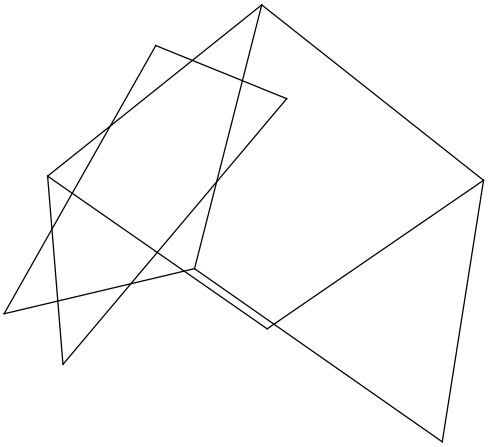
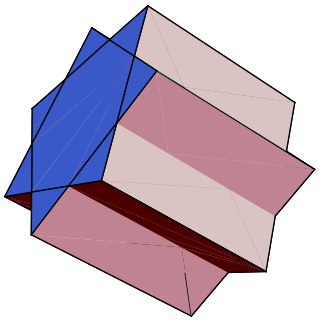
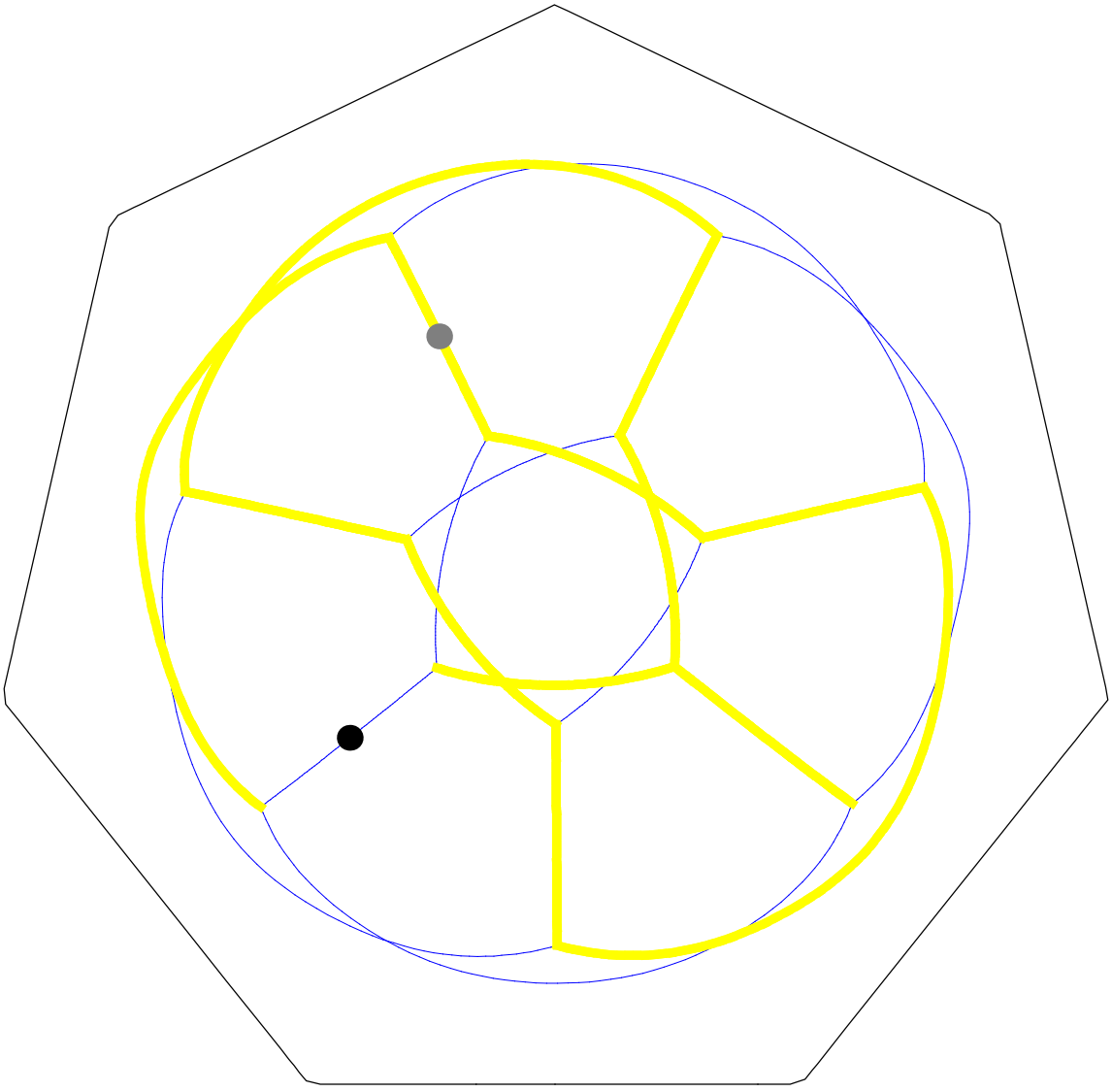
Izidor Hafner

Mazes on Uniform Polyhedra



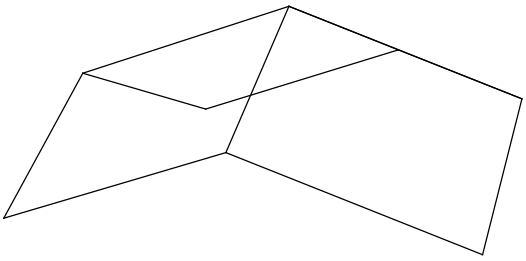


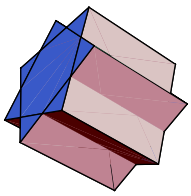


Introduction

Let as take an example. We are given a uniform polyhedron.

{4, 3, 4, 4}

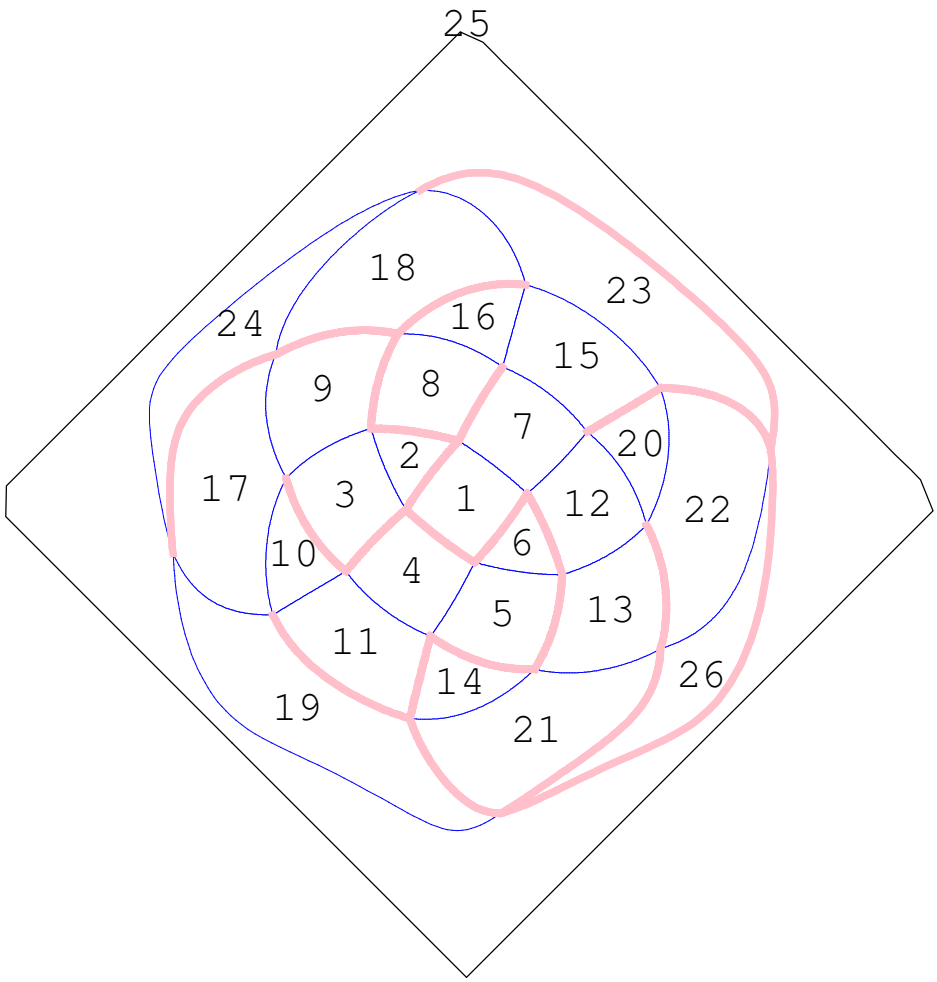


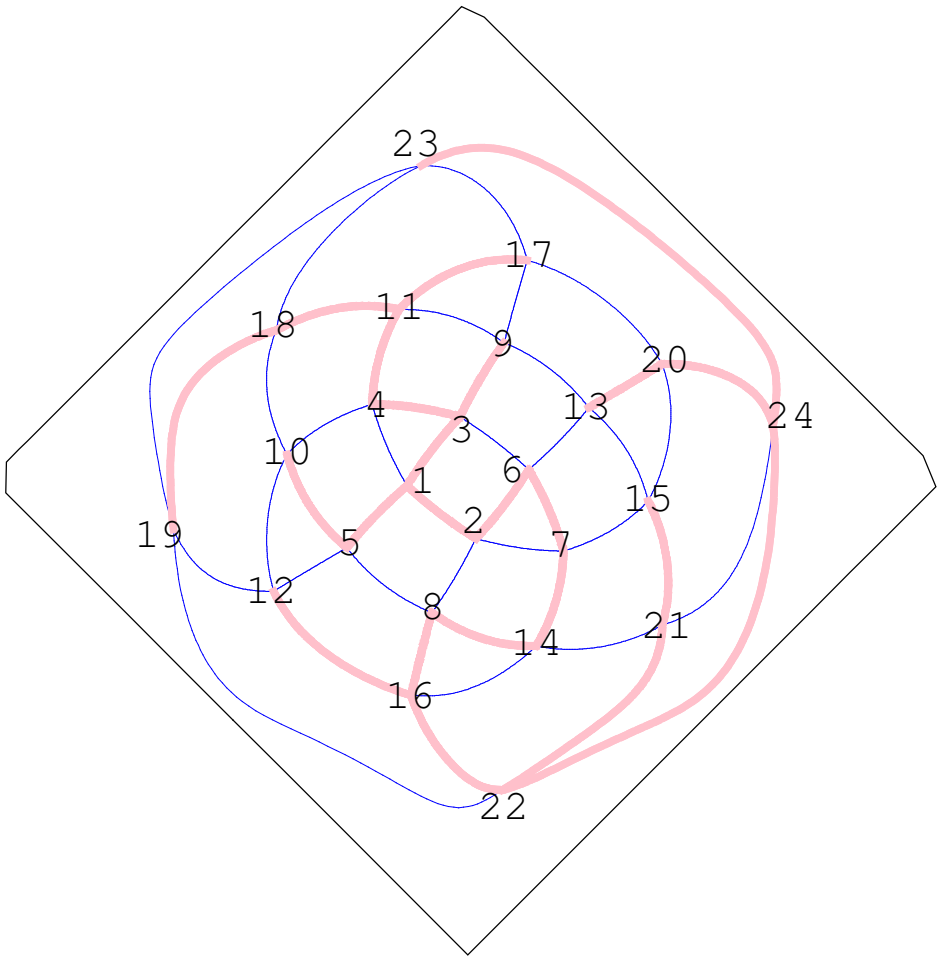


In Mathematica the polyhedron is given by a list of faces and with a list of koordinates of vertices [Roman E. Maeder, The Mathematica Programmer II, Academic Press1996]. The list of faces consists of a list of lists, where a face is represented by a list of vertices, which is given by a matrix. Let us show the first five faces:

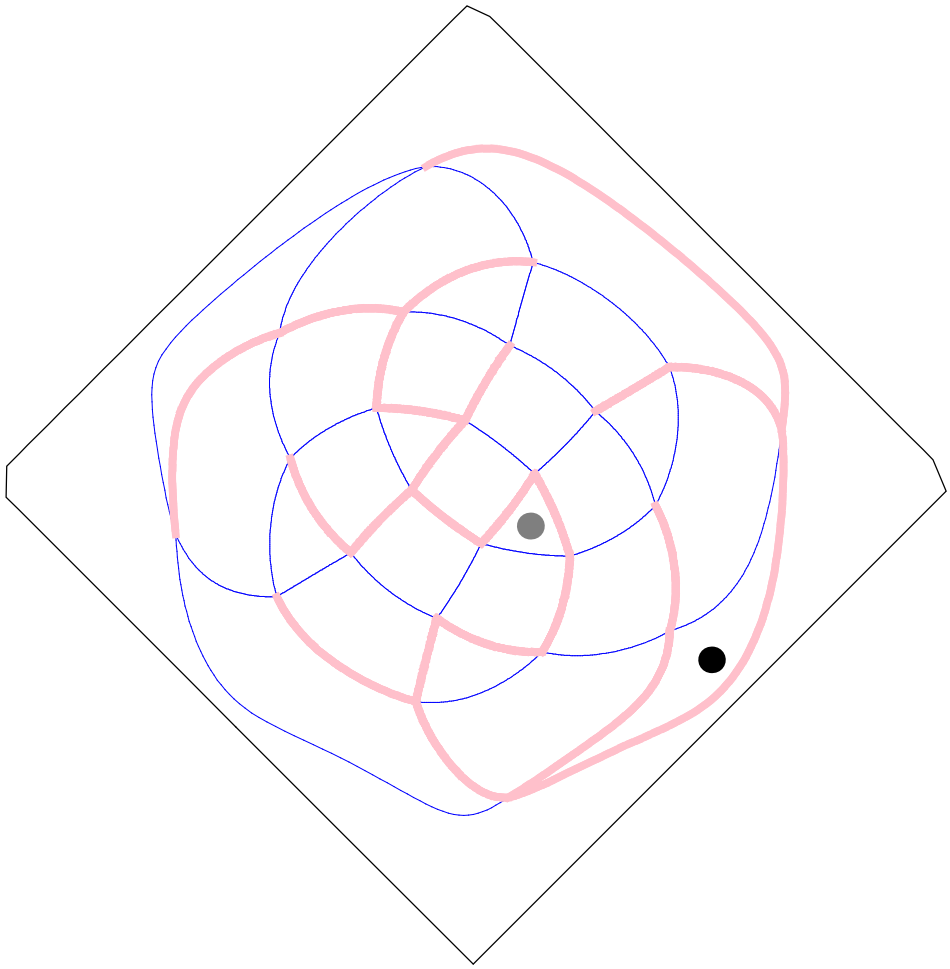
```
{{1, 2, 6, 3},
 {1, 3, 4},
 {1, 4, 10, 5},
 {1, 5, 8, 2},
 {2, 8, 14, 7}}
```

The nest two figures represent faces and vertices. The polyhedron is projected onto supescribed sphere and the sphere is projected by a cartographic projection.

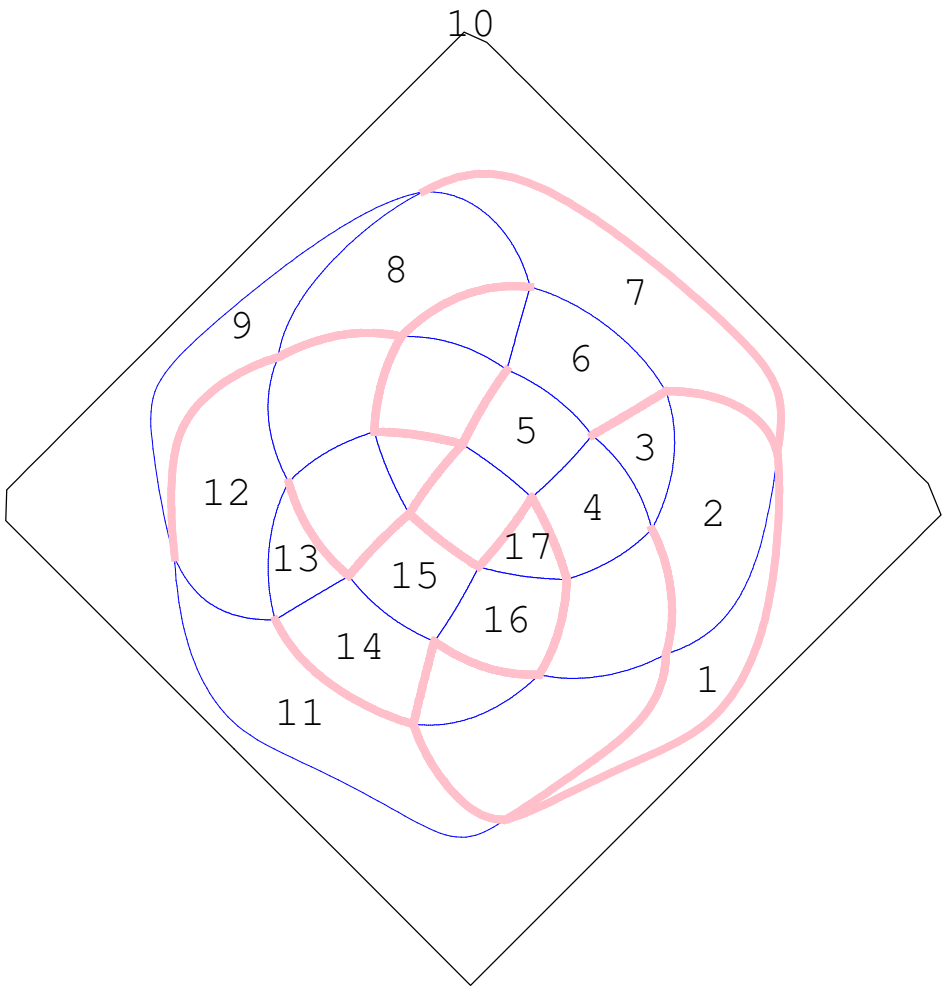




The problem is to find the path from the black dot to gray dot, where thick lines represent walls of a maze.



The solution is given by a list of faces passed from the black to gray dot.



Problems

1.

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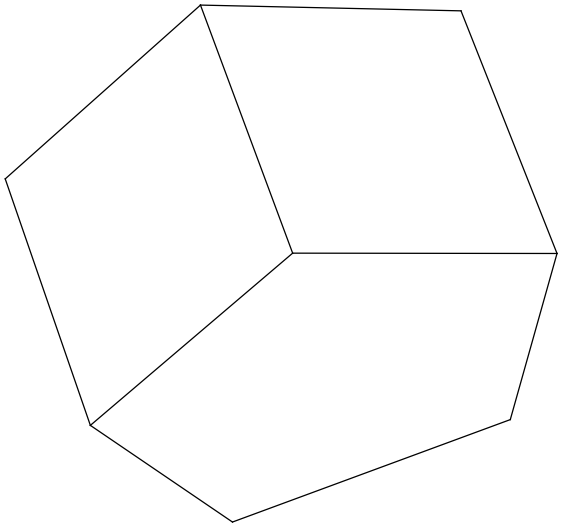
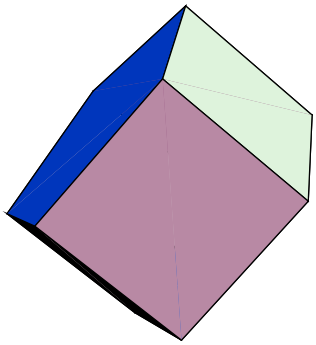
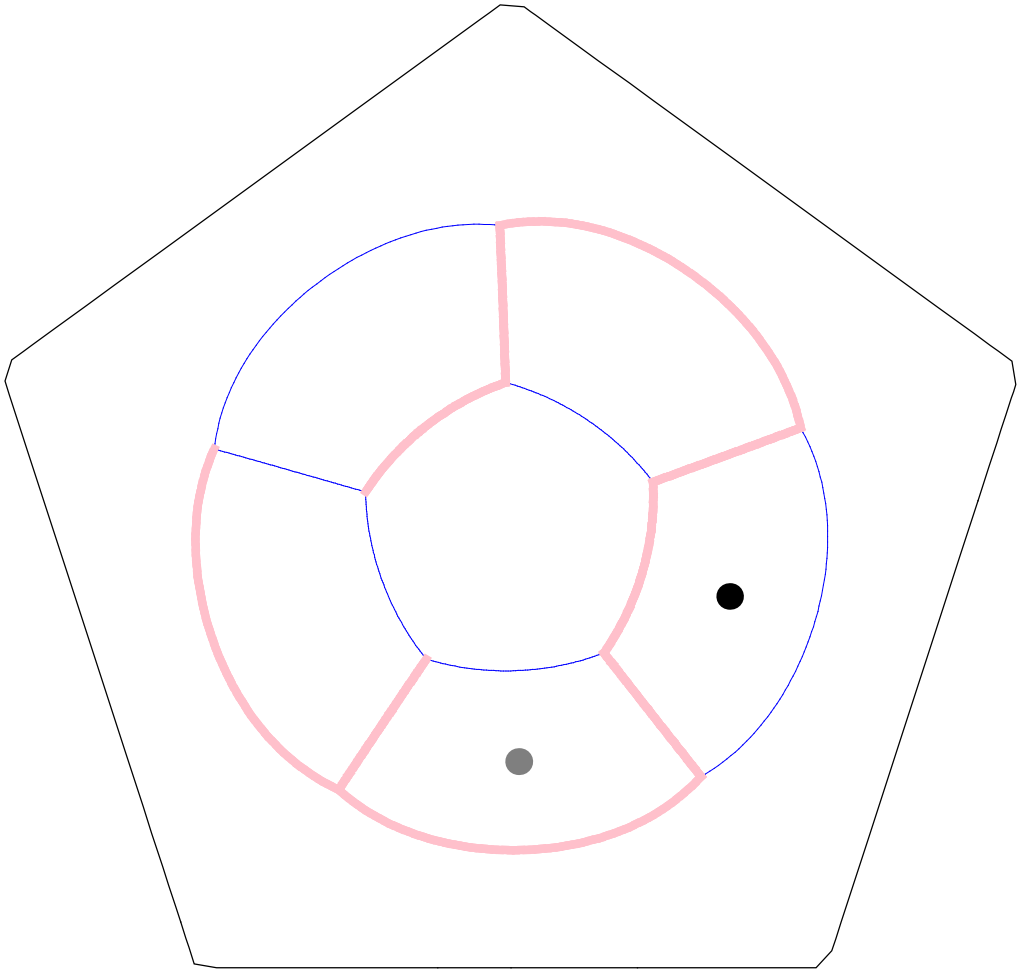
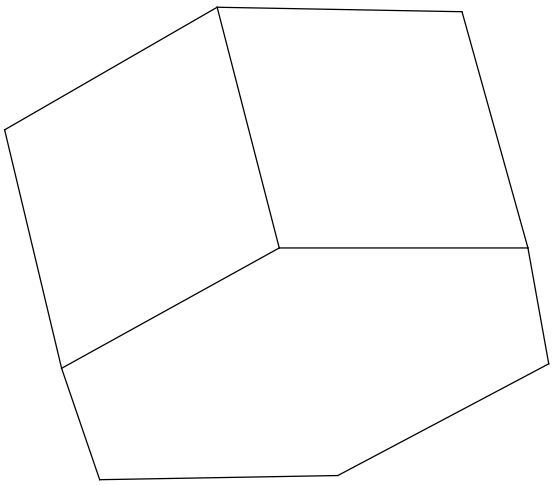


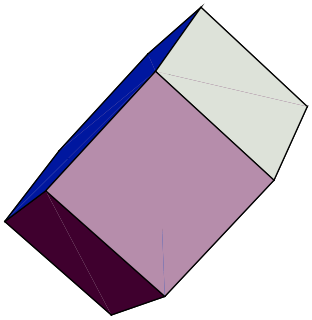


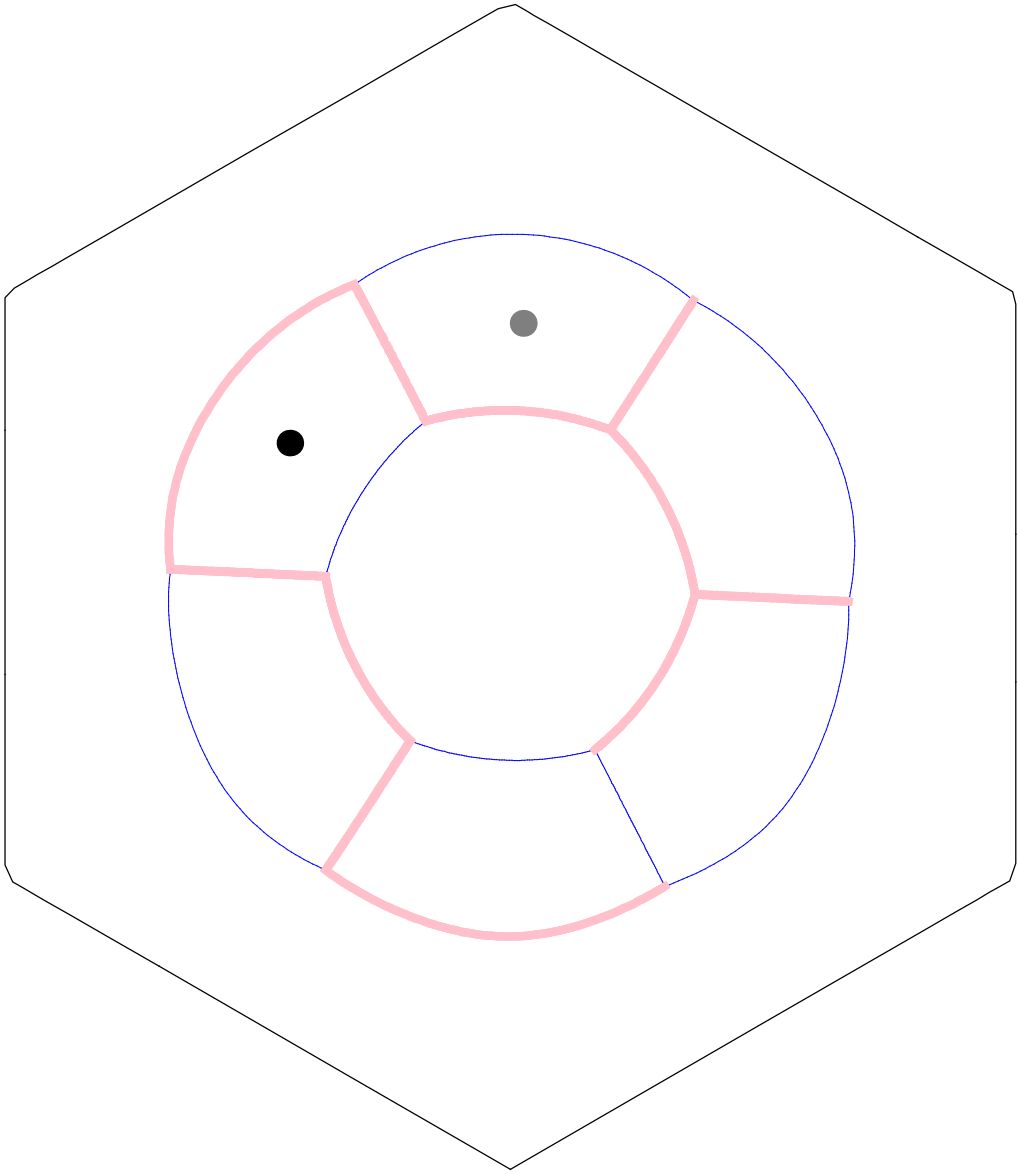


2.

