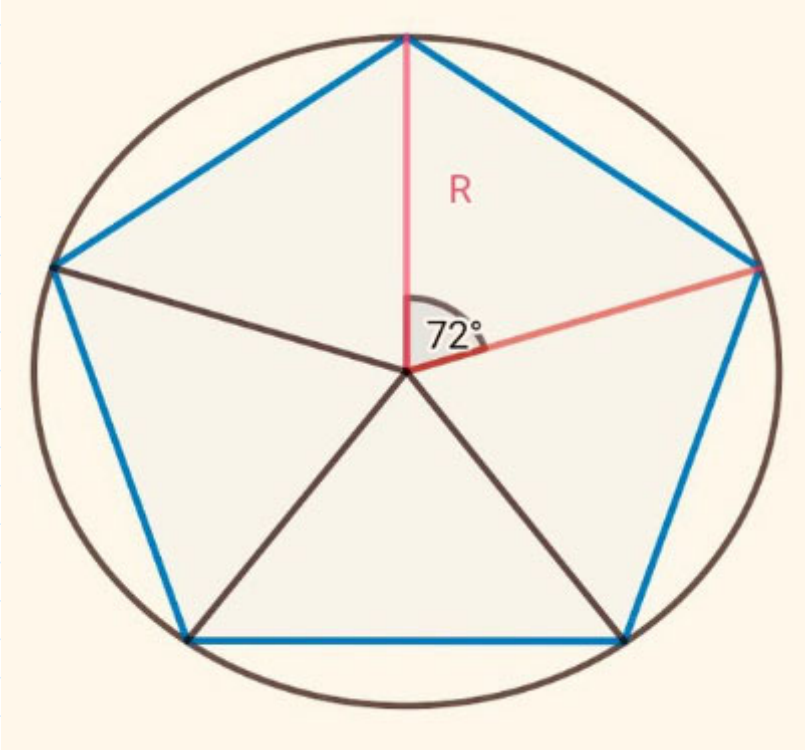
Platonic Solids - the regular polyhedrons made up of regular polygons (the lengths of each side and interior angles are equal). The dodecahedron is given as an example.


(Dodecahedron)

In this worksheet we are defining the regular polyhedrons by the radius of the circle that **circumscribes** a polygonal face. Choose the radius (R).



The Number of faces, sides and vertices surface area and volume will be displayed below.

$Radius := 10$ ¤ Select the size of the radius.

Select the shape from the list box below

$Shape :=$

- Tetrahedron
- Hexahedron
- Octahedron
- Dodecahedron
- Icosahedron

$$\begin{bmatrix} Face \\ Side \\ Vertices \\ Area \\ Volume \end{bmatrix} :=$$

if $Shape =$ "Tetrahedron"
- $Face \leftarrow 4$
- $Side \leftarrow 6$
- $Vertices \leftarrow 4$
- $Area \leftarrow 3 \cdot \sqrt{3} \cdot Radius^2$
- $Volume \leftarrow \frac{\sqrt{6} \cdot Radius^3}{4}$

else

if $Shape =$ "Hexahedron"
- $Face \leftarrow 6$
- $Side \leftarrow 12$
- $Vertices \leftarrow 8$
- $Area \leftarrow 12 \cdot Radius^2$
- $Volume \leftarrow \left(\sqrt{2} \cdot Radius\right)^3$

else

if $Shape =$ "Octahedron"
- $Face \leftarrow 8$

$$
\begin{aligned}
&\text{Side} \leftarrow 12\\
&\text{Vertices} \leftarrow 6\\
&\text{Area} \leftarrow 6 \cdot \sqrt{3} \cdot \text{Radius}^2\\
&\text{Volume} \leftarrow \sqrt{6} \cdot \text{Radius}^3\\
&\text{else}\\
&\quad \text{if Shape} = \text{“Dodecahedron”}\\
&\quad\quad \text{Face} \leftarrow 12\\
&\quad\quad \text{Side} \leftarrow 30\\
&\quad\quad \text{Vertices} \leftarrow 20\\
&\quad\quad \text{Area} \leftarrow \text{Radius}^2 \cdot \frac{15 \cdot \sqrt{2} \cdot \sqrt{\sqrt{5}+5}}{2}\\
&\quad\quad \text{Volume} \leftarrow \frac{15+7 \cdot \sqrt{5}}{4} \cdot \left(\frac{\text{Radius}}{2} \cdot \sqrt{\left(10-2\sqrt{5}\right)}\right)^3\\
&\quad \text{else}\\
&\quad\quad \text{if Shape} = \text{“Icosahedron”}\\
&\quad\quad\quad \text{Face} \leftarrow 20\\
&\quad\quad\quad \text{Side} \leftarrow 30\\
&\quad\quad\quad \text{Vertices} \leftarrow 12\\
&\quad\quad\quad \text{Area} \leftarrow \text{Radius}^2 \cdot 15 \cdot \sqrt{3}\\
&\quad\quad\quad \text{Volume} \leftarrow \frac{5 \cdot \left(3+\sqrt{5}\right)}{12} \cdot \left(\sqrt{3} \cdot \text{Radius}\right)^3\\
&\text{return} \begin{bmatrix} \text{Face} \\ \text{Side} \\ \text{Vertices} \\ \text{Area} \\ \text{Volume} \end{bmatrix}
\end{aligned}
$$

$$
\begin{bmatrix} \text{Radius} \\ \text{Shape} \\ \text{Face} \\ \text{Side} \\ \text{Vertices} \\ \text{Area} \\ \text{Volume} \end{bmatrix} = \begin{bmatrix} 10\ \text{¤} \\ \text{“Dodecahedron”} \\ 12 \\ 30 \\ 20 \\ \left(2.853 \cdot 10^3\right)\ \text{¤}^2 \\ \left(1.245 \cdot 10^4\right)\ \text{¤}^3 \end{bmatrix}
$$