

Resource 2 Proportional circle map

Teacher notes

Proportional circles are used on pages 8 and 9 of the [Environment Agency document Managing flood FCRM](#). In maps such as these the **area** of each circle is in proportion to the value of the data that is located at the centre of the circle. Consequently, on page 8, the circles are in proportion to the number of properties that were flooded.

Maps such as these have a number of strengths.

- They are useful if the range of data is very large.
- Spatial patterns can be seen because the circles are located on the map.
- They are easy to understand because larger circles represent more data.

However, these maps also have limitations.

- Maps can become cluttered if there is too much data. In this case, some of the circles overlap and some small circles have had to be shown in outline inside larger circles.
- Estimating area can be difficult. It is easy to see that the number of properties flooded was much greater in Kendal than that in Appleby but difficult to work out from the size of the circles by how much. The actual figures were 176 flooded properties in Appleby and 2150 in Kendal so the Kendal circle should cover approximately 12 times the area of the Appleby one.

Constructing proportional circles

The following data has been sourced from Flood Investigation Reports published by Cumbria County Council and the Environment Agency.

Settlement	Homes affected	Source of data
Carlisle	2128	https://www.cumbria.gov.uk/eLibrary/Content/Internet/536/6181/42494151257.pdf
Cockermouth	594	https://www.cumbria.gov.uk/eLibrary/Content/Internet/536/6181/42774103411.pdf
Keswick	515	http://www.cumbria.gov.uk/eLibrary/Content/Internet/536/6181/42503135122.pdf
Appleby	176	https://www.cumbria.gov.uk/eLibrary/Content/Internet/544/3887/6729/6734/4255216356.pdf
Greystoke	15	http://www.cumbria.gov.uk/elibrary/Content/Internet/544/3887/6729/6734/426559239.pdf?timestamp=4312316544
Warcop	11	http://www.cumbria.gov.uk/elibrary/Content/Internet/544/3887/6729/6734/42695145050.pdf?timestamp=4312316544

Number of properties flooded by settlement in December 2015 as a result of Storm Desmond

To construct this type of map your students need to draw circles which have an area that is in proportion to the number of properties flooded. The area (A) of a circle is determined by the equation:

$$A = \pi r^2$$

where r = the radius of the circle.

- Step one** Calculate the square root of each data point for your map.
- Step two** Decide how big the largest circle can be. This will depend on the size of the map. It may also depend on the number of circles that are in close proximity to one another, as you don't want the circles to overlap too much. The square root for Carlisle is 46 so you need a scale that can represent this number – a radius of 46 mm will be the easiest to calculate but you could halve this number if you want smaller circles.
- Step three** Draw a circle with a radius of 46 mm on the map with its centre on Carlisle. This circle will represent the number of properties flooded in Carlisle.
- Step four** Draw circles for each of the other places affected by flooding.
- Step five** Draw three or four circles of different sizes to act as a scale for your map. These can be drawn to the side of the map and can be drawn inside each other. Each circle should represent a round number (such as 2000, 1000 or 200). To draw these circles you will need to find the square root for each of the scale circles just as in step one. For example, the square root of 2000 is 45, so a circle representing flood damage to 2000 properties should have a radius of 45 mm. Make sure that you label each circle in the scale to show how many flooded properties it represents.

There is an outline map of Cumbria on the next page that you can use for this activity.