{4, 4, 6}

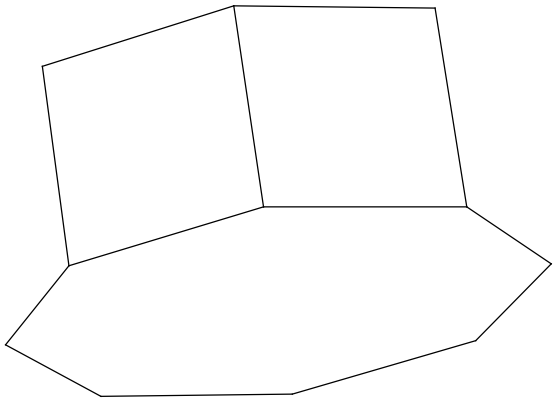


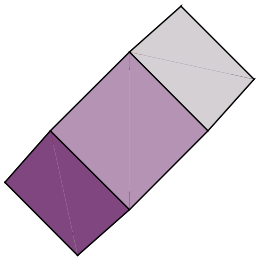


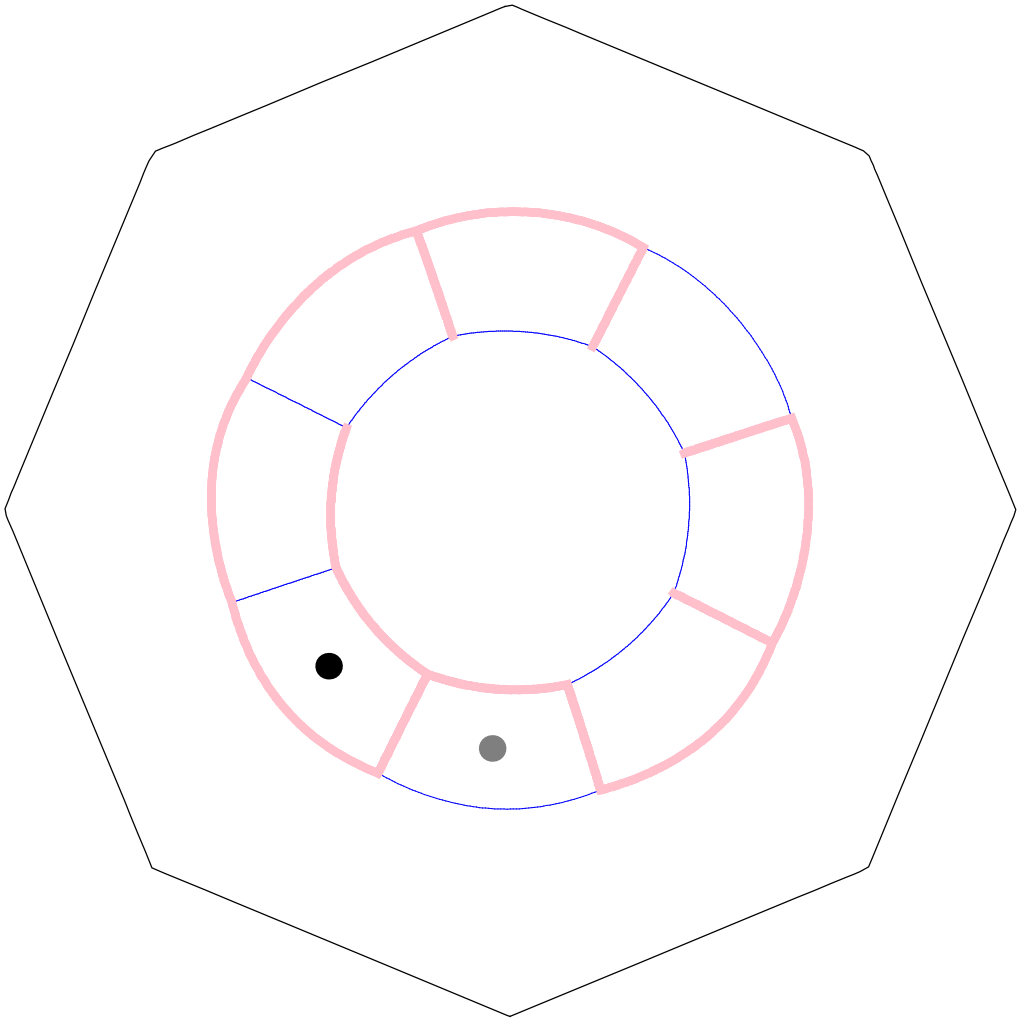


3.

{4, 4, 8}

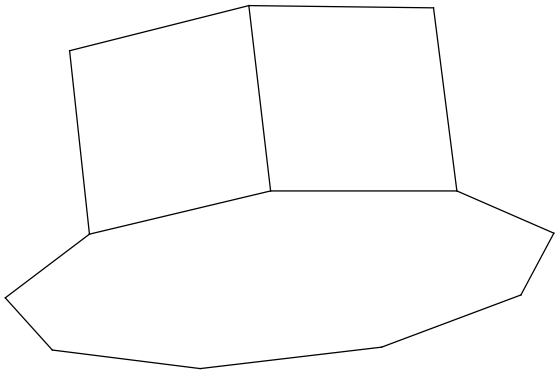


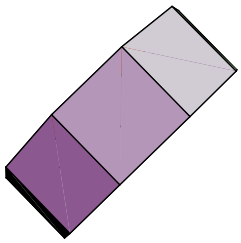


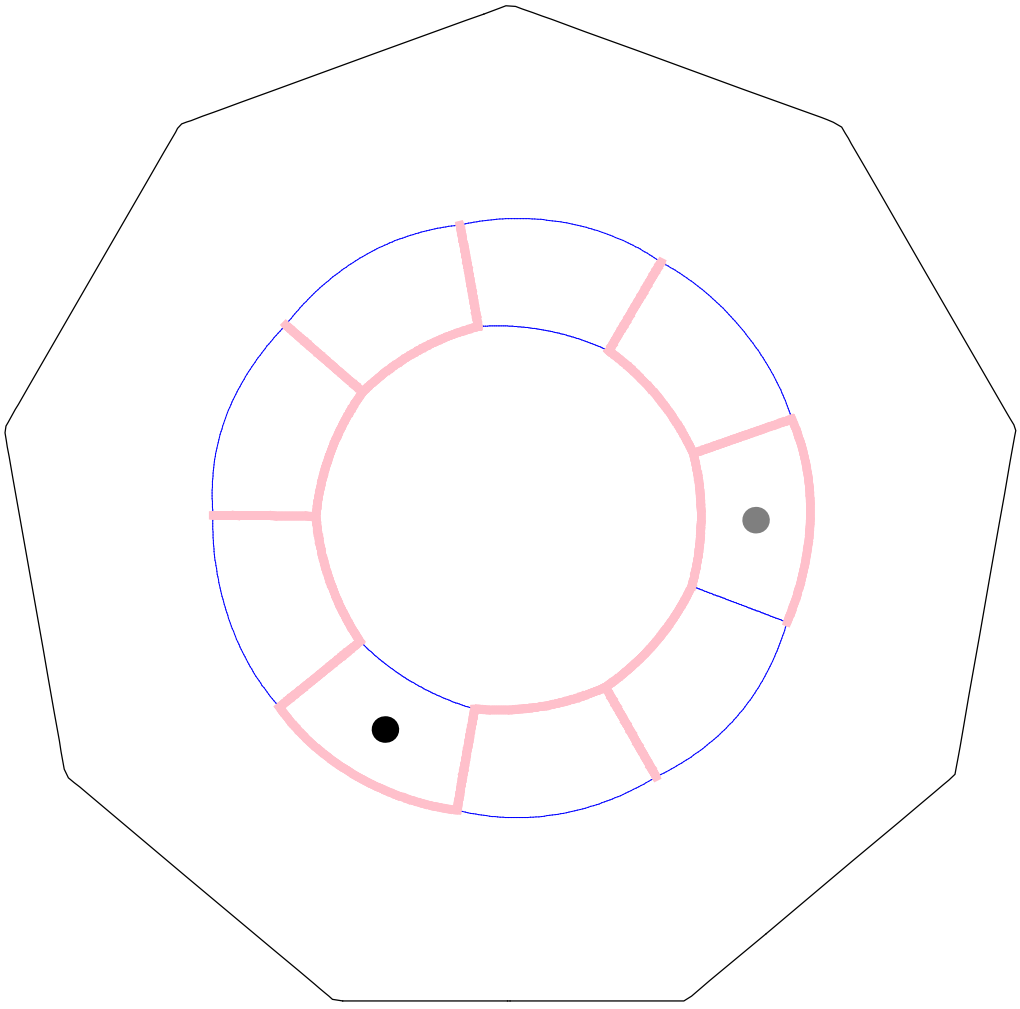


4.

{4, 4, 9}

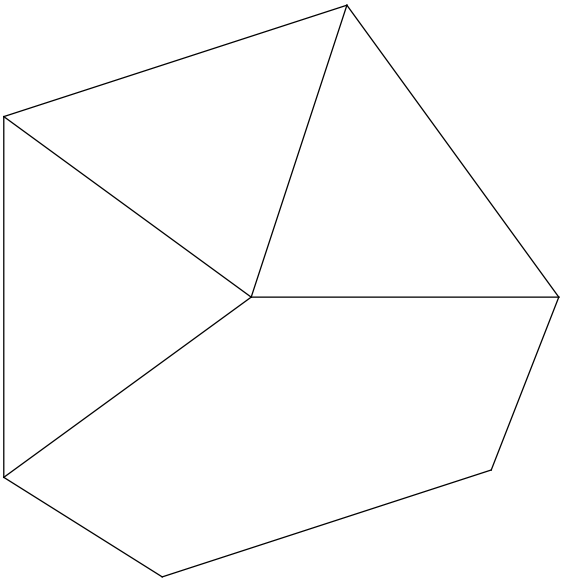


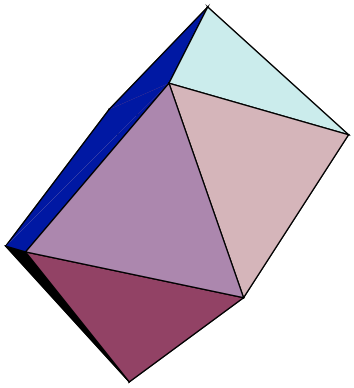


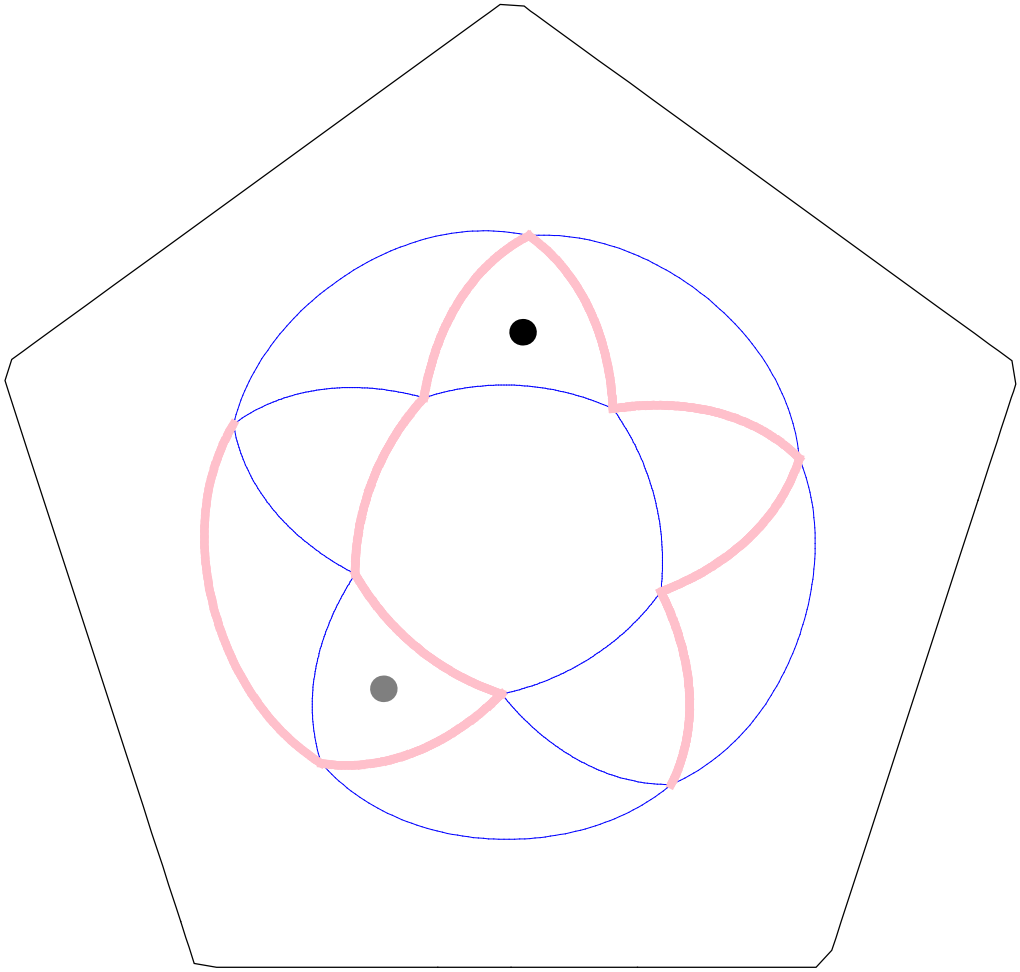


5.

{3, 3, 3, 5}

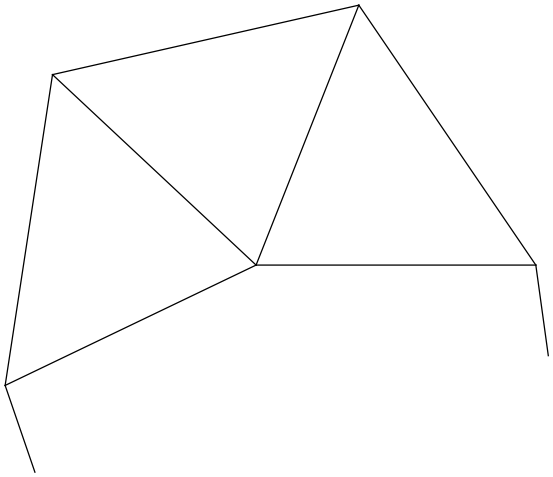


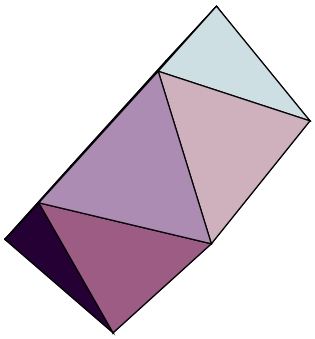


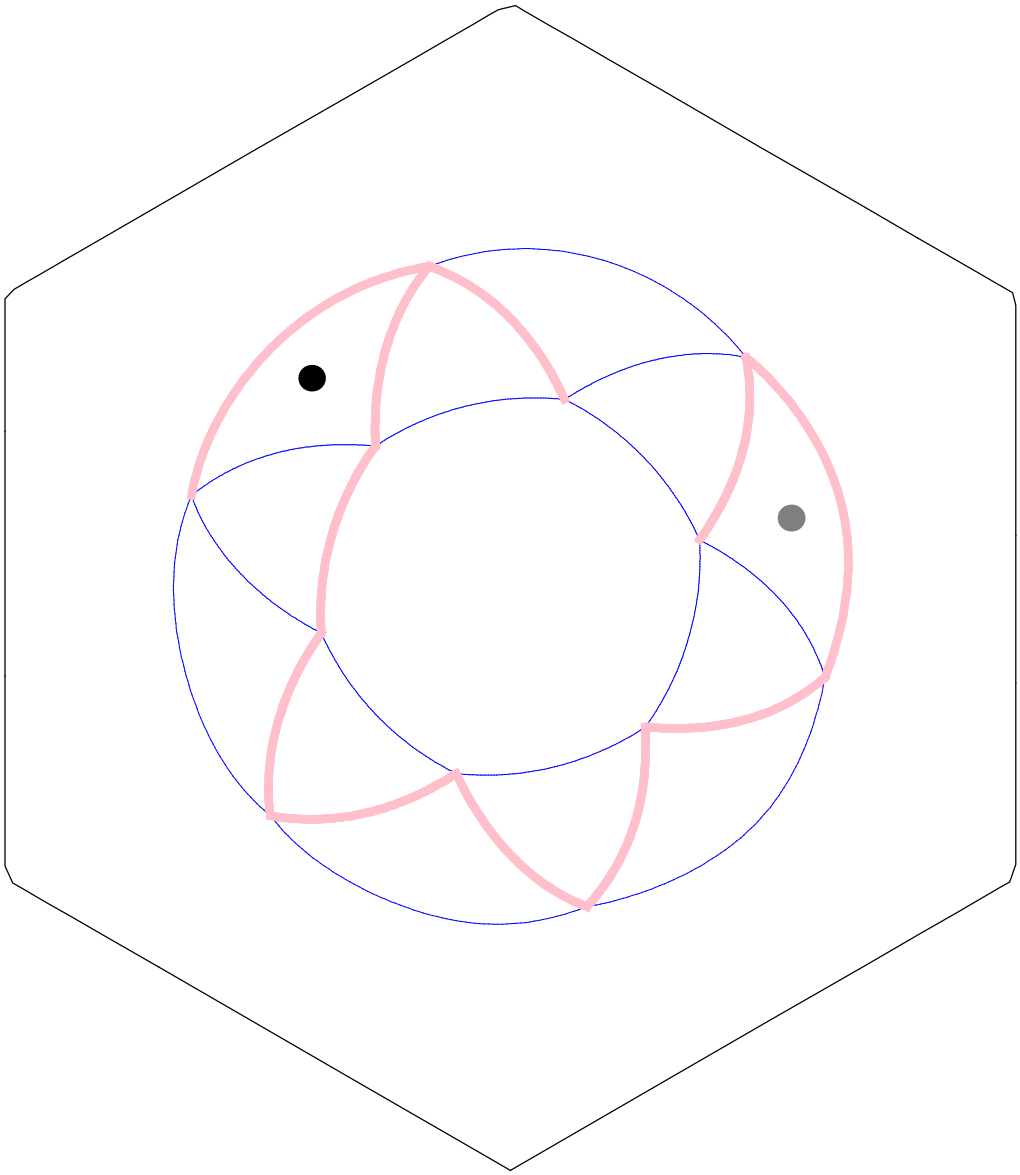


6.

{3, 3, 3, 6}

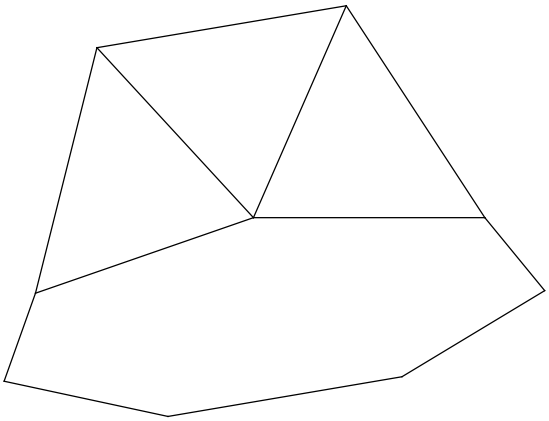


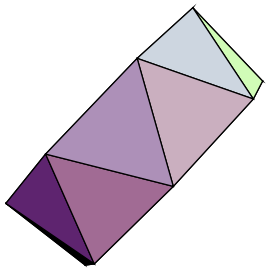


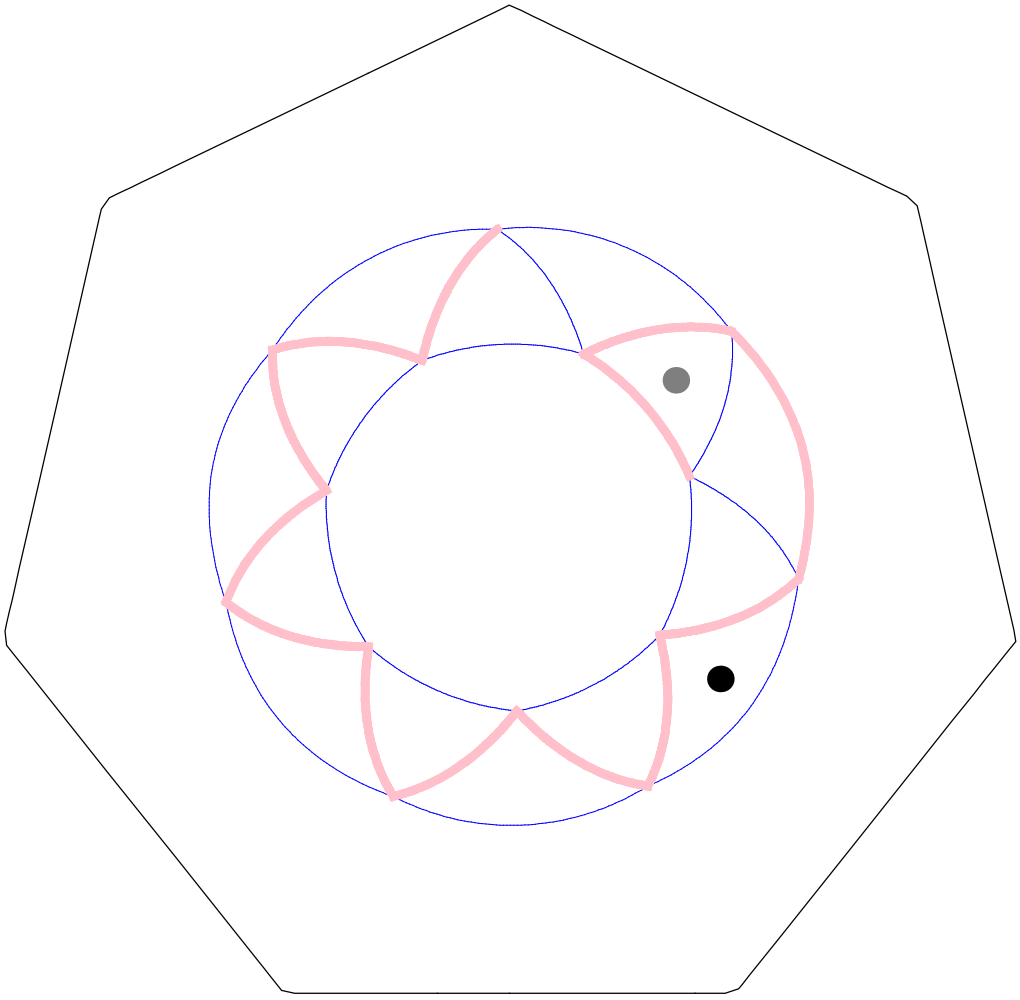


7.

