

Rollers

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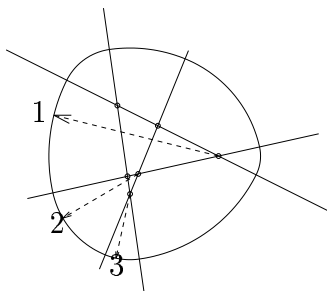
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1 What is a roller?

A roller [1, p. 219] is a shape that has constant diameter. That means it will roll between two parallel lines without losing contact with either. The 50p and 20p pieces are examples of rollers.

2 Make your own roller



Draw a number of line segments. Every pair of lines must cross. Draw circular arcs round the perimeter, centered on the points of intersection, between the corresponding line segments (the radii of three arcs are shown).

Make the arcs large enough for the resulting shape to be convex. This shape has constant diameter.

If two of the lines are nearly parallel, the roller will be very large. A good way to control the size of the roller is first to draw a circle of the required size, and then draw the lines inside the circle. This doesn't guarantee that the roller will lie entirely inside the circle, though.

3 Perimeter and area

Any curve of constant diameter d has perimeter of length πd , like the circle. But the area inside a non-circular curve will always be less than the area of the corresponding circle, $\pi d^2/4$. This is because

Theorem Of all shapes with the same perimeter, the circle has the greatest area.

References

- [1] David Wells. *The Penguin Dictionary of Curious and Interesting Geometry*. Penguin, 1991.