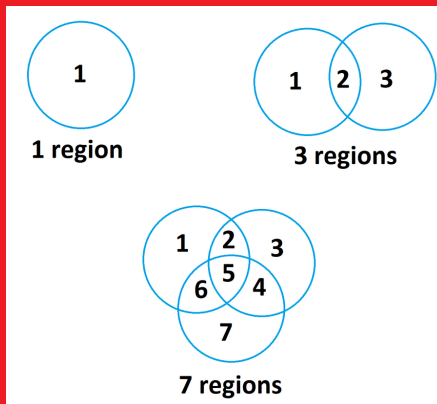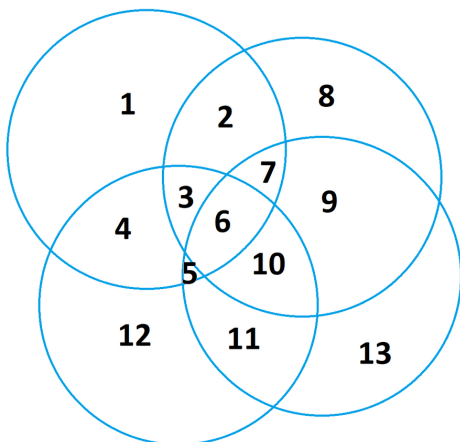# CIRCLES: Solutions

puzzle #1

One circle encloses 1 region.
Two circles can enclose 3 regions.
Three circles can enclose 7 regions.

How many regions can four circles enclose?

Mathematicians have proved that it is impossible to create more than 13 regions with four circles, even if you use circles of different sizes.

Can you draw a picture of five circles enclosing 21 regions?

puzzle #2

Draw circles on the surface of a regular tetrahedron (triangular pyramid). What fraction of a full circle are the circles drawn at the corners?

ANSWER TO PUZZLE 1:

One can make 13 regions with four circles.
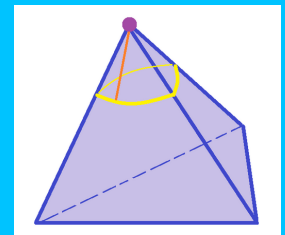
ANSWER TO PUZZLE 2:

A regular tetrahedron has equilateral triangles as faces with angles of 60 degrees. The "circle" at the corner of the solid is composed of three 60-degree sections, that is, a total of 180-degrees of turning. This is only half of a full turn, 360 degrees. It is thus only half of a full circle!

About the Author: Dr. James Tanton

The NMF Weekly is written by mathematician Dr. James Tanton as a resource for friends and fans of the 2021 National Math Festival.

Learn more at globalmathproject.org/nmf-weekly & nationalmathfestival.org