{3, 3, 3, 7}

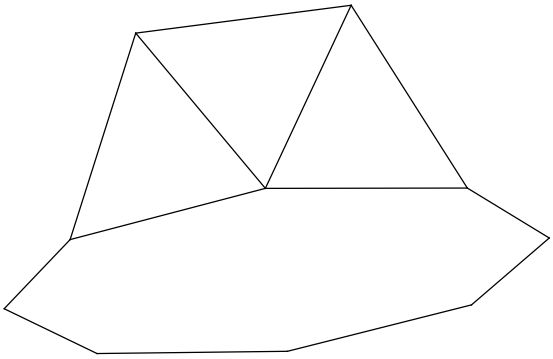


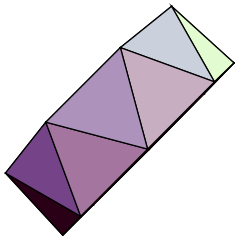


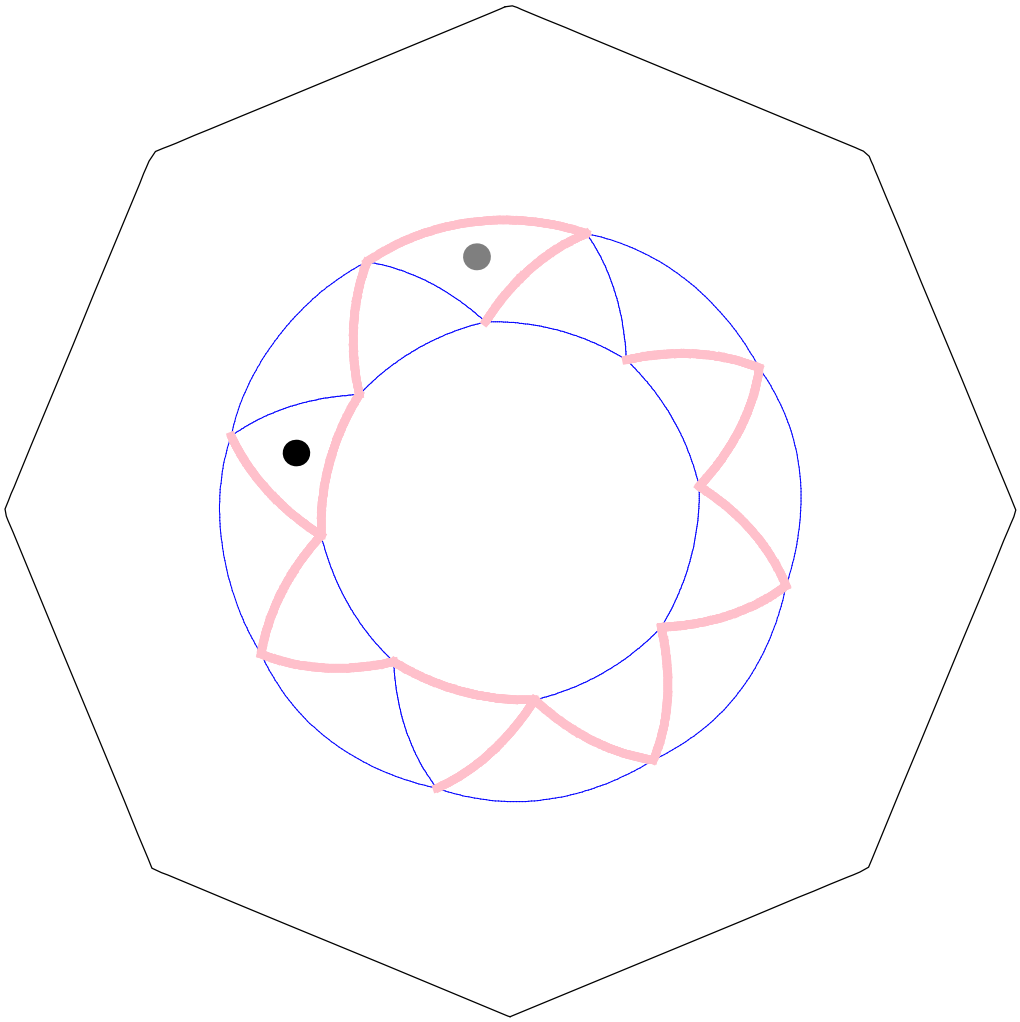


8.

{3, 3, 3, 8}

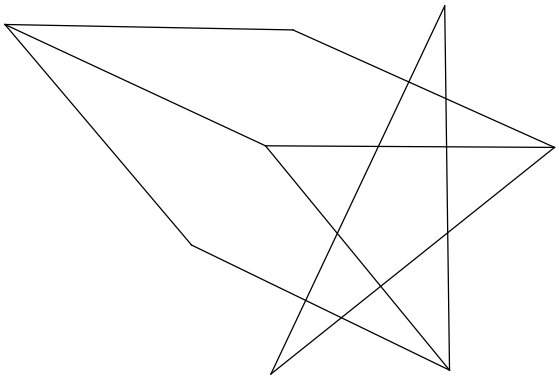


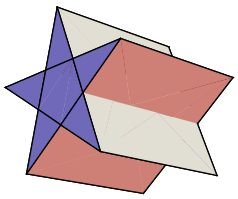


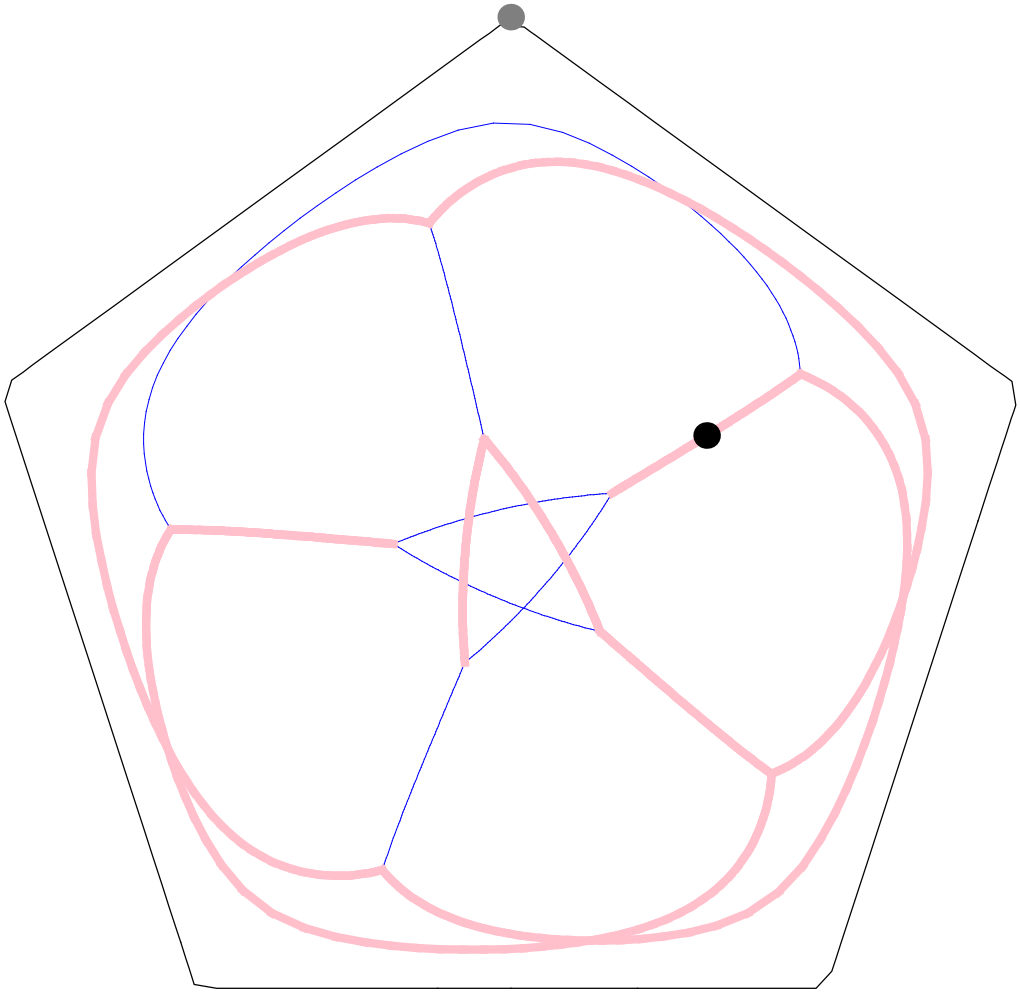


9.

$\{4, 4, \frac{5}{2}\}$

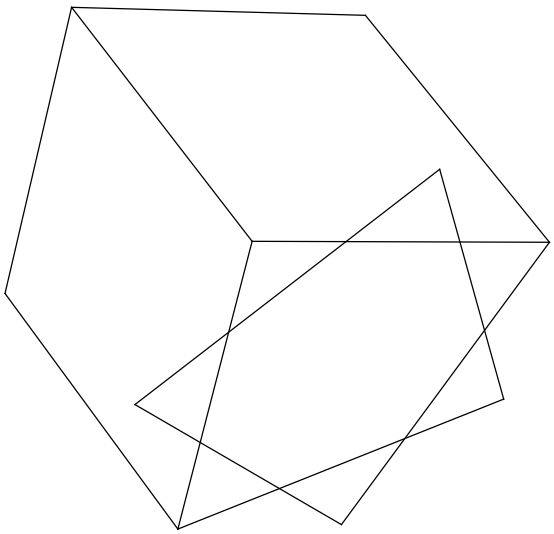


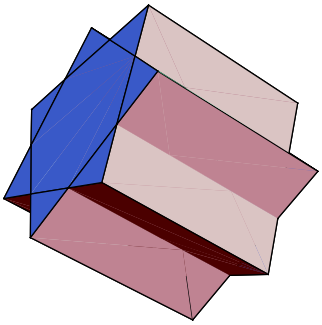


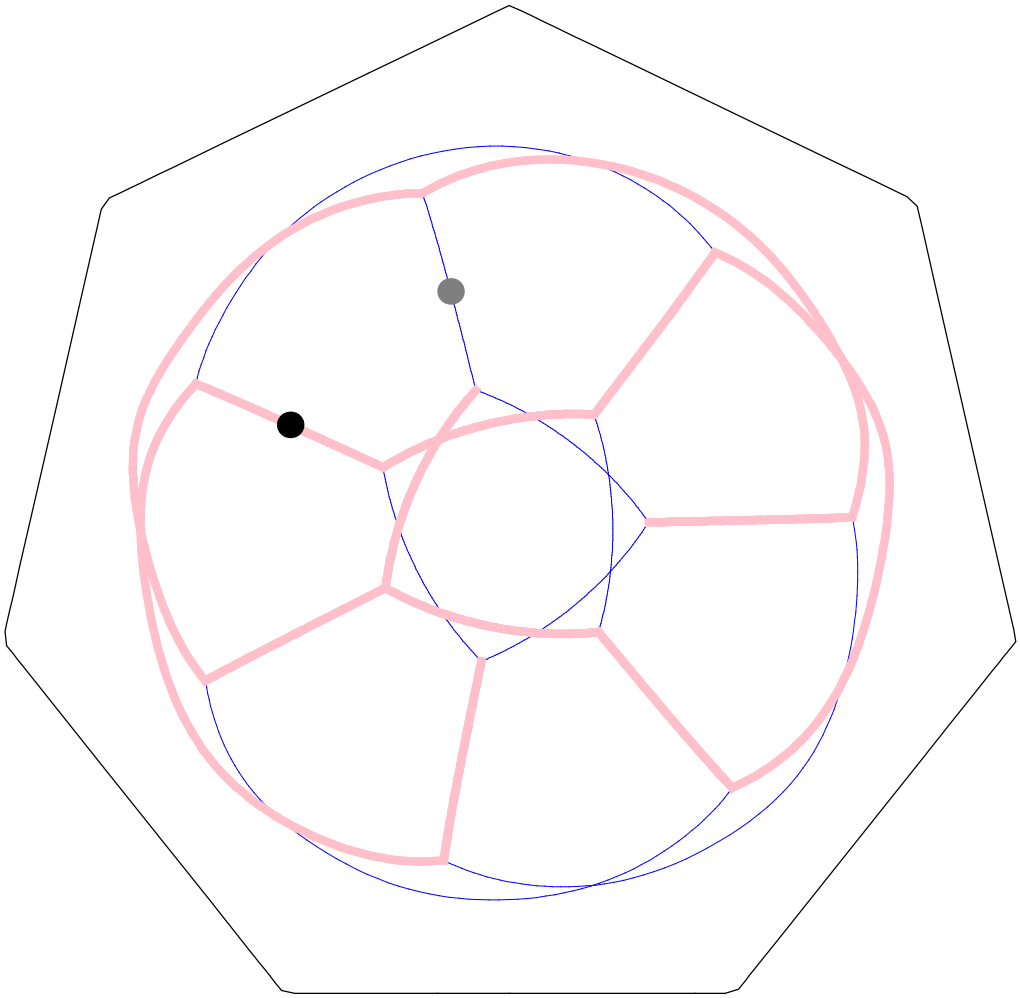


10.

$$\left\{4, 4, \frac{7}{2}\right\}$$

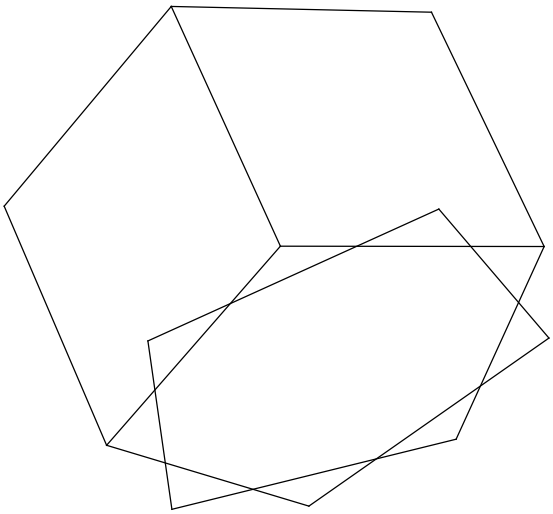


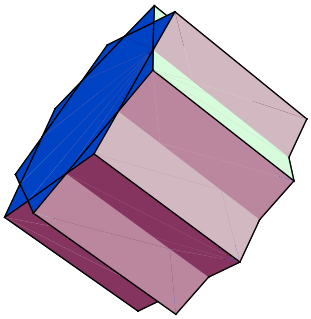


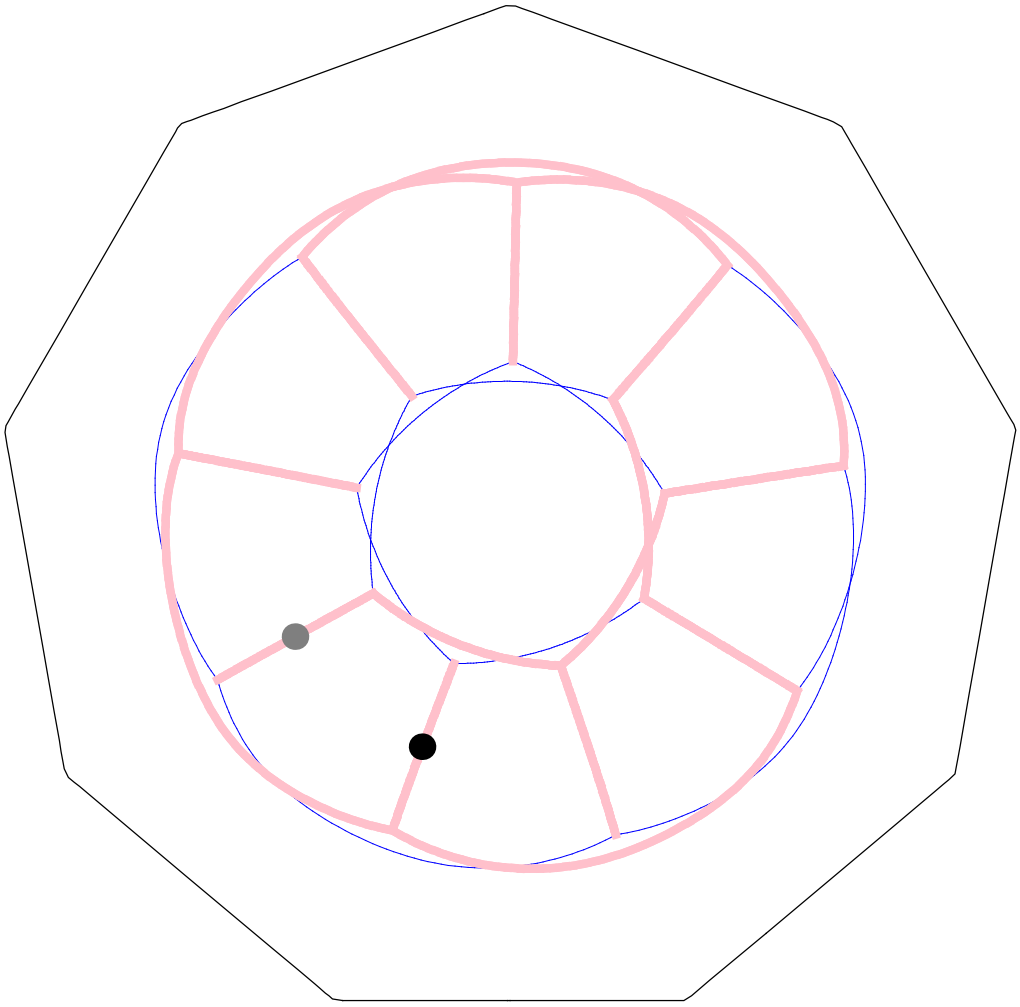


11.

$$\{4, 4, \frac{9}{2}\}$$

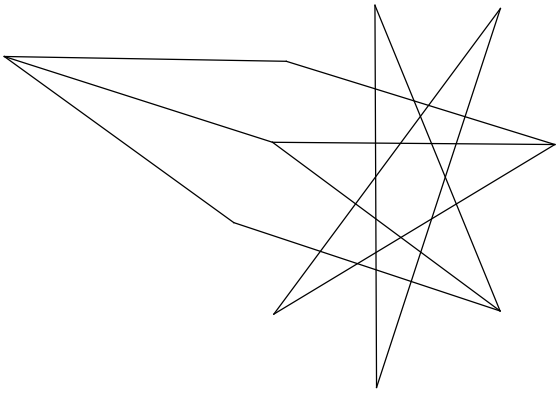


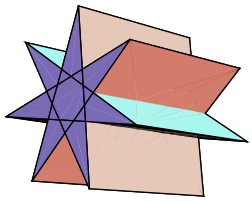


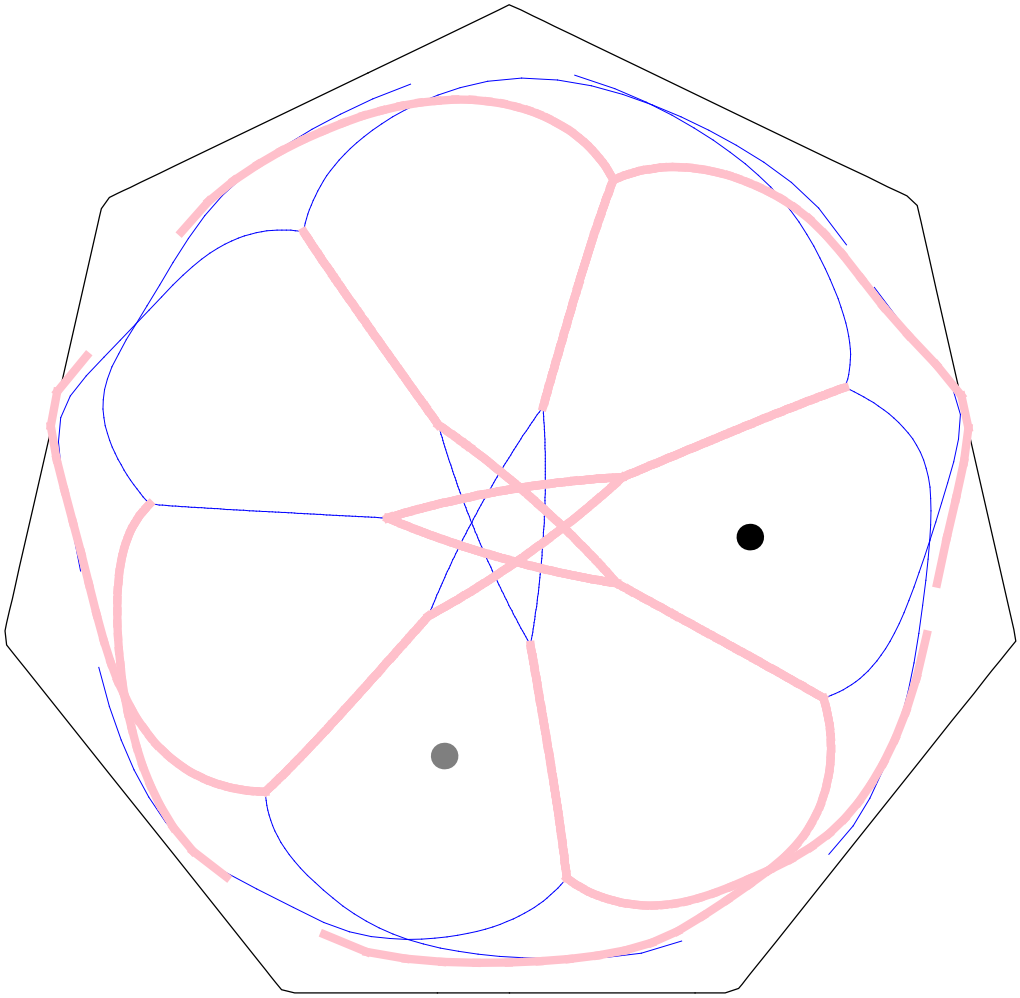


12.

