focus to the *directrix* (line below the parabola) and represents the *minimum* of the parabola.



Repeat the process, this time using the marks labelled -1 and 1. These scores are also perpendicular bisectors of the lines joining the focus points on the directrix. They're tangents to the parabola, and start showing the edge of the curve. By the time you've repeated this process a number of times, the parabola becomes very clear. It's even clearer if you look at the other side of the piece of paper.

Investigate

Try experimenting with making the focus point at different heights on the page. How will the parabola look if

you place the spot above the centre of the piece of paper?

What happens if the spot is placed below the centre of the paper?