

Regular Polygons II

Learning regular polygons concepts

School Grade: K7/K8

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## Regular hoctahedron

The regular hoctaedron is a polyhedron consisting of 6 vertices, 12 edges, and 8 faces consisting of equilateral triangles equal to each other and dihedral angles equal to 109°47’.

### Volume

### Total surface area

## Regular Dodecaedron

The regular dodecaedron is a polyhedron consisting of 20 vertices, 30 edges, and 12 faces consisting of regular pentagon equal to each other and dihedral angles equal to 116°55'.

### Volume

### Total surface area

## Regular Icosahedron

The regular icosaedron is a polyhedron consisting of 12 vertices, 30 edges, and 20 faces consisting of equilateral triangle equal to each other and dihedral angles equal to 138°19'.

### Volume

### Total surface area

# Solved Problems

1. Calculate octagon area having perimeter equal to 24 dm.

Solution:

The area of octagon is equal to:

the data in the problem gives us the perimeter but not the apothem which we need to calculate by applying the formula:

Where f is the fixed number of an octagon equal to: 1,207 and L is the length of a side. The length of the side is equal to p/8 so we have:

1. Calculate the volume and total area of a regular tetrahedron having the surface area of each face equal to 1548 dm2.

Solution:

Regular tetrahedron is a polyhedron having 12 equal faces having the shape of a regular pentagon. The formula for the total surface area **Stot** and the volume **V** of a regular tetrahedron are:

To calculate this value we need the length L of the regular pentagon that forms the polyhedron. Appling the formula of the constant area for regular polygons, that for pentagon is equal to 1,72, we have:

So we can calculate:

# National Evaluation Exercise

(Eighth grade examination - Italy:

<https://drive.google.com/file/d/14InFQjfRfuZfalFEETvRMy1yZE7H7WQZ/view?usp=sharing>)

1) A right triangle is equivalent to a rectangle having a base of 48 cm.

The hypotenuse is of the longer cathetus, and the sum of their lengths is 72 cm.

(a) Determine the perimeter of the two polygons.

(b) Rotate the triangle around the longer cathetus and the rectangle around the shorter side and

determine the ratio of the side surfaces and the ratio of the volumes of the solids.

(c) Superimpose the two solids and determine the total area and volume of the compound solid.

(d) Assuming that both solids are iron (density = 7.5 g/cm3), determine the mass of each solid.

(e) Assuming instead that the compound solid has a mass of 61 440 g, determine the density

of the material of which it is composed.

(Eighth grade examination - Italy:

<https://drive.google.com/file/d/1jNLbTNVsQA56-8lfMxx1BNHKX9FD7kKh/view?usp=sharing>)

2) Which of the following two figures represents the development of a cube?



The edge of the cube measures 1.5 cm. Calculate:

(a) the length of the diagonal;

(b) the area of the total surface;

(c) the volume;

(d) the mass, knowing that it is marble (density 2.8 g/cm3);

(e) Also calculate the dimensions of possible boxes containing 12 cubes in a single layer.

(f) Which of these boxes requires the least amount of cardboard surface area for its packaging?

# References

<https://en.wikipedia.org/wiki/Regular_polygon>

<https://www.youtube.com/watch?v=qetSusATv2w>