$\{4, 4, \frac{7}{3}\}$

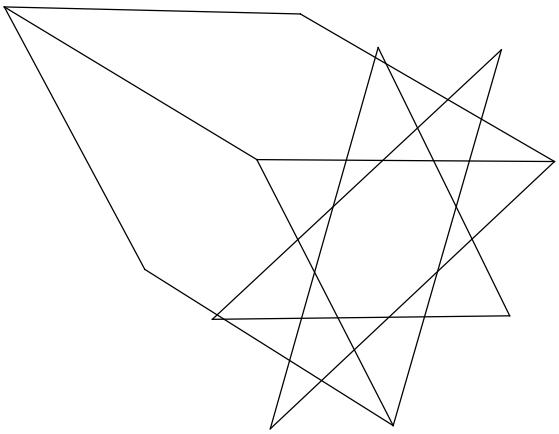


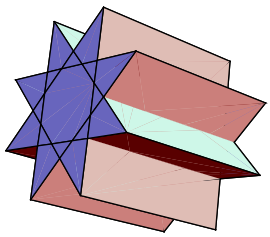


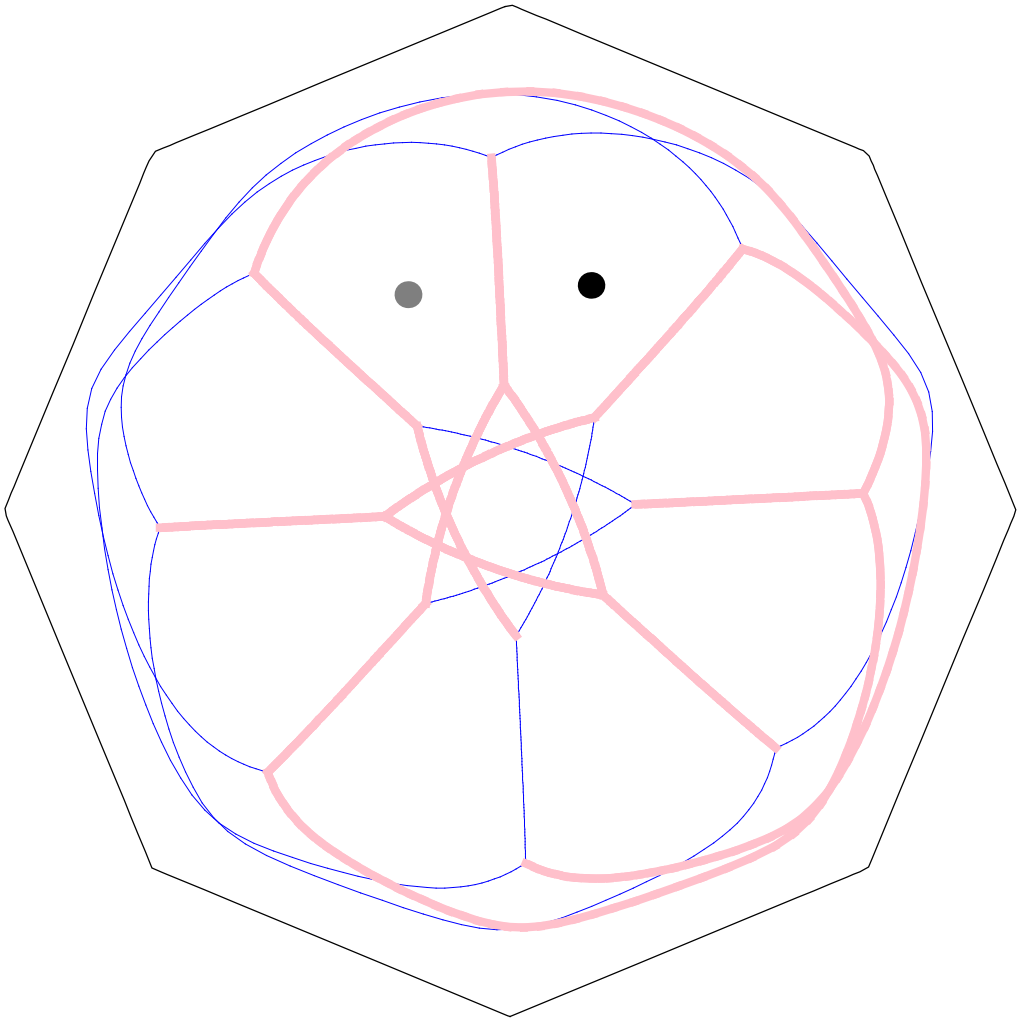


13.

$$\left\{4, 4, \frac{8}{3}\right\}$$

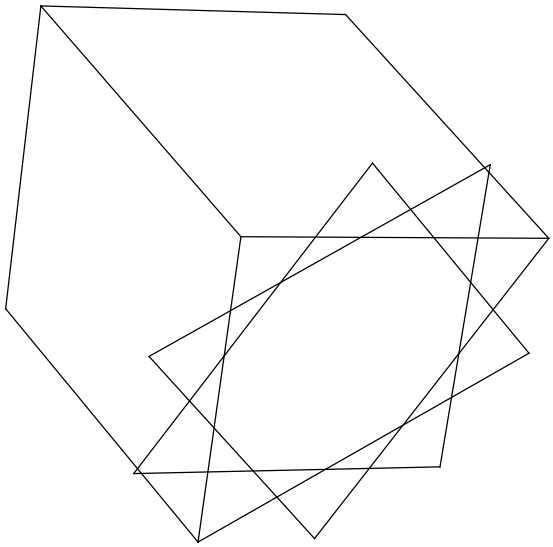


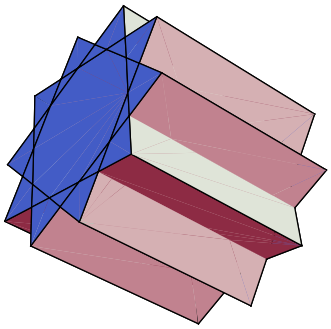


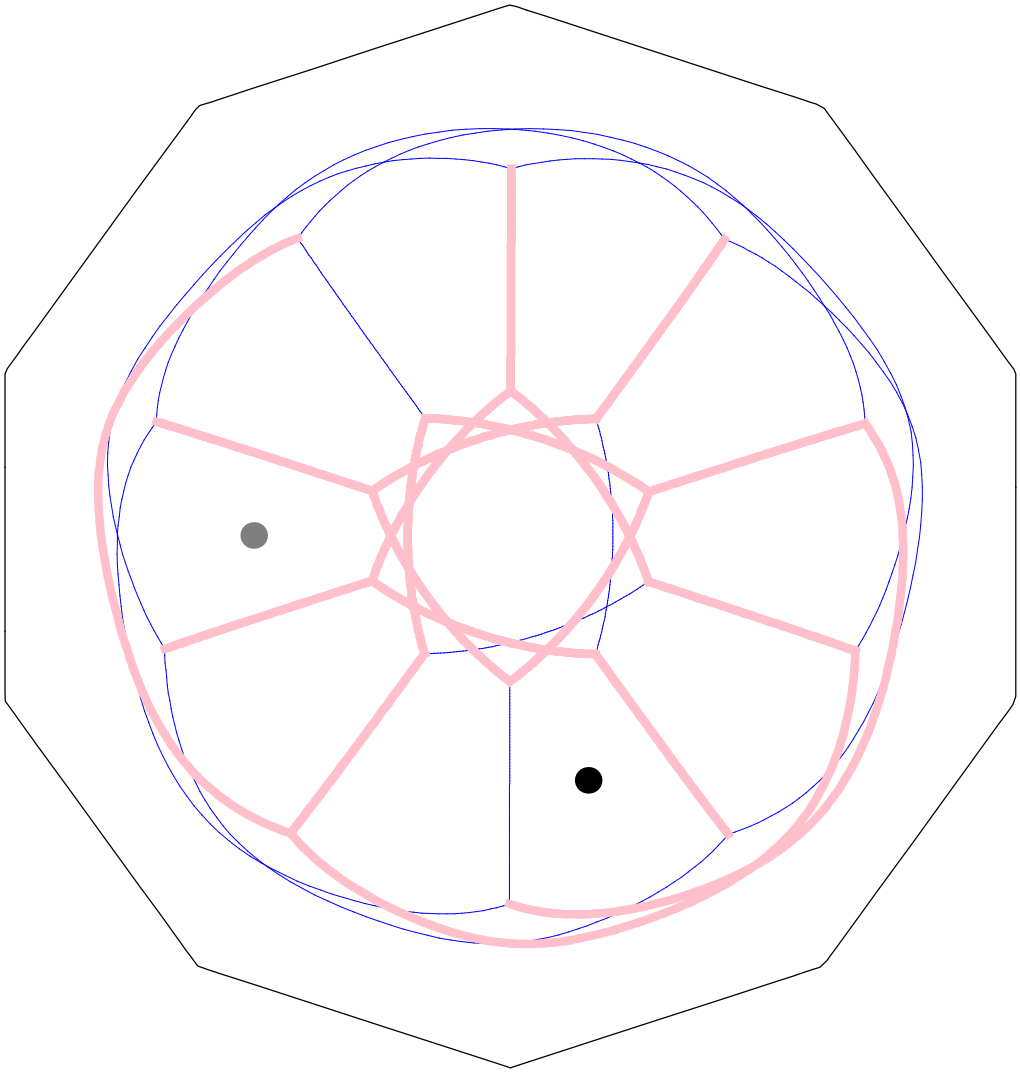


14.

$\{4, 4, \frac{10}{3}\}$

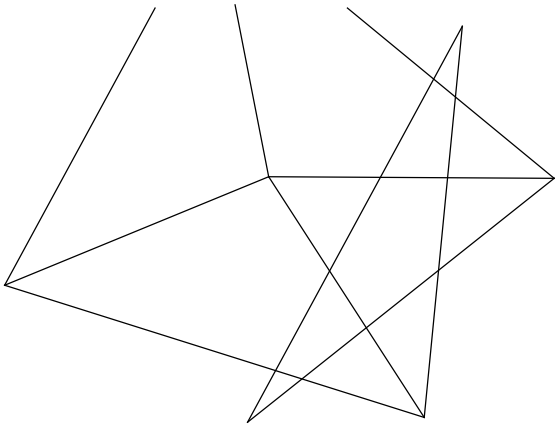


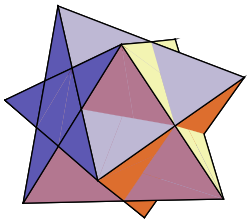


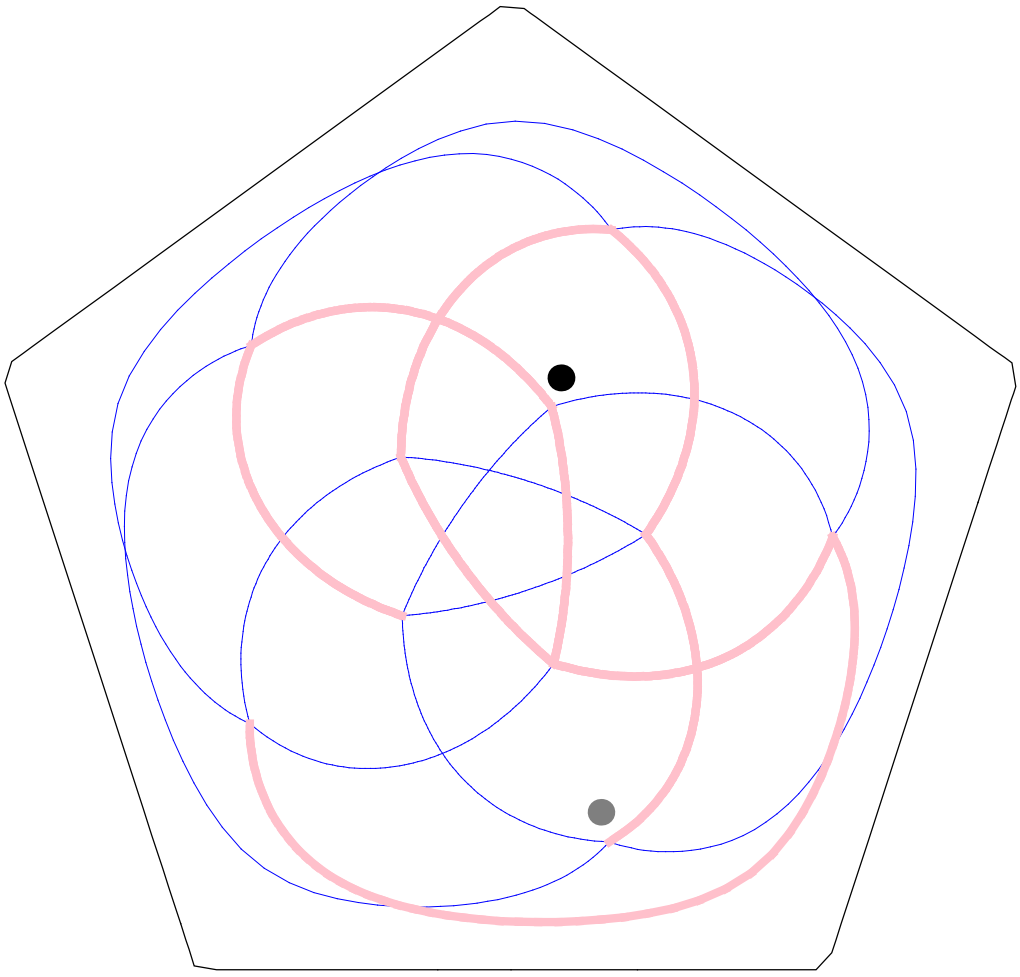


15.

$$\left\{3, 3, 3, \frac{5}{2}\right\}$$

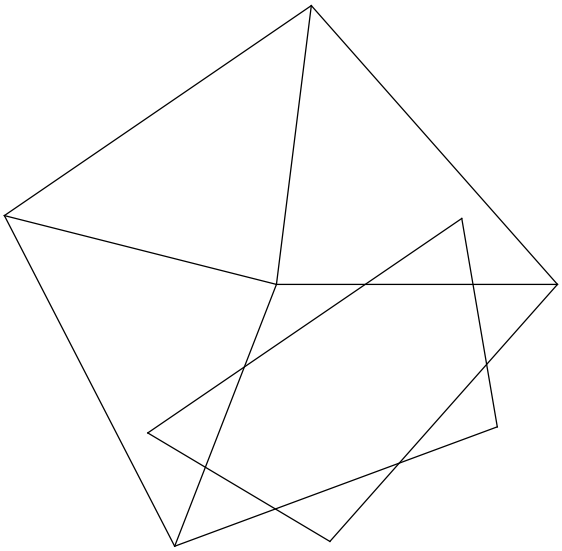


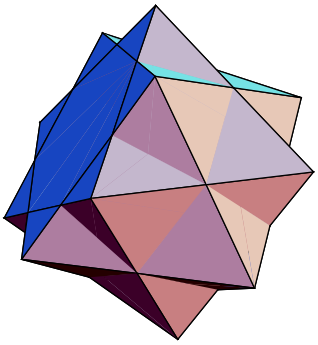


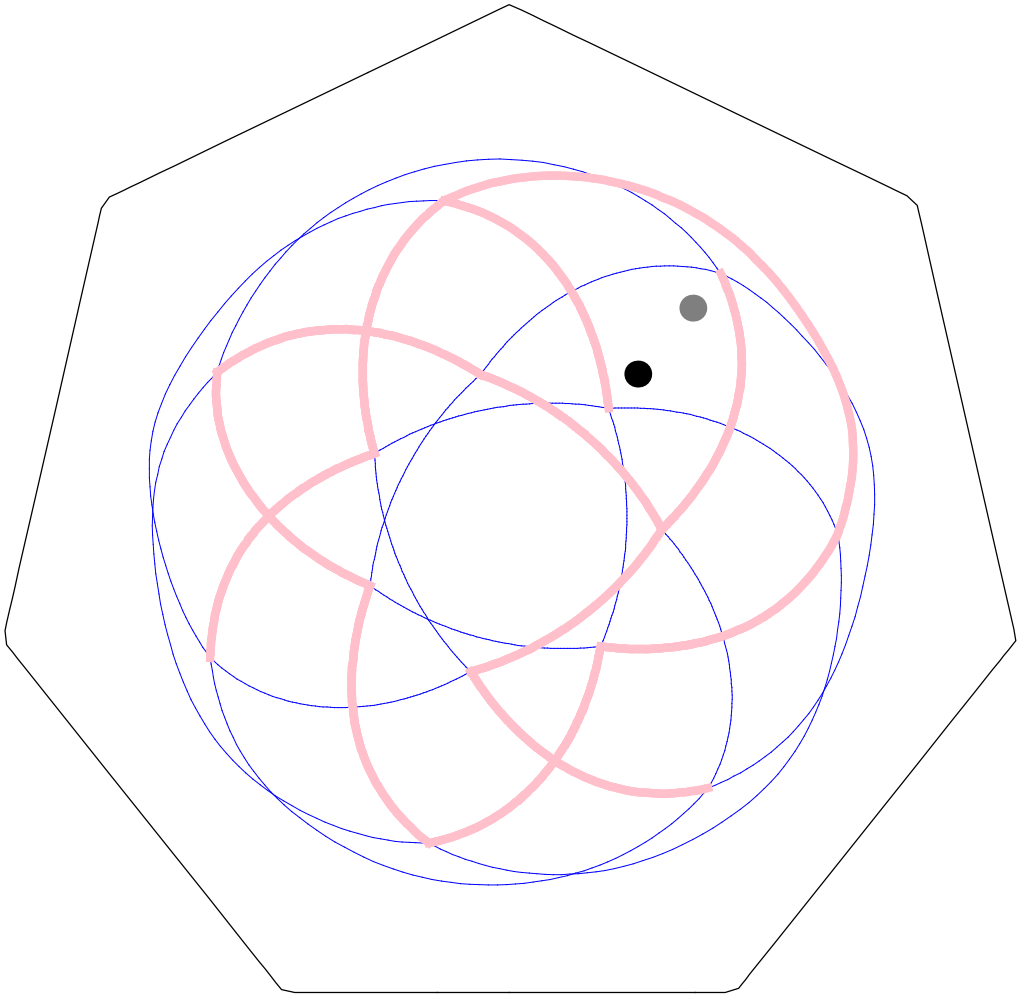


16.

$\{3, 3, 3, \frac{7}{2}\}$

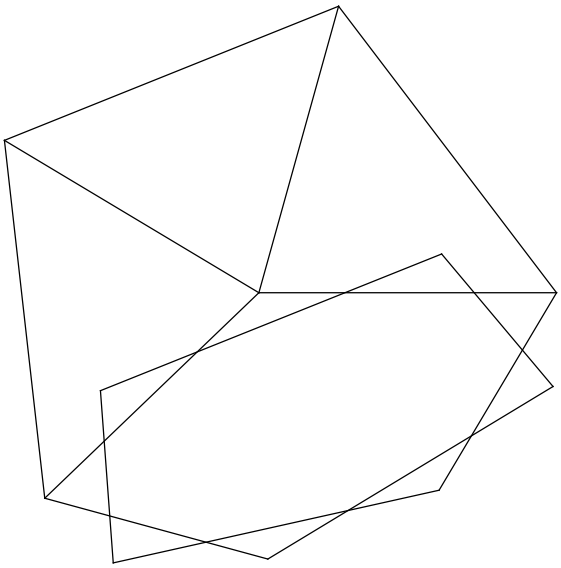


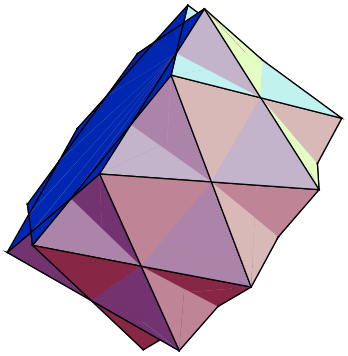


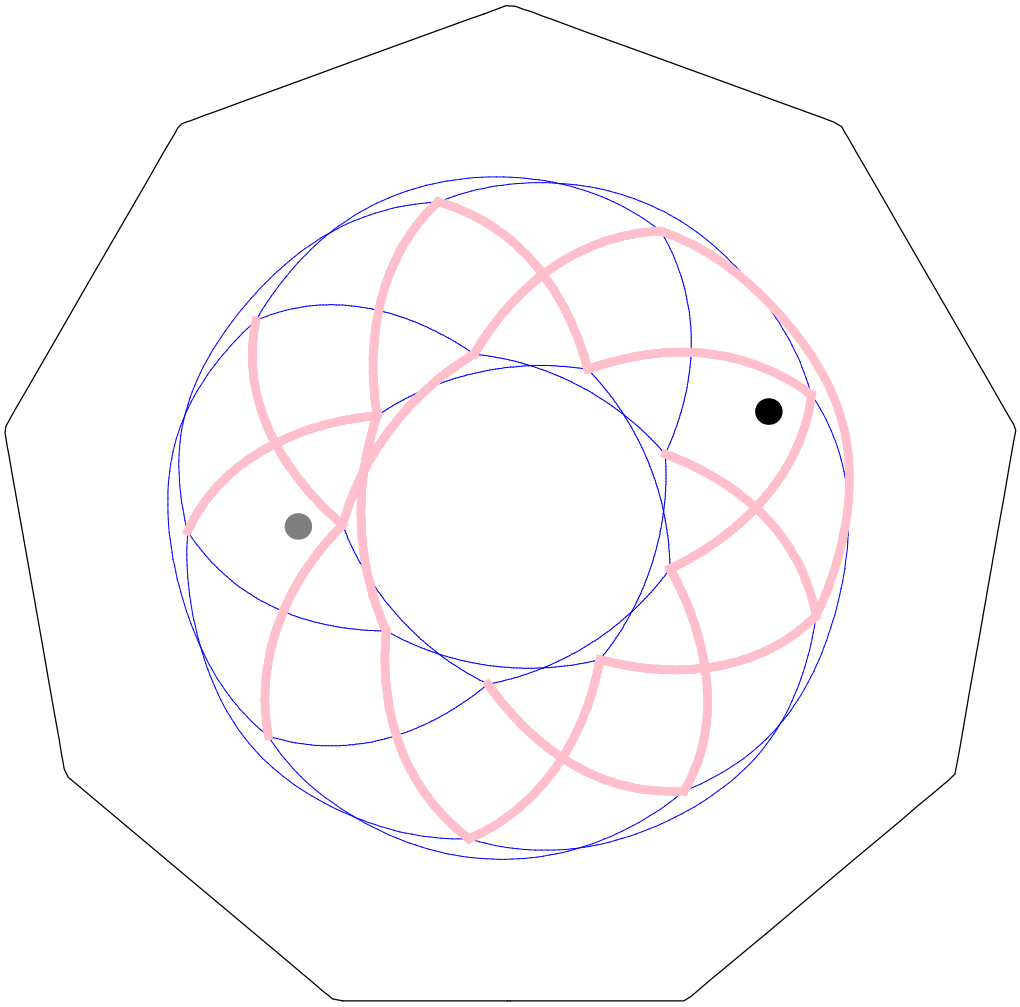


17.

$$\left\{3, 3, 3, \frac{9}{2}\right\}$$

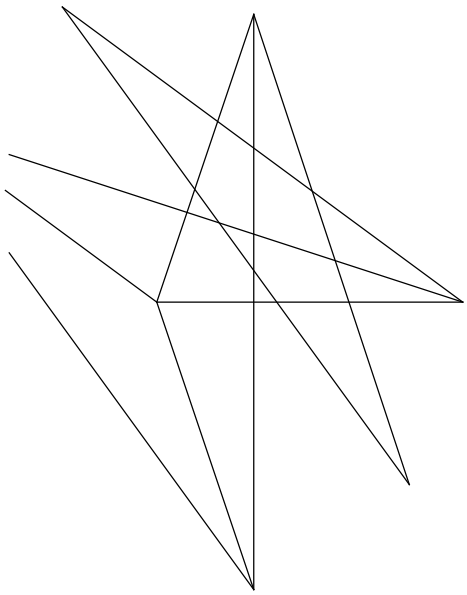


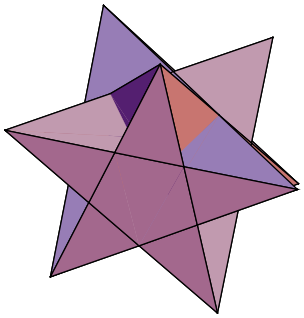


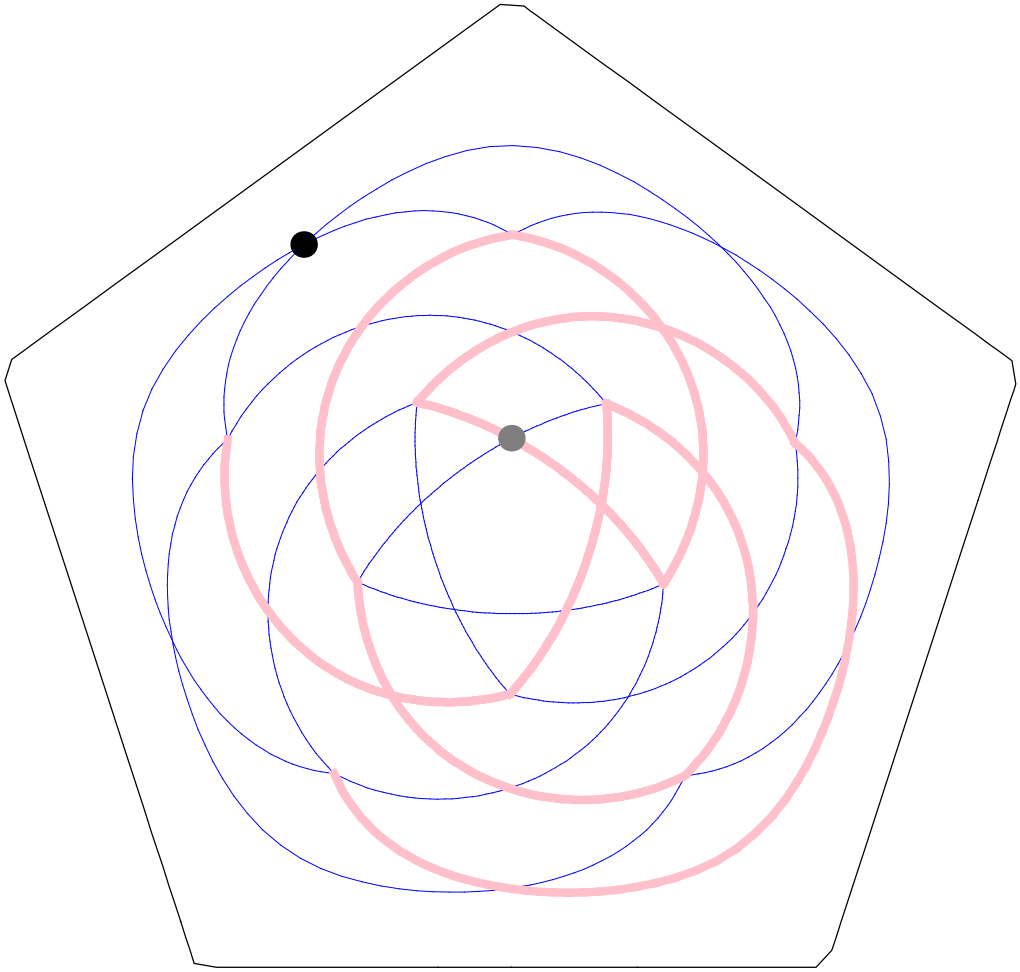


18.

