

Don't tie yourself in a knot

An activity by Johnny Ball

For Number Day, you're going to tackle creating an evenly spaced knotted piece of string. When you do, you'll be holding a piece of history in your hands.

A knotted string or rope like this would have helped builders down the ages, measure lengths and distances, make circles and arcs, as well as forming perfect right angles for square shapes like tabletops, or the square corners for buildings.

The Egyptians use knotted string to measure areas of land. The Nile flooded each year, but when the floods subsided, the land had now been naturally fertilized by the nutrients in the water. So, they would use knotted string to divide their newly fertilized farmland equally between farmers.

The Egyptians had learnt to use mathematics to help in everything they did.

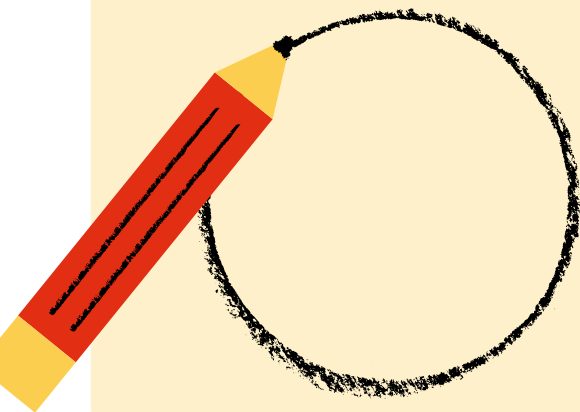
Your teacher will take you through how to create your knotted string. Once you've created it, you could try out these activities.



"GOOD LUCK"
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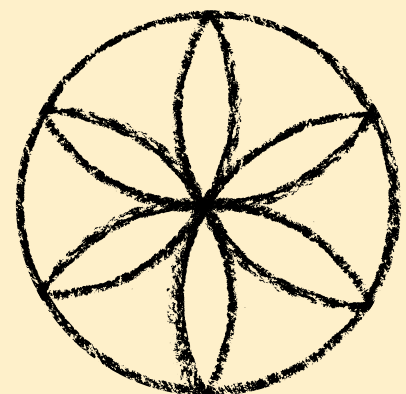
Practice making arcs:

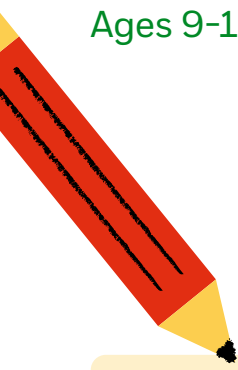
- First hold a knot on one spot.
- Now, with a pencil tip held by or even through any knot, some distance away, you can use your string as a pair of compasses to make perfect arced curves, or even complete circles.



Make some patterns:

- Using exactly the same radius every time, you can make a circle with six petals inside it.
- There are lots of other designs you can make, using your string as a pair of compasses to make circles and circular arcs.



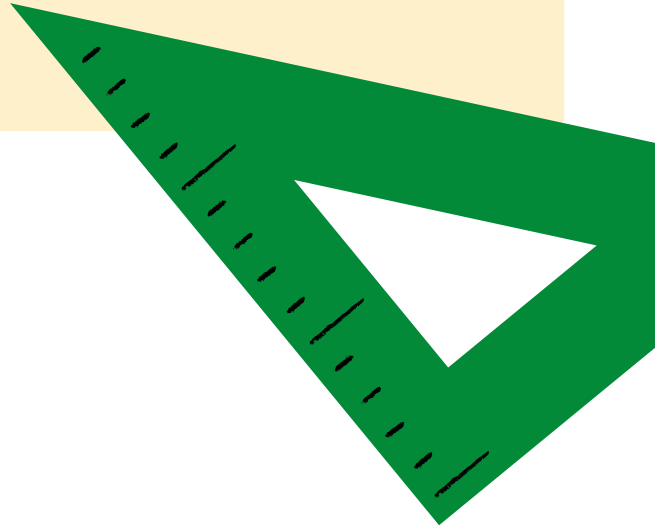


Make a 3, 4, 5 right-angled triangle:

- Find the 13th knot on your string and grip it in your fingers with the very first knot.
- From this point, stretch a four-unit length forming a straight line.
- Now stretch the string so it forms a triangle with sides of unit lengths 3, 4 and 5.
- The angle between sides 3 and 4, will be a perfect right-angled triangle.
- Making dots for the angles, and then using a ruler, you can complete your 3, 4, 5 triangle drawings.

Make chocolate bar shapes:

- Once you have a 3, 4, 5 triangle, you can construct another alongside, to produce a chocolate bar shape of three rows of four squares.
- By repeating this, you can make chocolate bar patterns as large as you like.
- You might try making an 8 x 8 chess board!

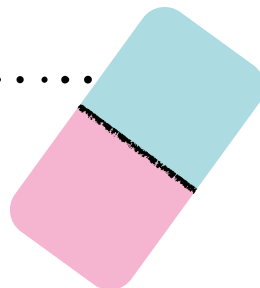


SUMMING UP

You've hopefully seen how an evenly knotted string makes a very useful tool. You can use it to create patterns, triangles, and even use it as a pair of compasses!

You could see if you can use it in your other Number Day activities.

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The following activity can be tackled by children of all ages and does not have to coincide with the maths curriculum.

This activity is also a great project for pair work.



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You'll need:

- 1.5 metres of string
- Ruler
- Pencil
- Paper

Activity instructions:

Having an evenly knotted piece of string is key to this project, so encourage pupils to take their time and try to be accurate. Talk them through these steps so they can create their knotted string.

1. Tie a simple knot at one end of the string.

As you tighten the string into a knot, hold it between finger and thumb while you pull tight with the other hand. This way, you can get each knot exactly where you want it. Try to get the first knot right at the end of the string, with the smallest end sticking out.

2. Holding the string on a ruler or tape measure, hold the first knot at a 0 and make a second knot exactly 10 cm away.

As you tighten, keep checking you are forming the knot in the right place, until the knot is as tight as can be. If your tightened knot is in the wrong place, loosen it and try again.

3. When you have three knots, you can check they are the same distance apart by holding the middle knot and doubling the string so the other two knots lie side by side.

You can do this kind of check after every new knot.

4. From 1.5 metres of string, you should end up with 16 evenly spaced knots.

5. Now, by bringing the two end knots together, to make your string double, you can check how well each pair of knots coincide.

Once pupils have their knotted strings, there are lots of different things they could try out with them.

They could:

- Practice making arcs
- Make patterns with circles
- Make a 3, 4, 5 right-angled triangle
- Make chocolate bar shapes

Instructions for each of these activities will be on your pupils' activity sheets.