$$\left\{3,\ 3,\ 3,\ \frac{5}{3}\right\}$$

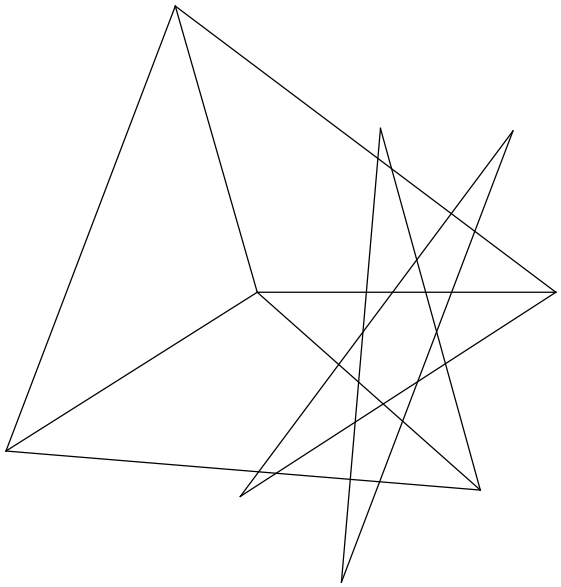


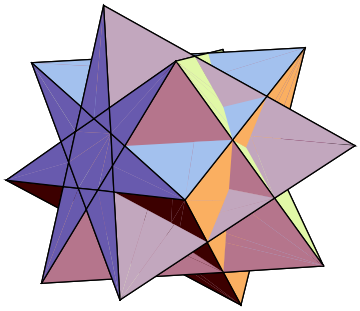


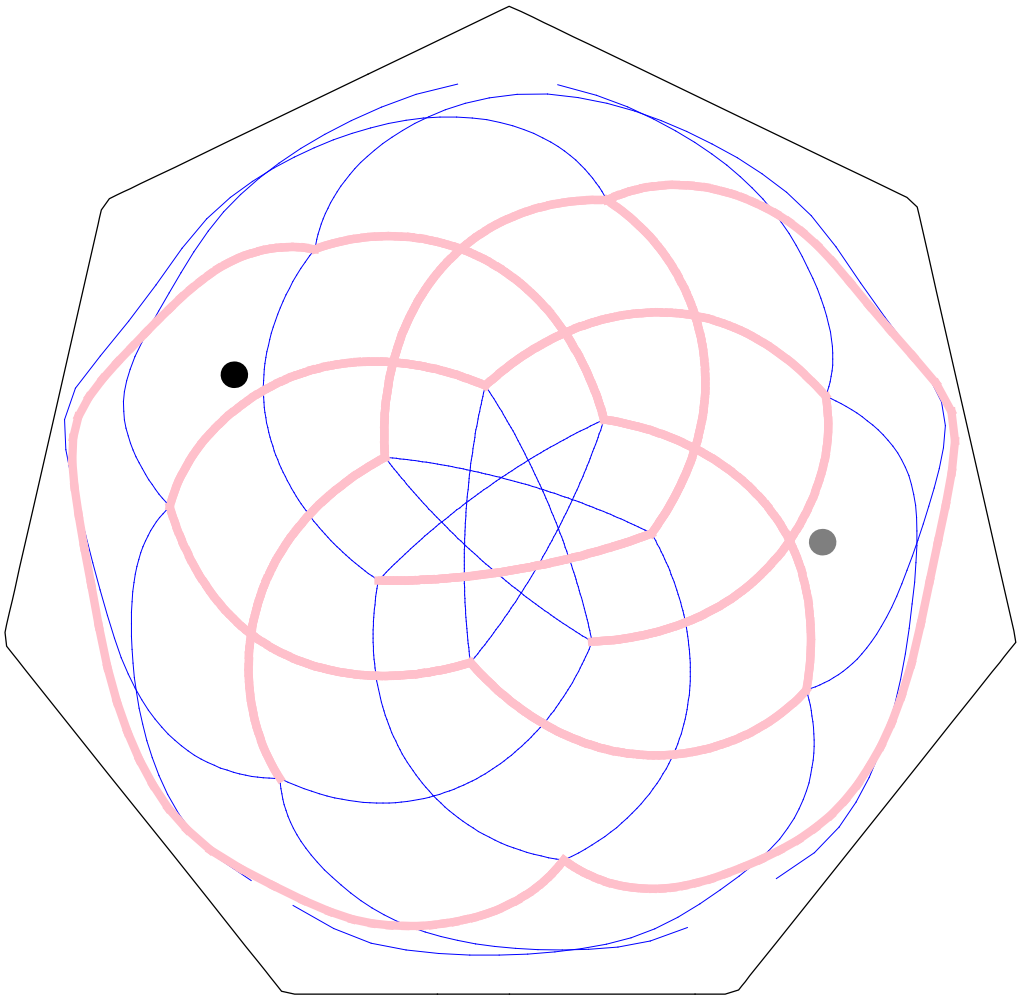


19.

$$\left\{3,\,3,\,3,\,\frac{7}{3}\right\}$$

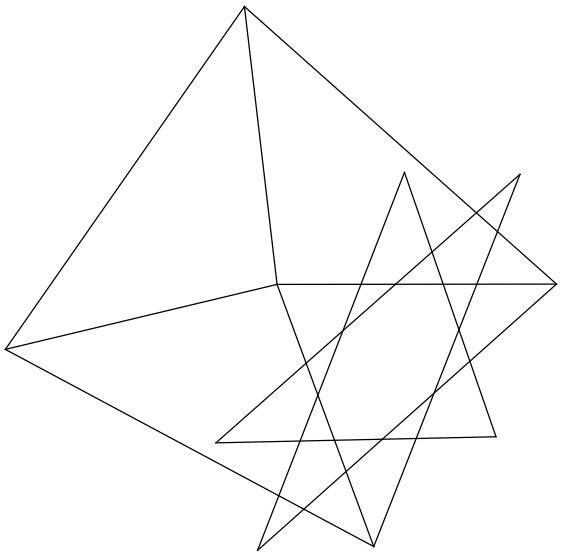


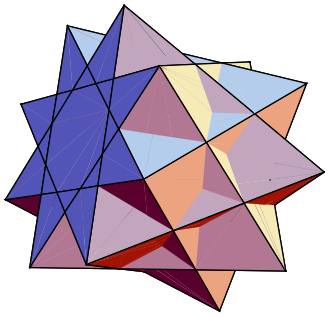


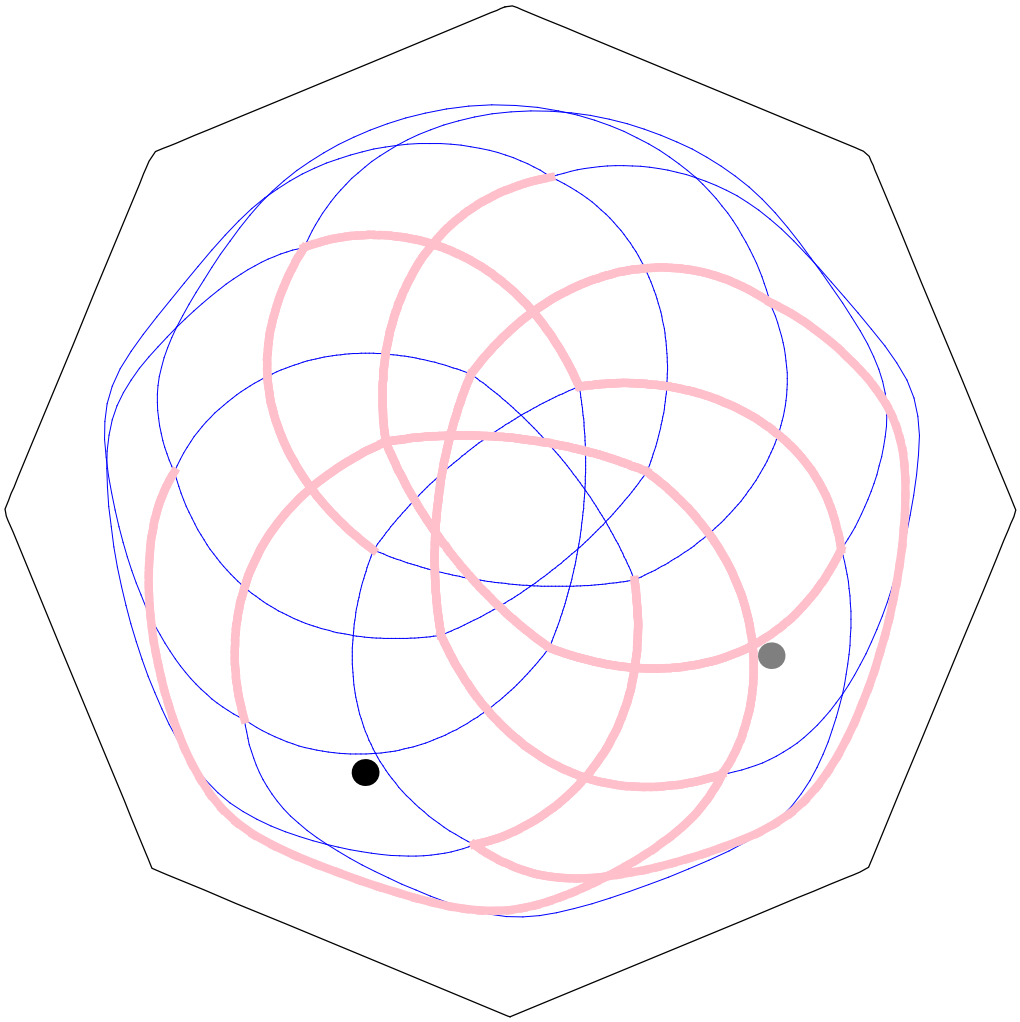


20.

$\{3, 3, 3, \frac{8}{3}\}$



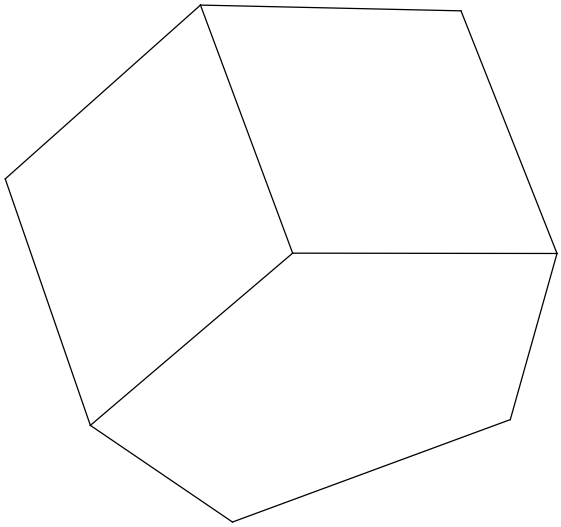


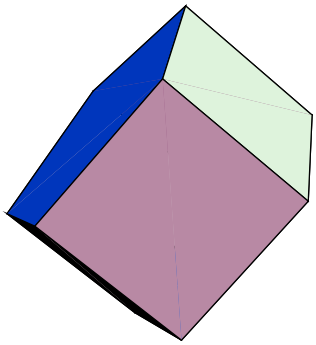


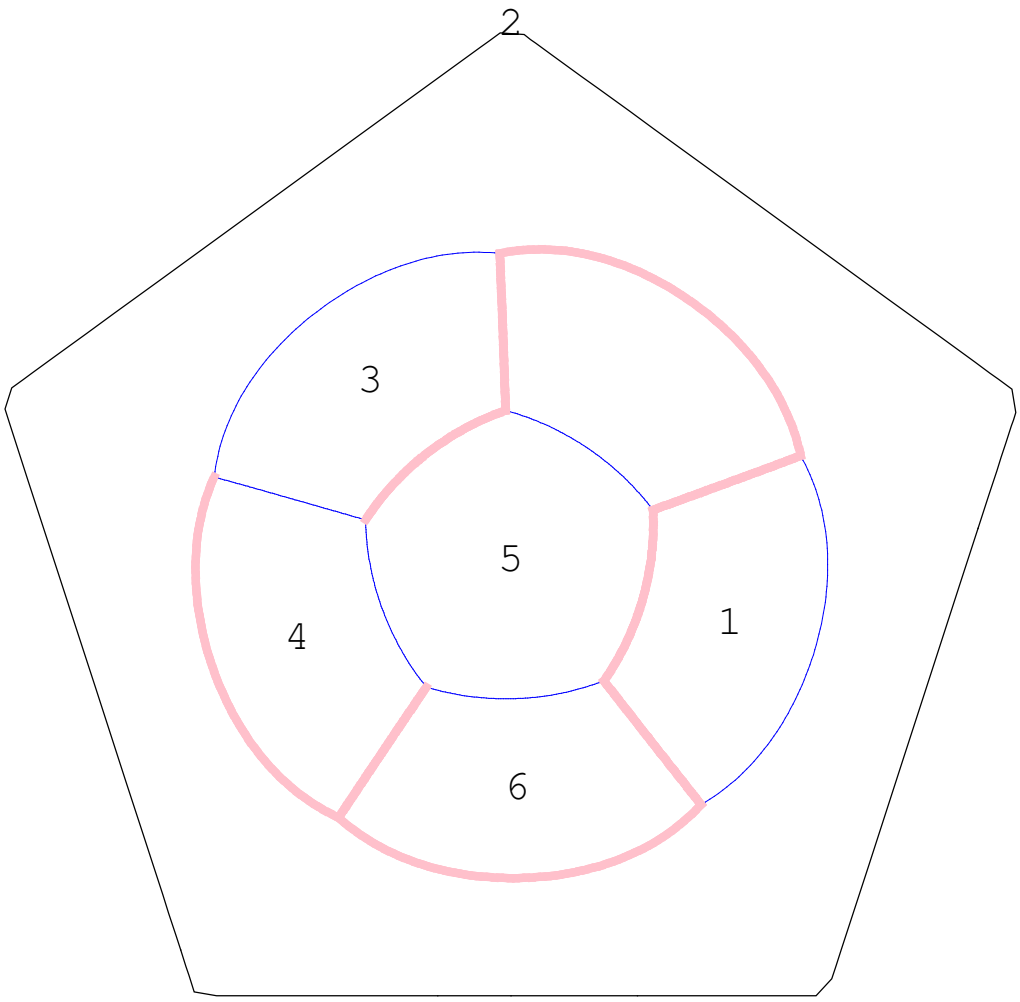
Solutions

1.

{4, 4, 5}

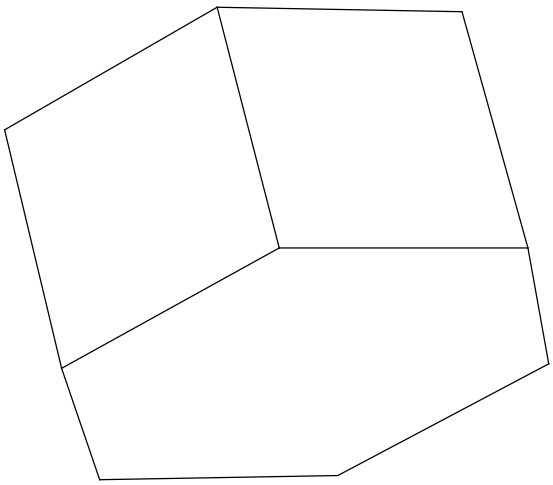


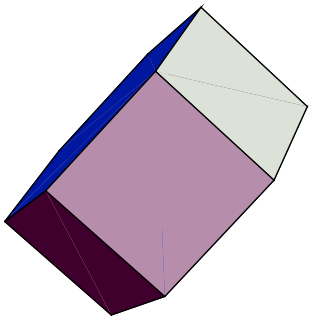


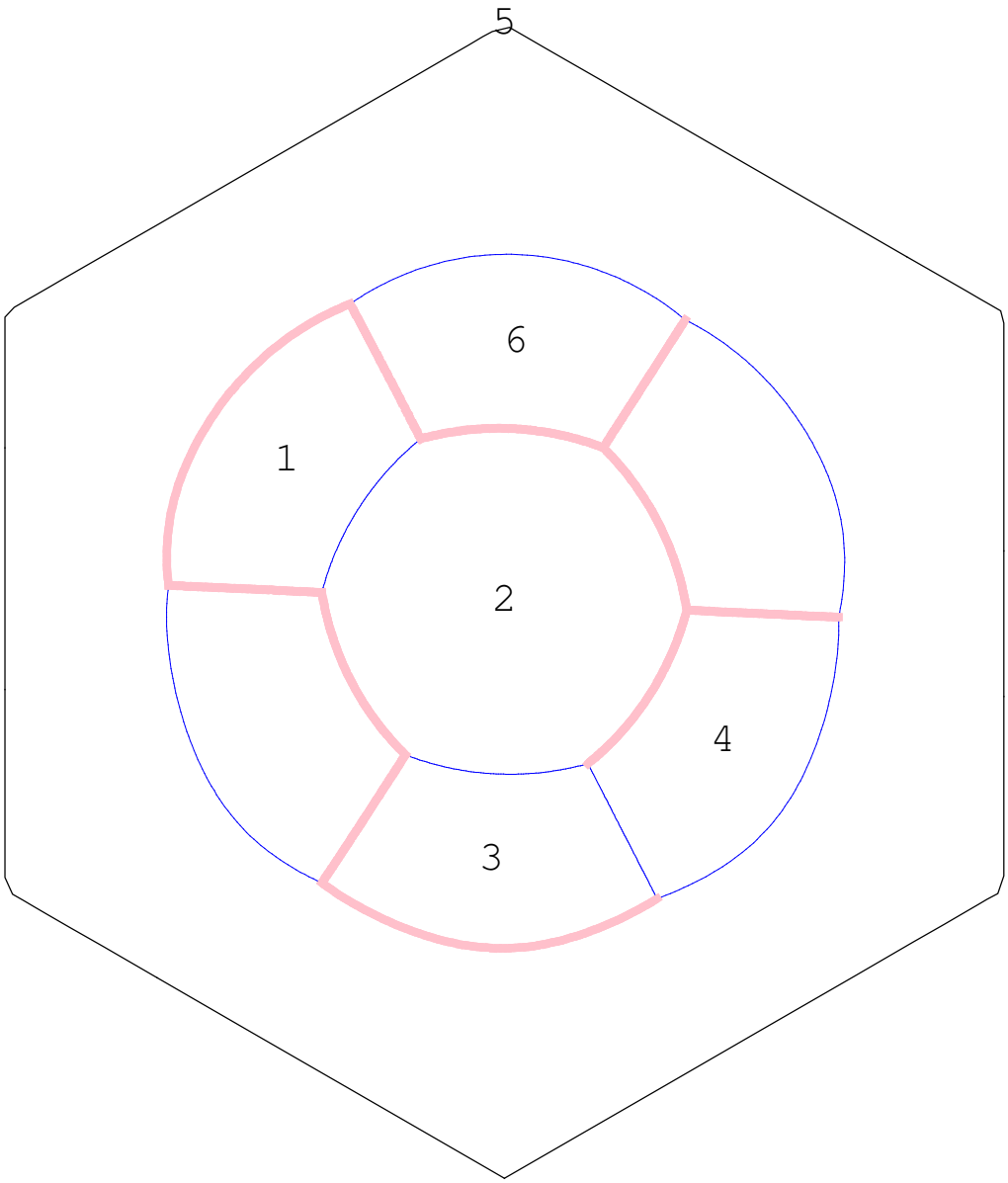


2.

{4, 4, 6}

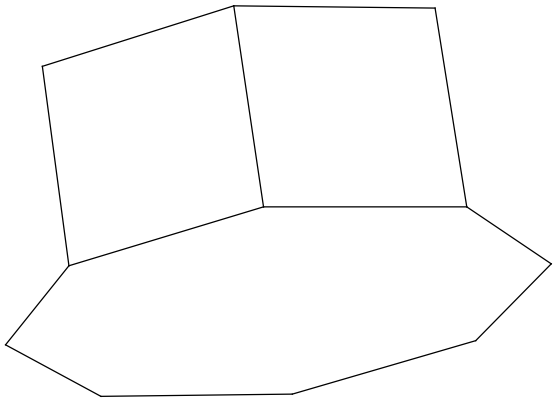


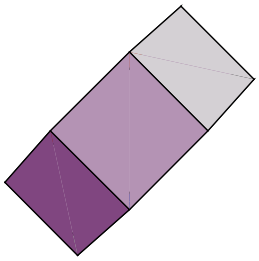


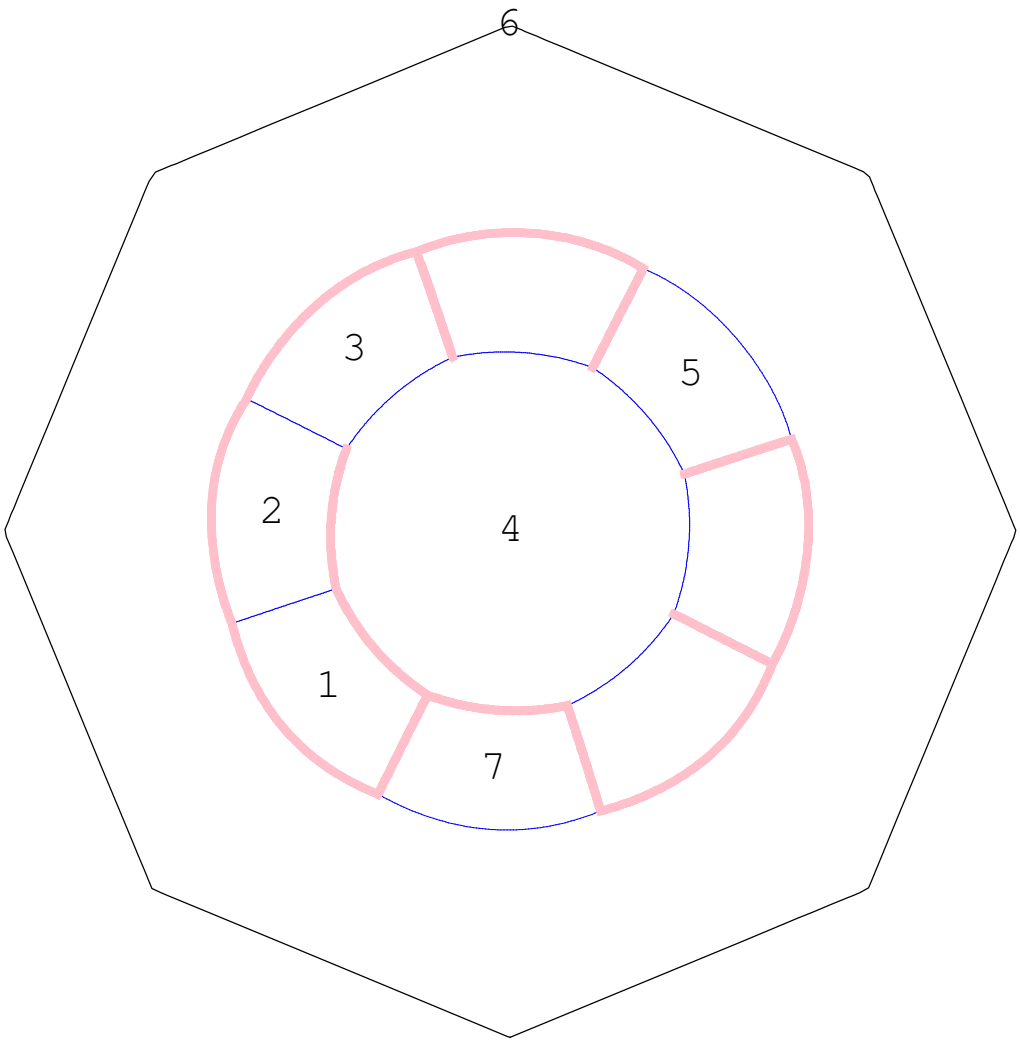


3.

{4, 4, 8}

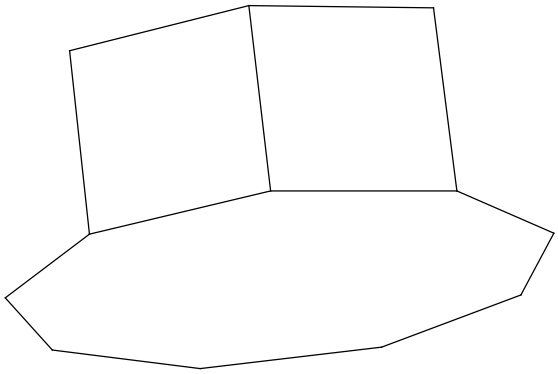


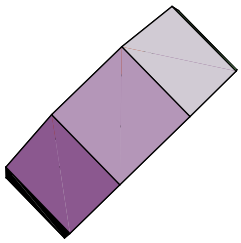


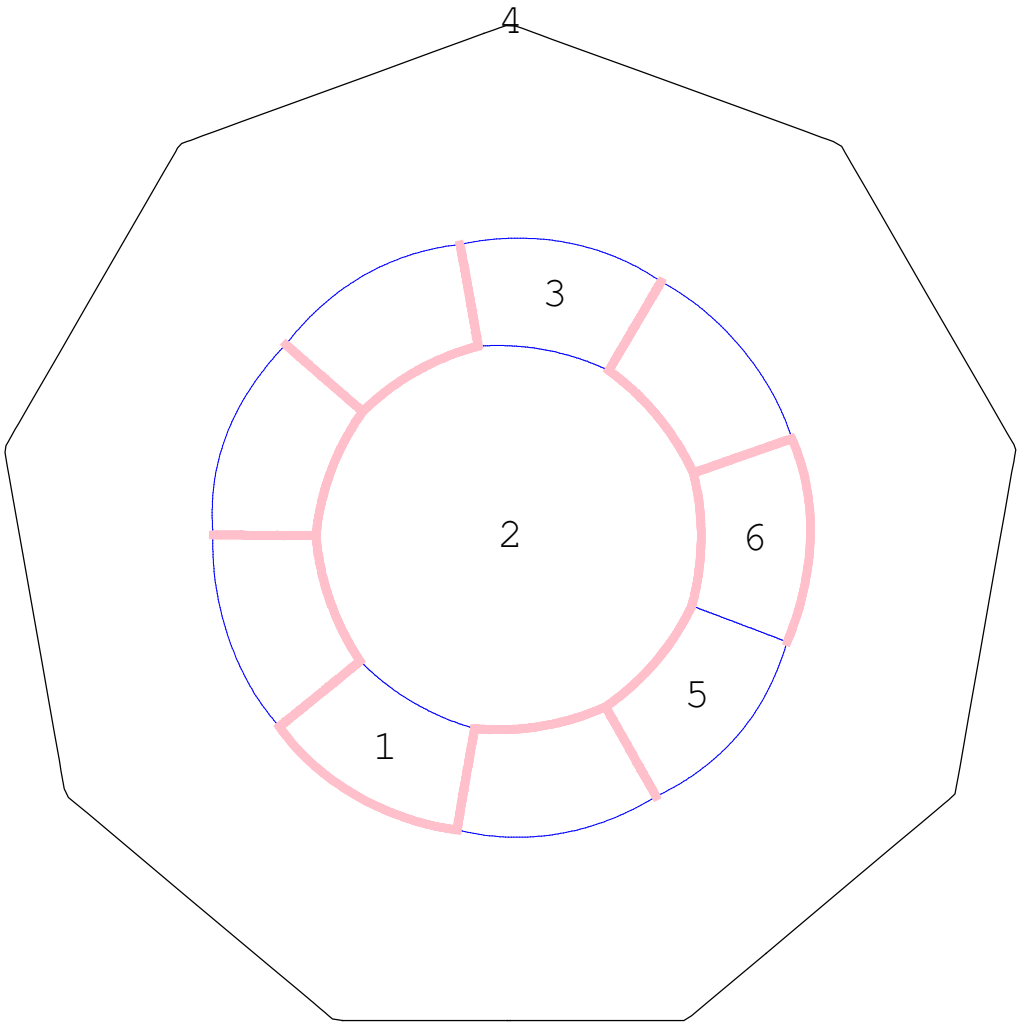


4.

{4, 4, 9}

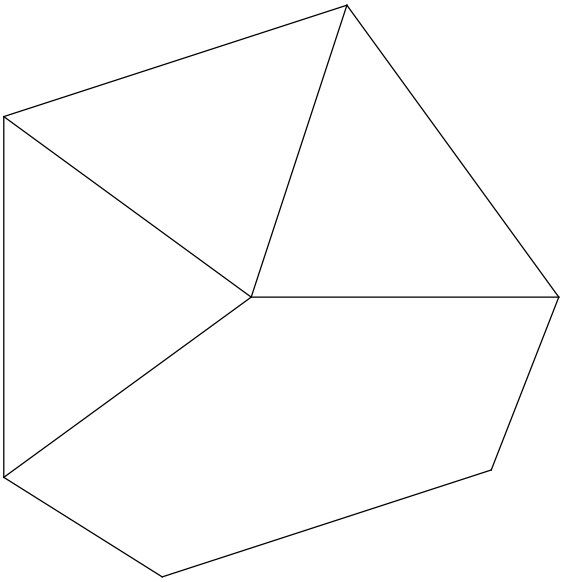


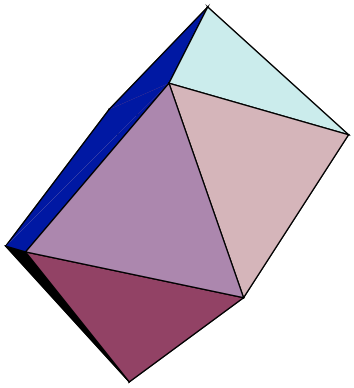


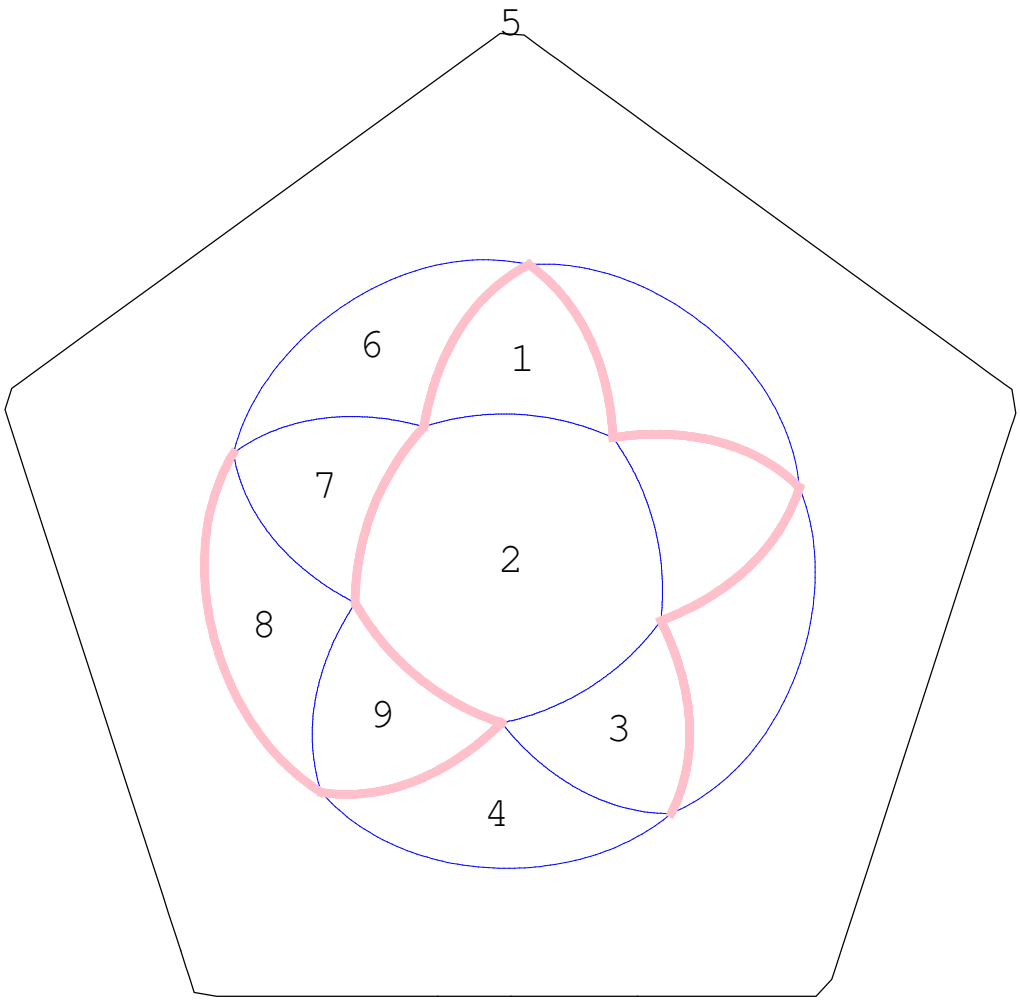


5.

{3, 3, 3, 5}

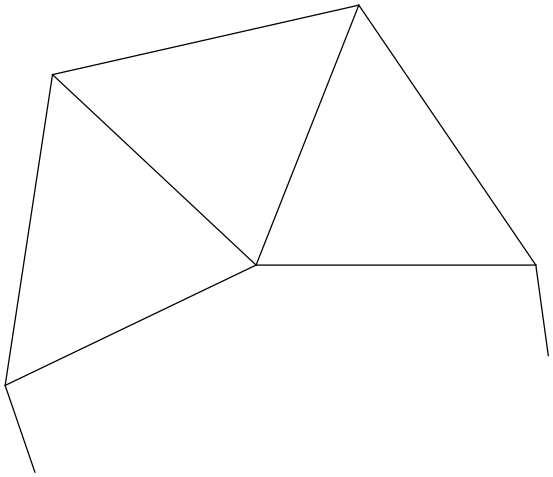


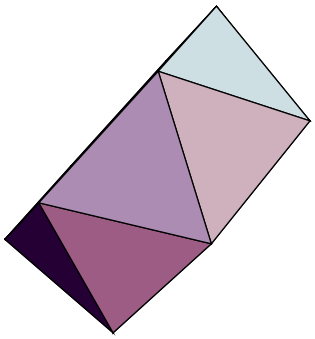


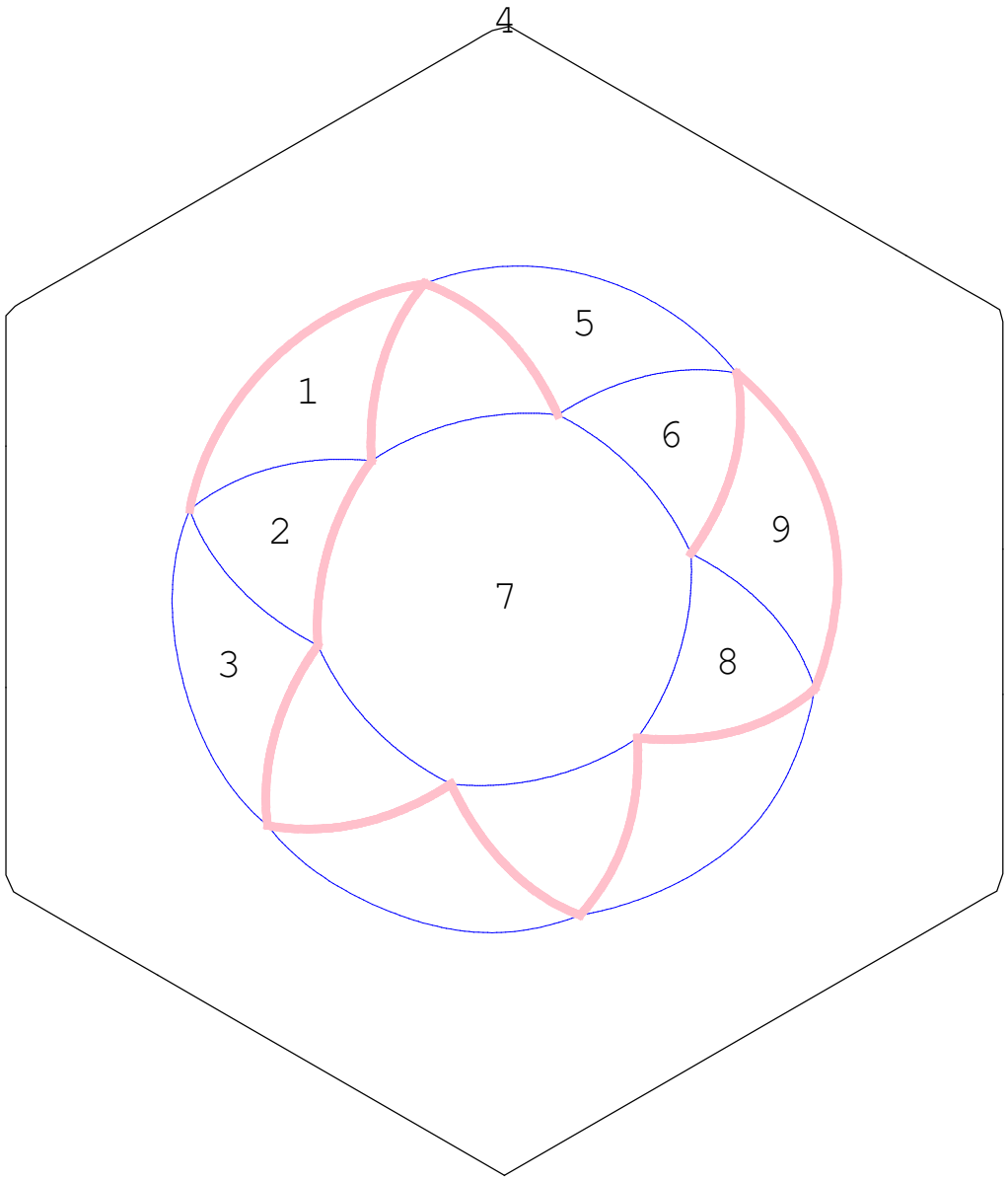


6.

{3, 3, 3, 6}

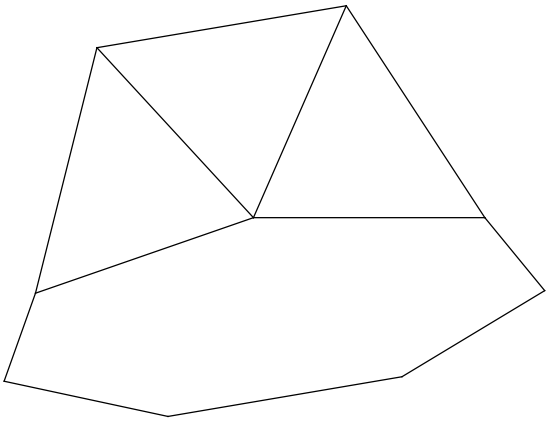


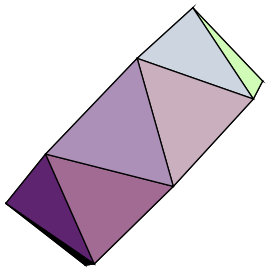


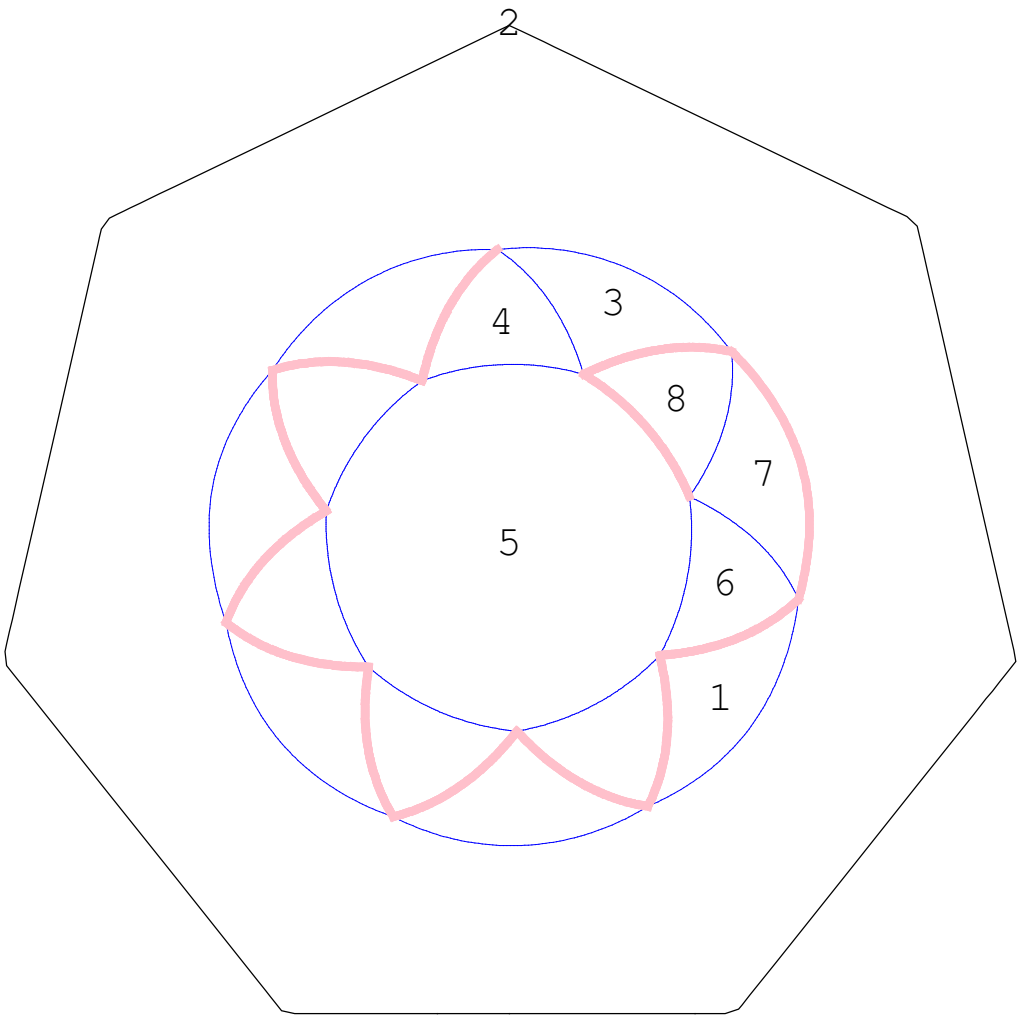


7.

{3, 3, 3, 7}

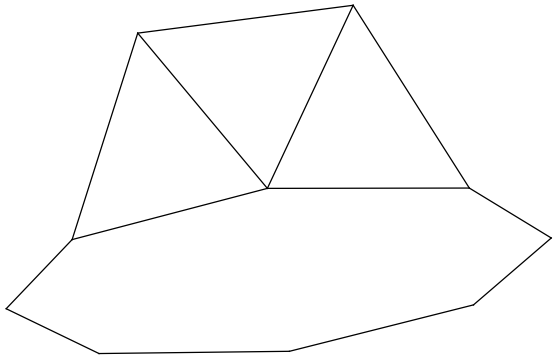


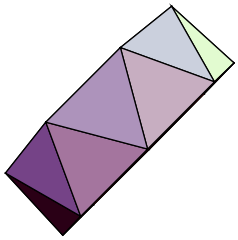


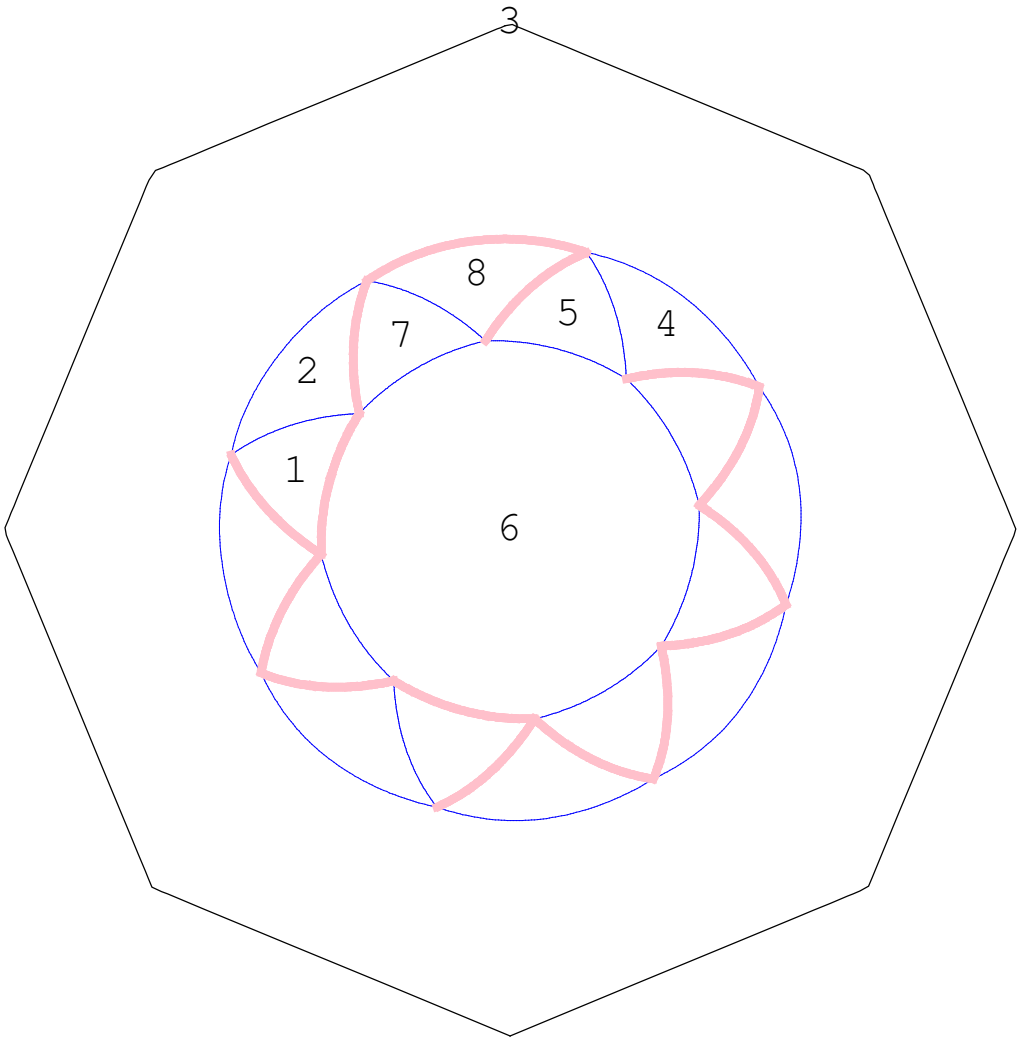


8.

{3, 3, 3, 8}

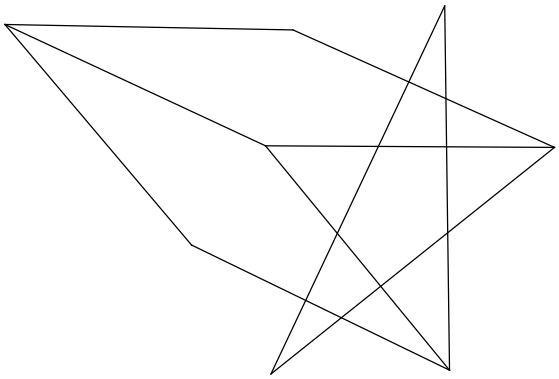


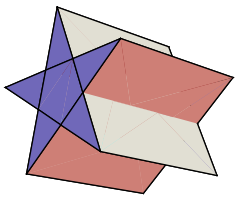


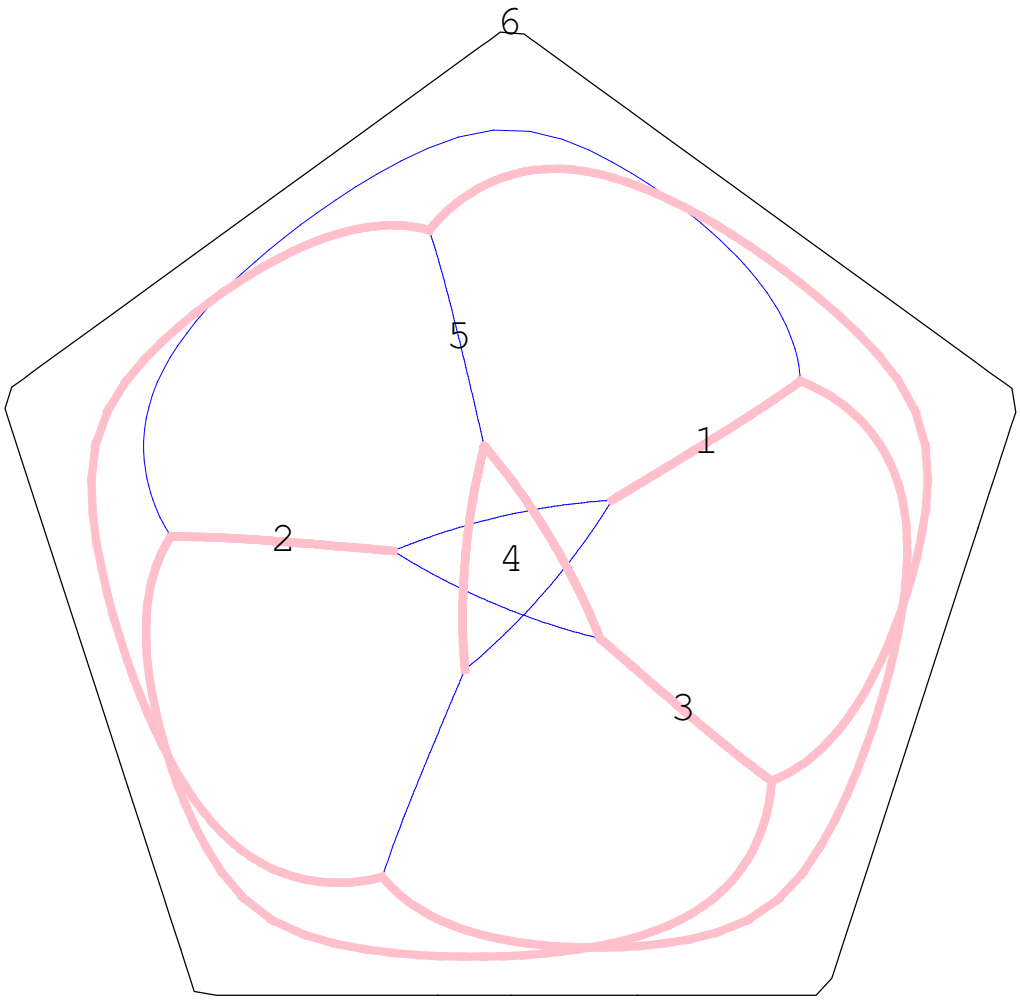


9.

$\{4, 4, \frac{5}{2}\}$

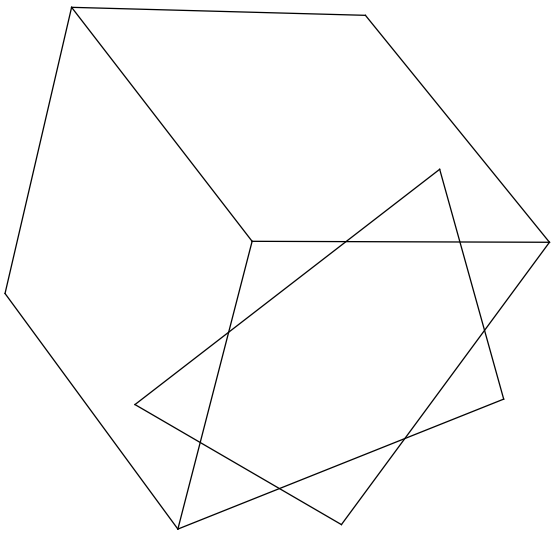


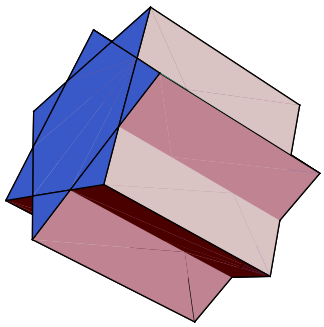


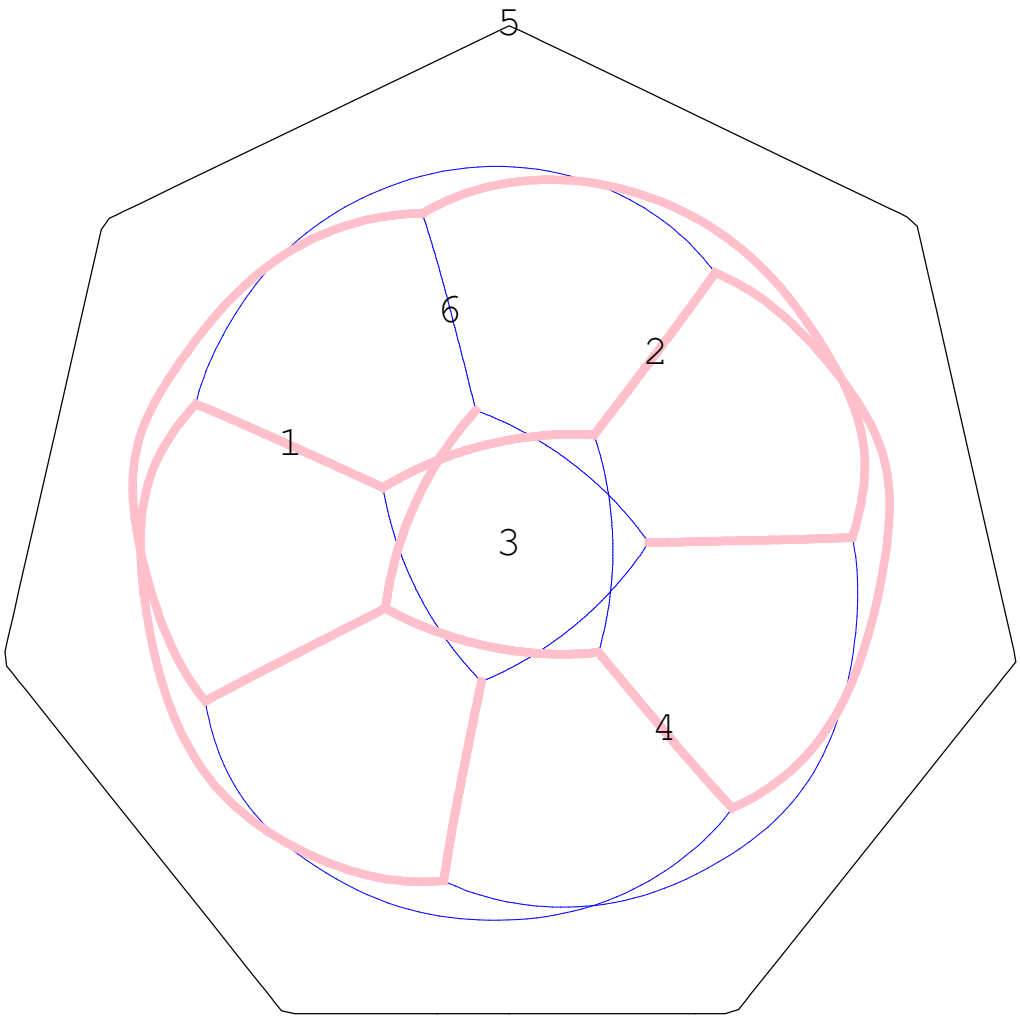


10.

$\{4, 4, \frac{7}{2}\}$

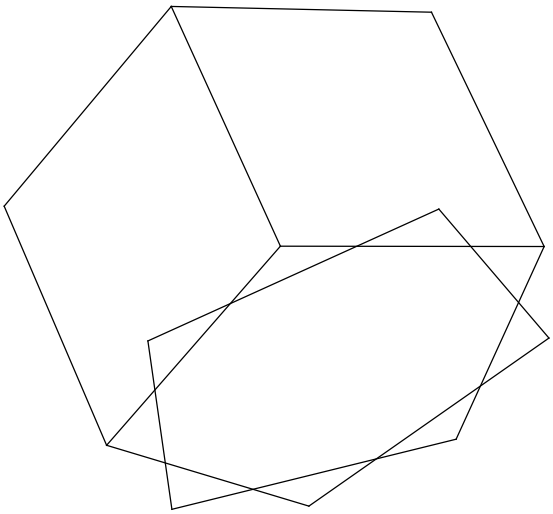


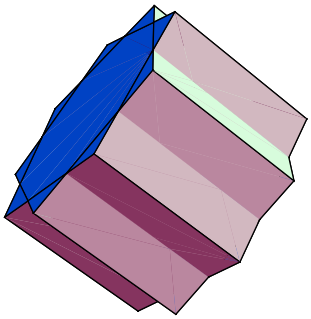


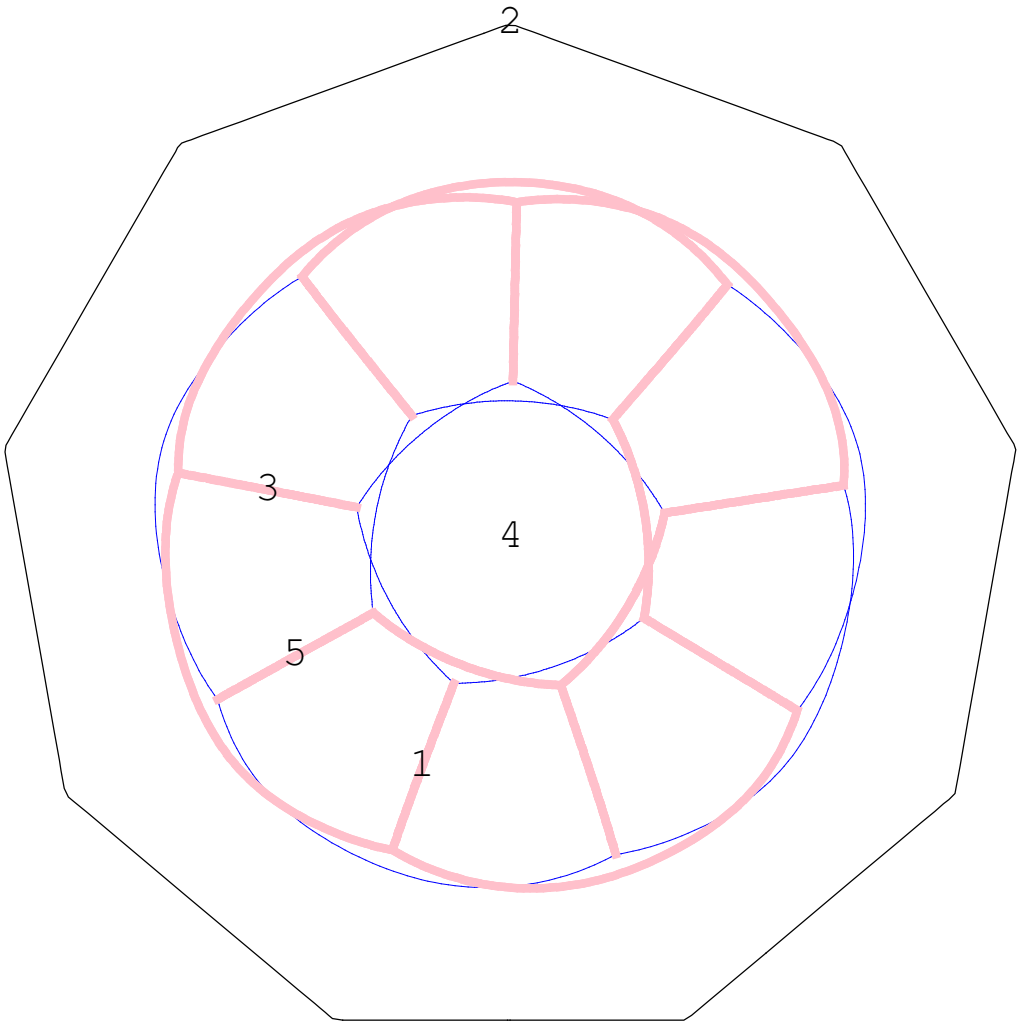


11.

$\{4, 4, \frac{9}{2}\}$

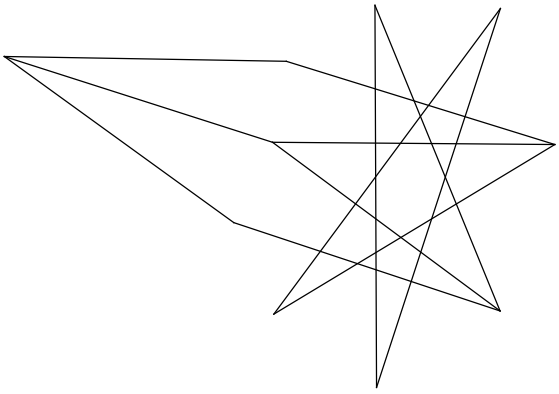


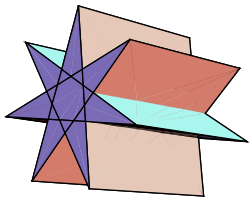


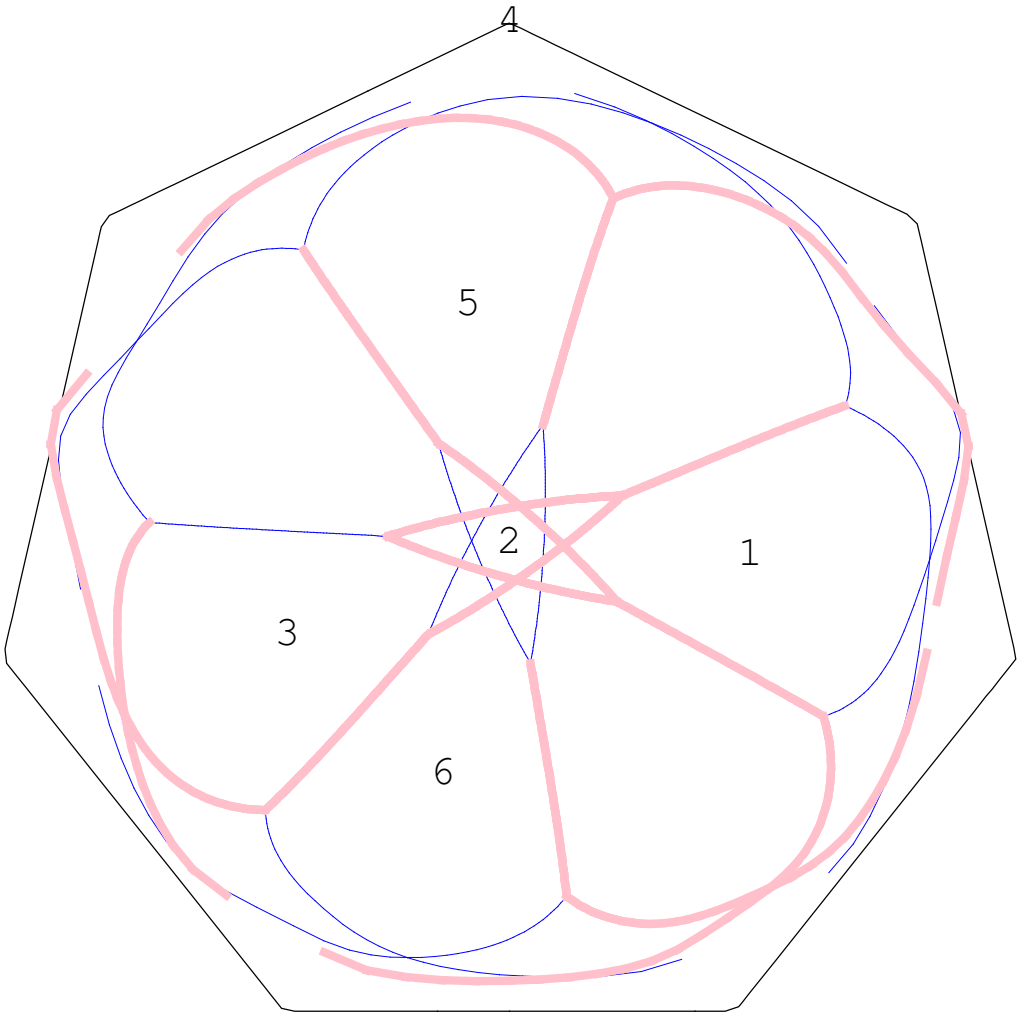


12.

$\{4, 4, \frac{7}{3}\}$

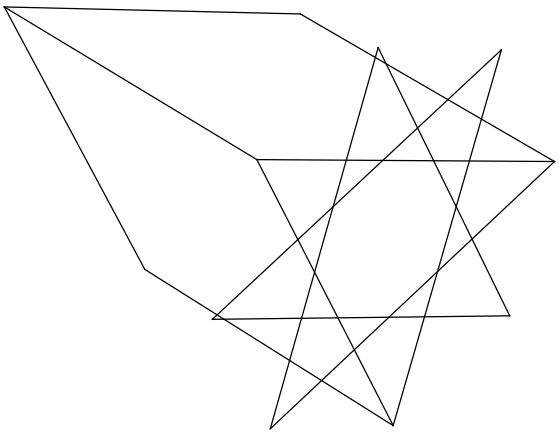


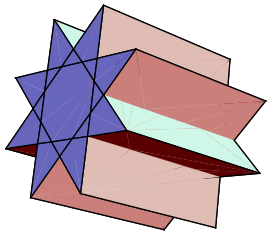


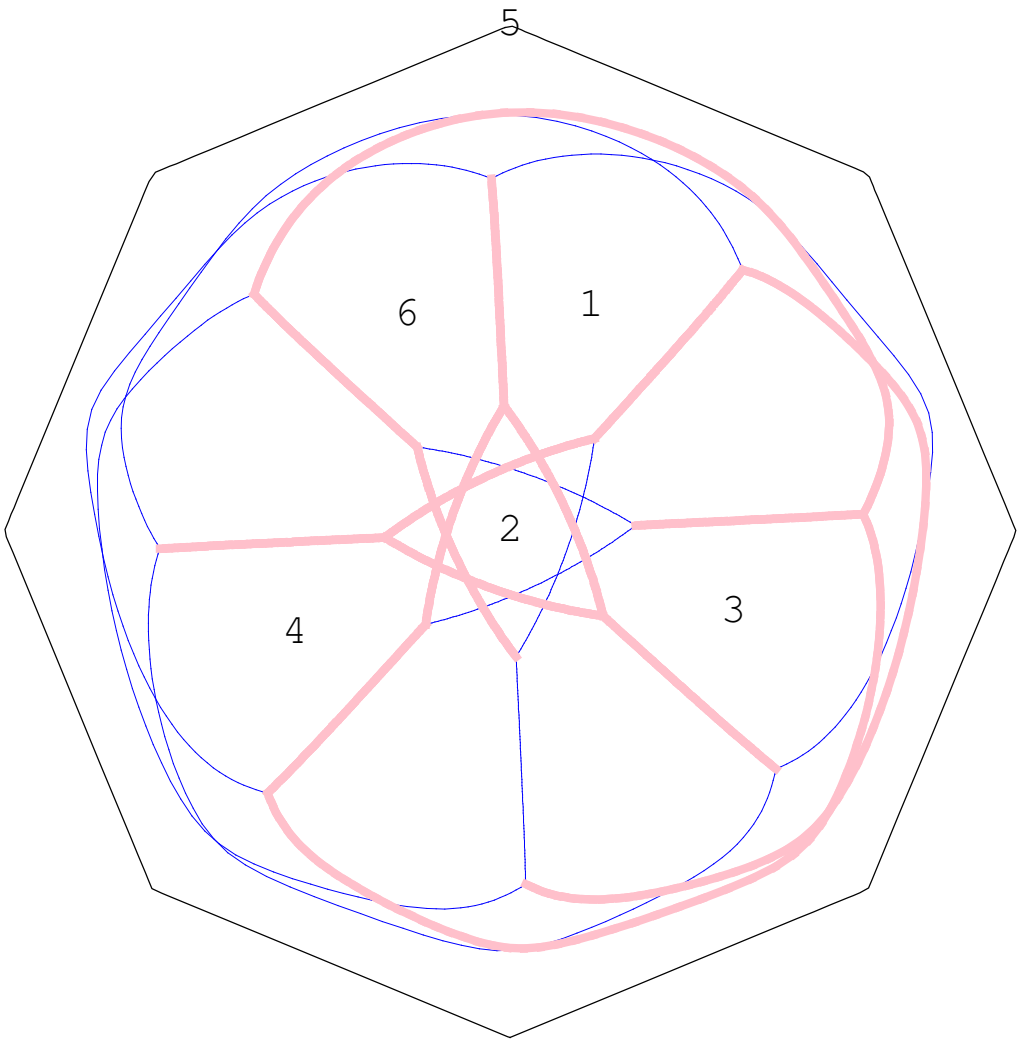


13.

$\{4, 4, \frac{8}{3}\}$

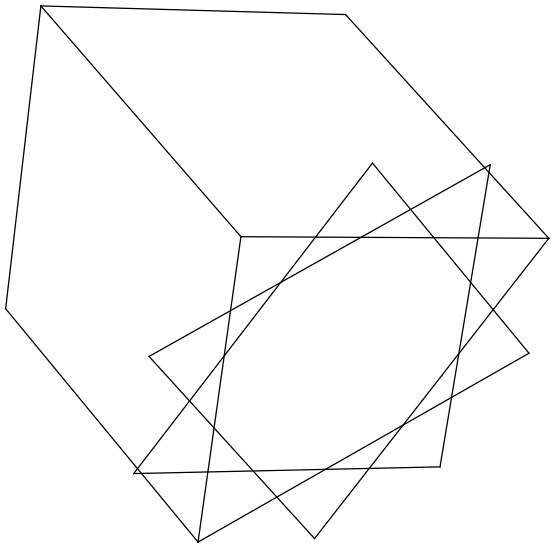


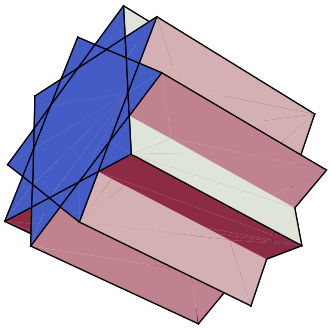


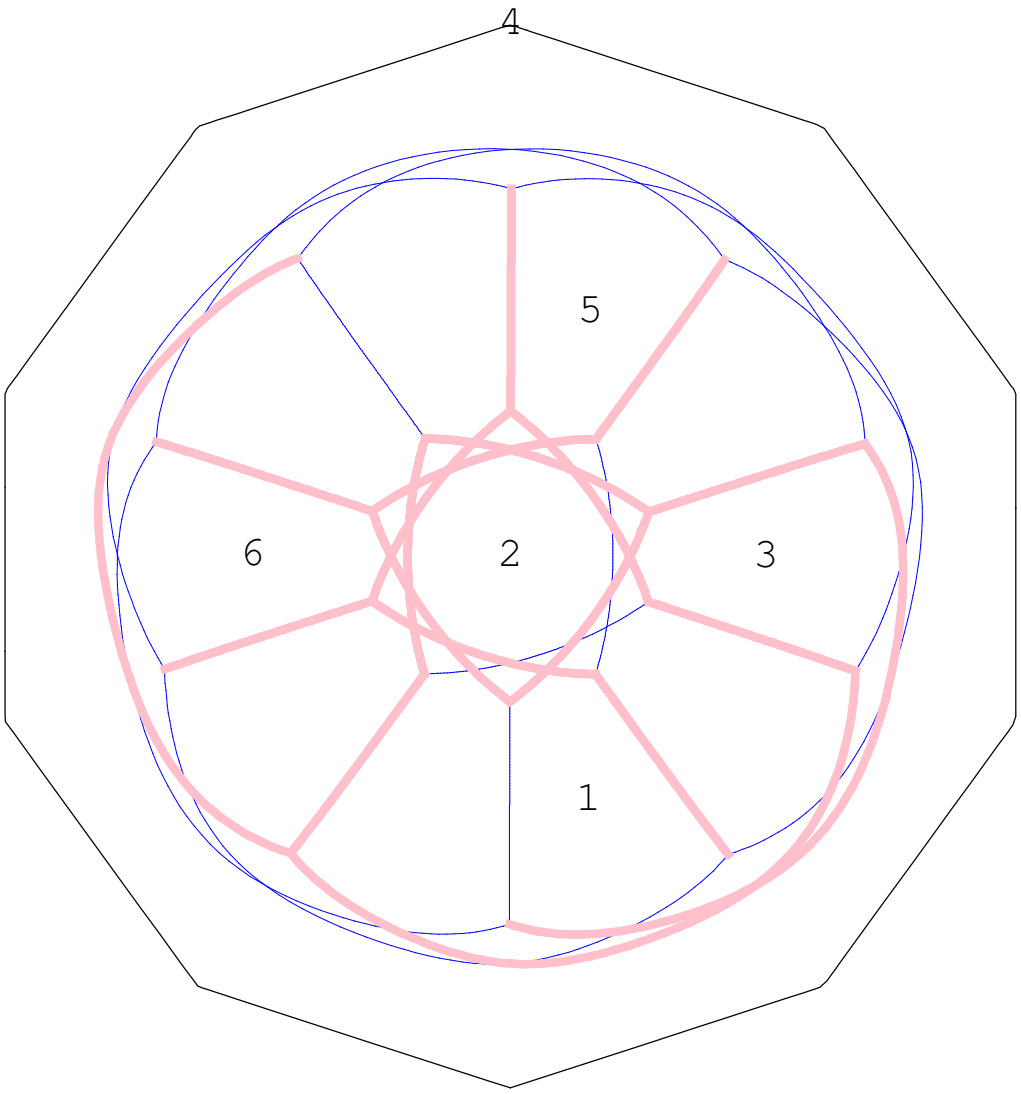


14.

$\{4, 4, \frac{10}{3}\}$

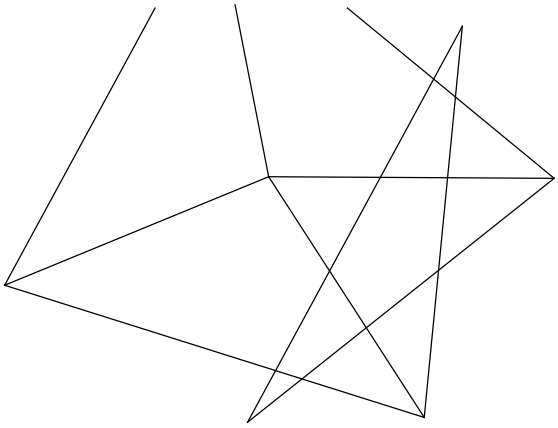


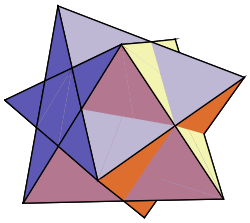


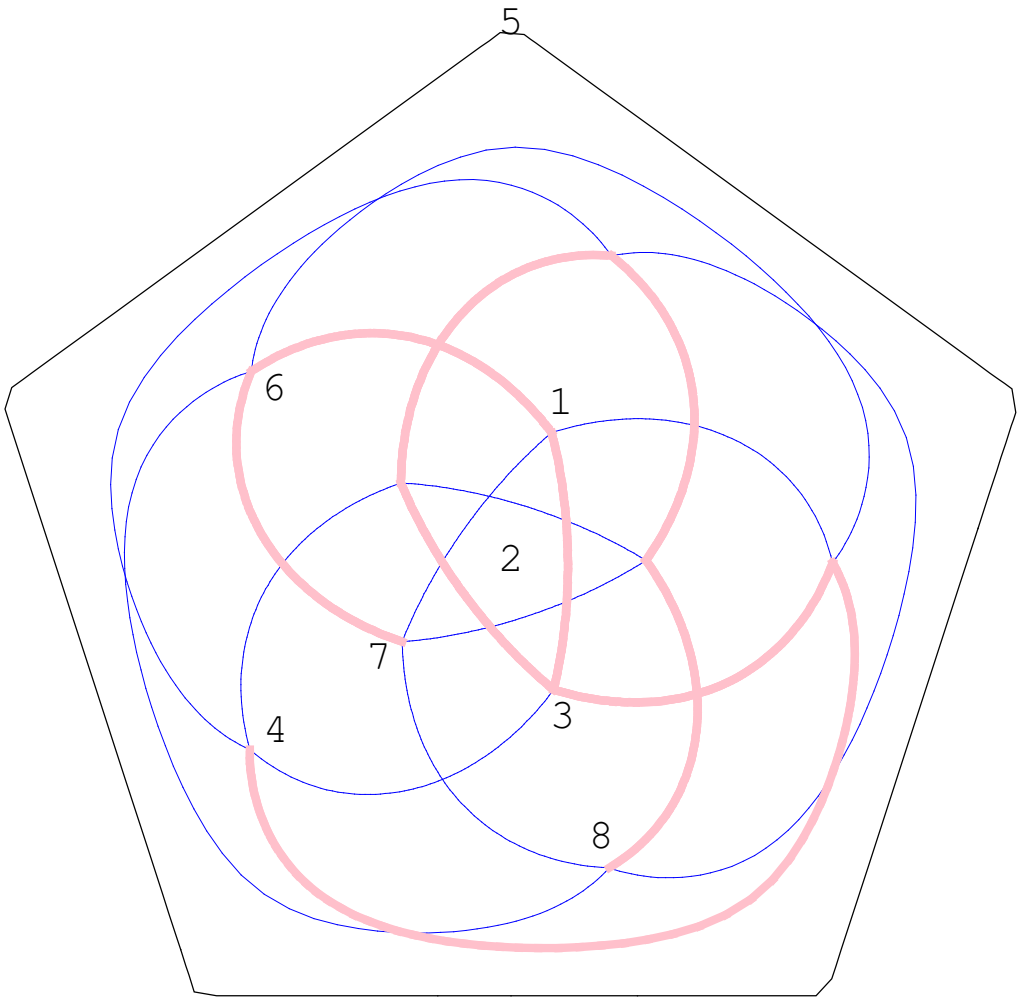


15.

$$\left\{3, 3, 3, \frac{5}{2}\right\}$$

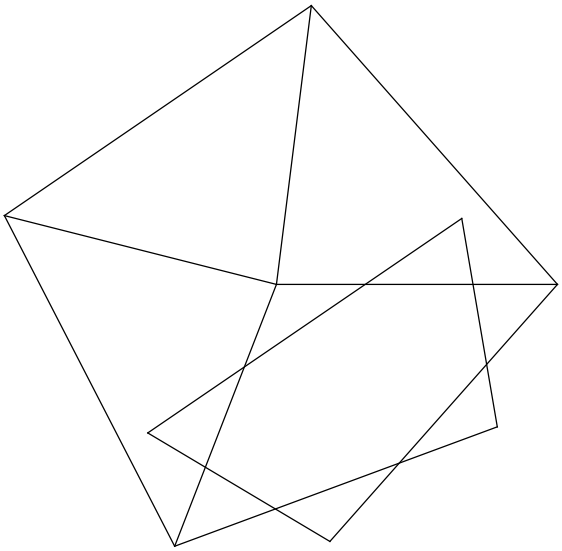


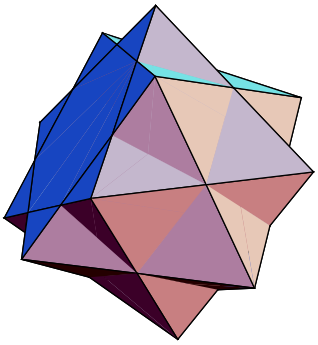


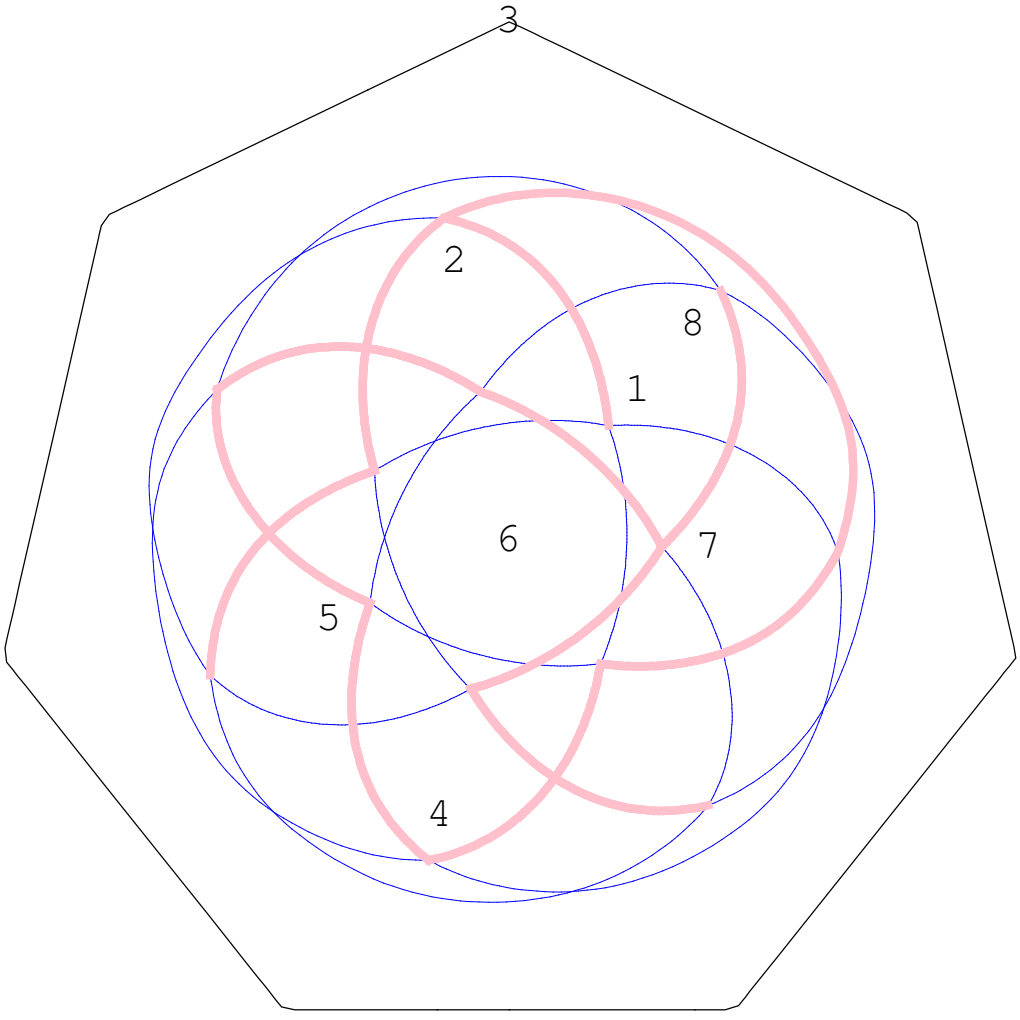


16.

$\{3, 3, 3, \frac{7}{2}\}$

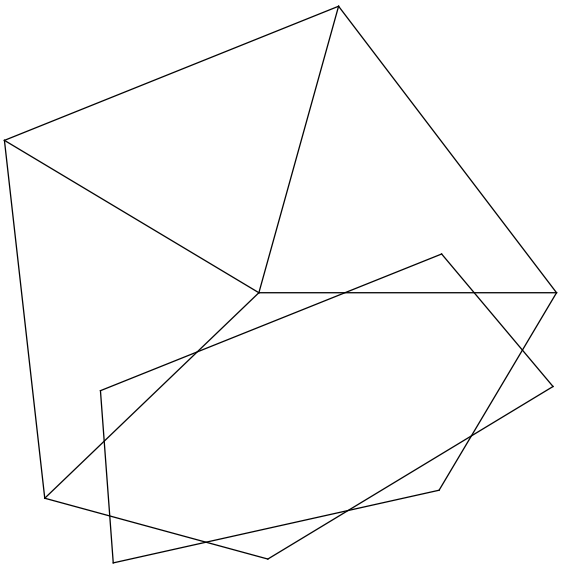


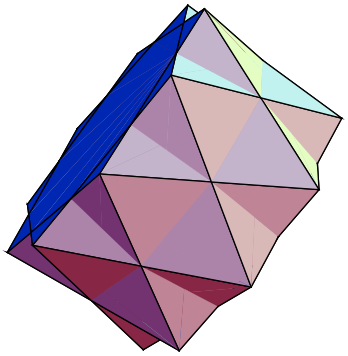


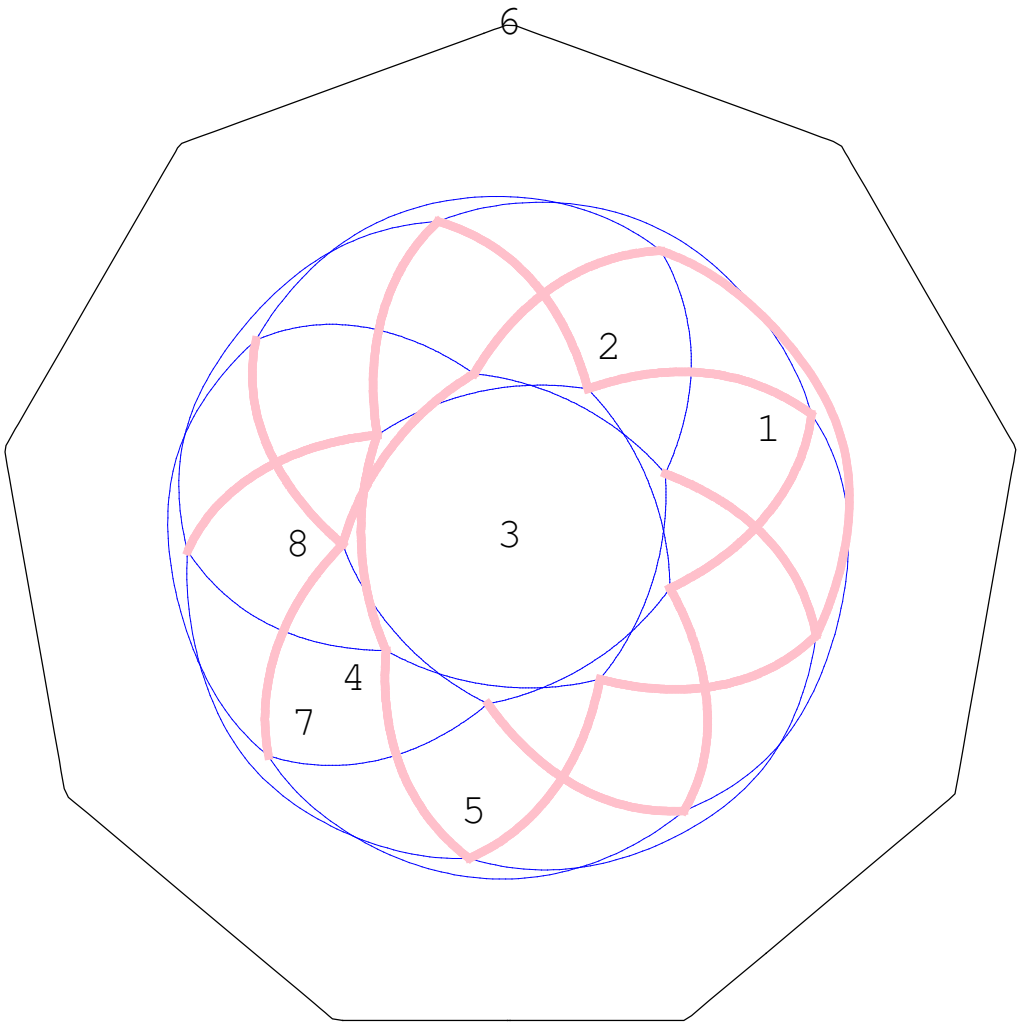


17.

$$\left\{3, 3, 3, \frac{9}{2}\right\}$$

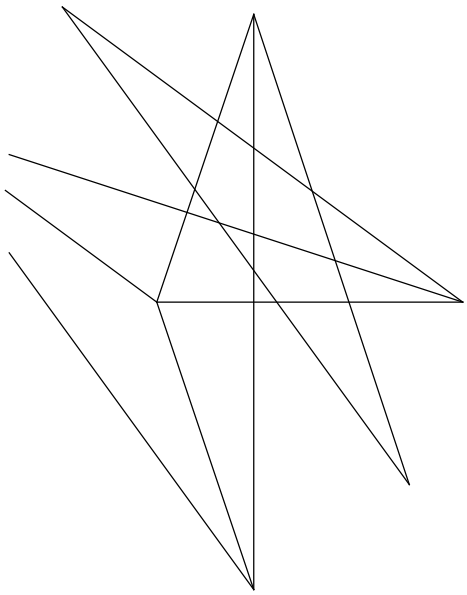


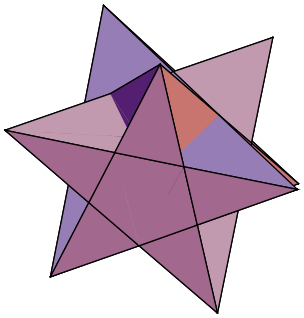


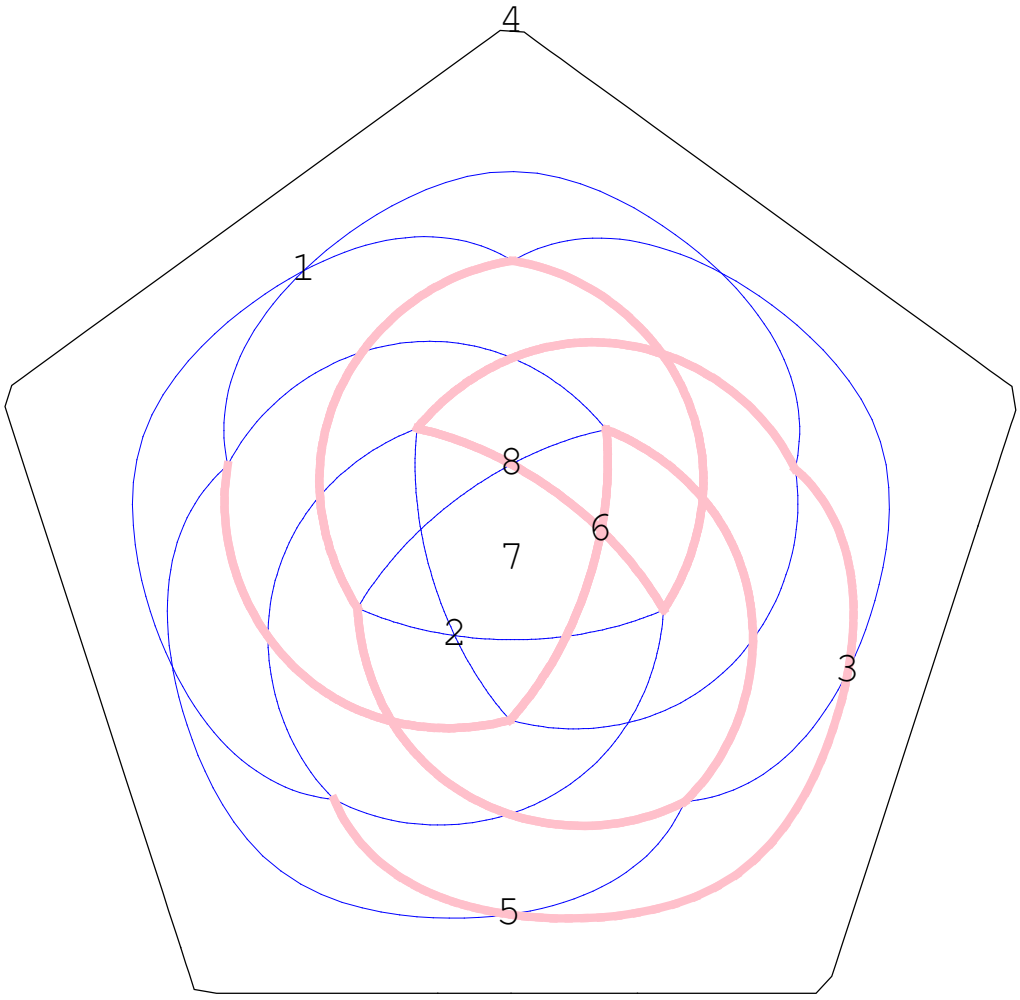


18.

$$\left\{3, 3, 3, \frac{5}{3}\right\}$$

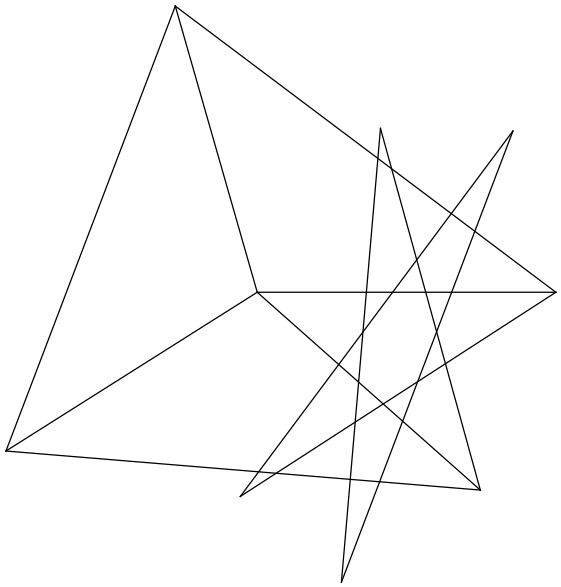


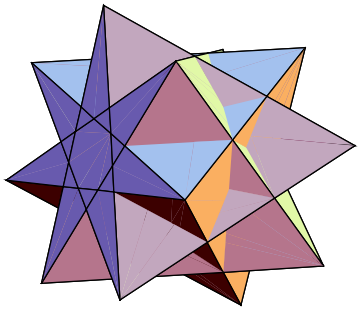


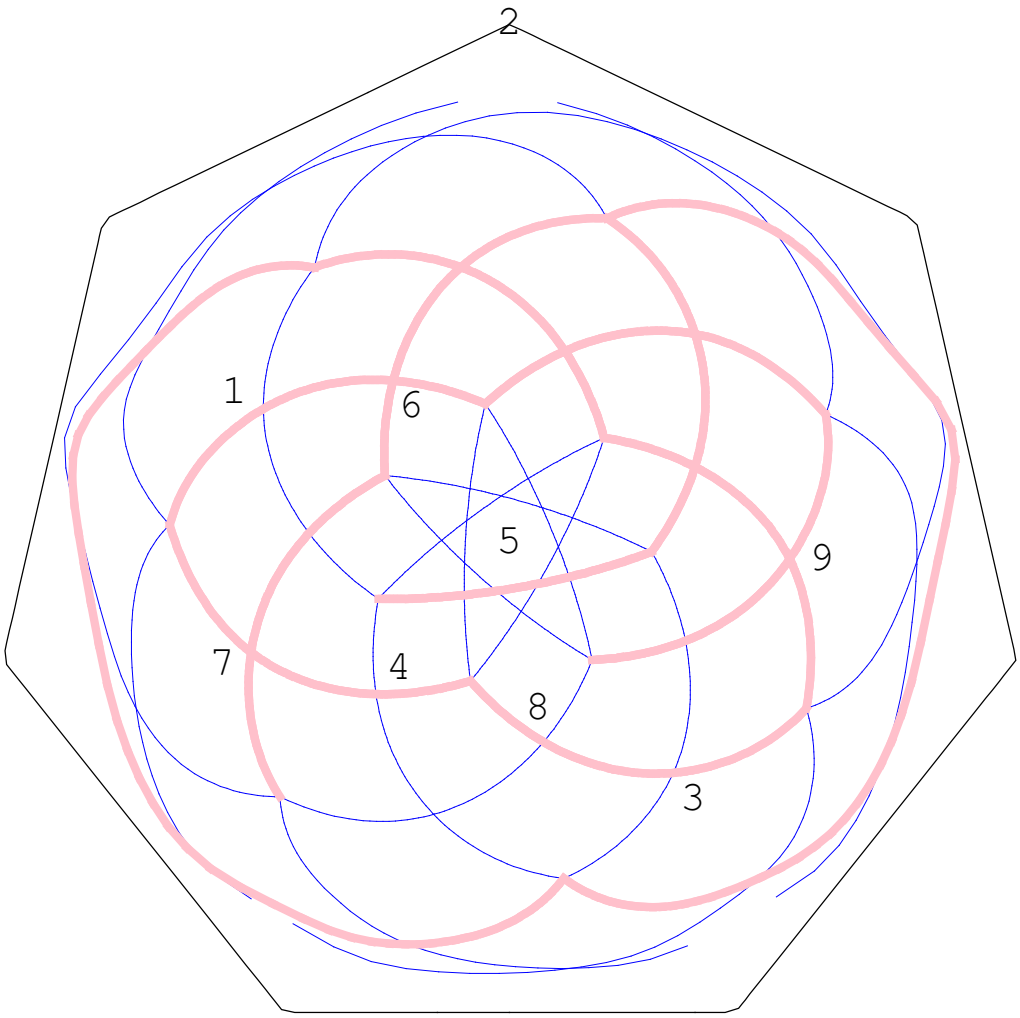


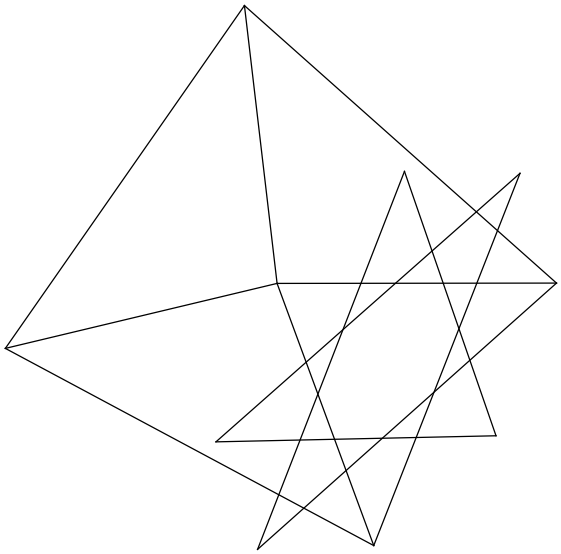
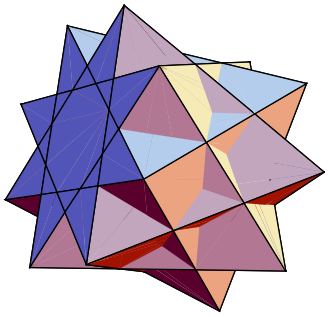
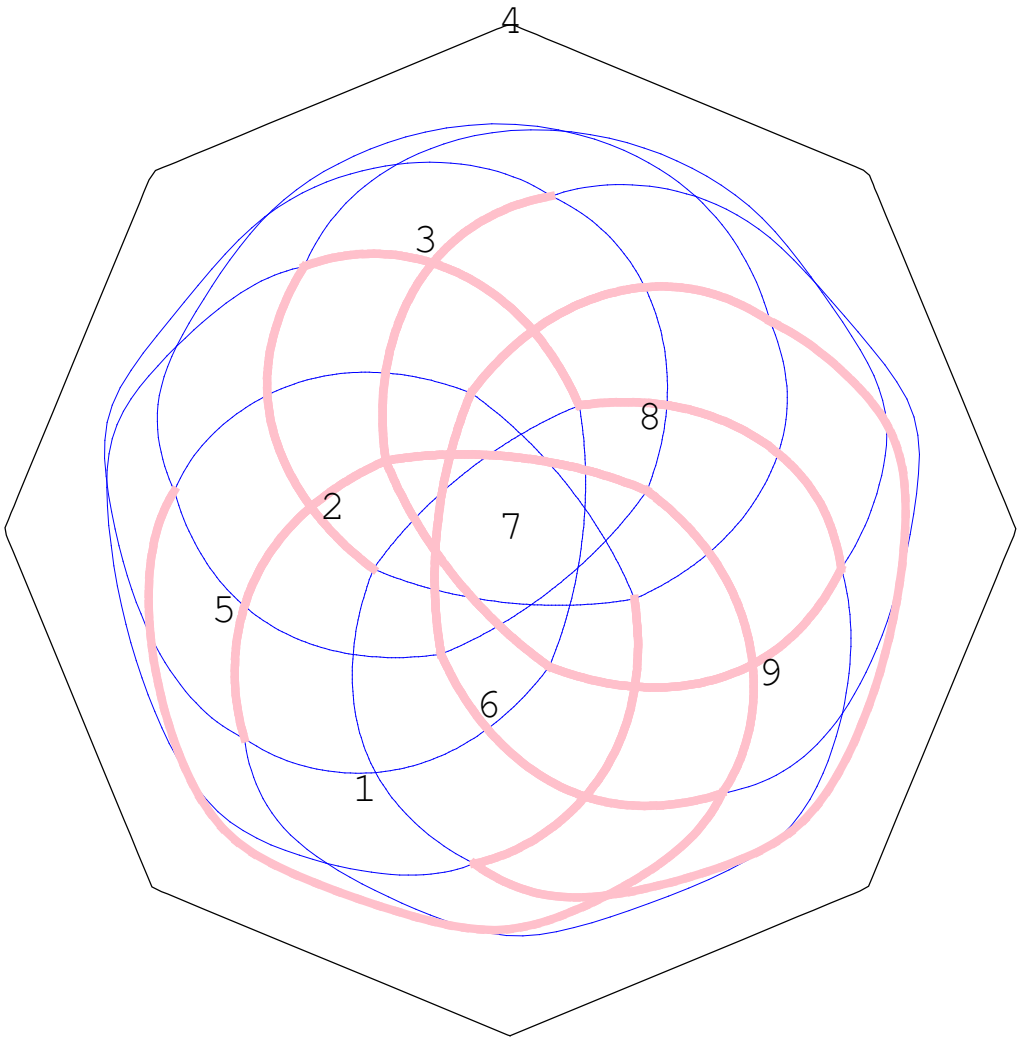
19.

$$\left\{3, 3, 3, \frac{7}{3}\right\}$$







20.

$$\left\{3, 3, 3, \frac{8}{3}\right\}$$