# Two-dimensional figures

## Circle - common

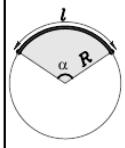
All points on the circumference of a circle are equidistant from its center.


$D=2R$
$l=2\pi R=\pi D$
$A=\pi R^2=\frac{\pi D^2}{4}$

$A$ — Area

## Sector of a Circle

The pie-shaped piece of a circle 'cut out' by two radii.

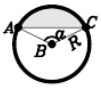



$D=2R$
$l=2\pi R=\pi D$
$A=\pi R^2=\frac{\pi D^2}{4}$

$A$ — Area

## Segment of a Circle

Either of the two regions into which which a secant or a chord cuts a circle

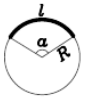



$if\ \alpha<180$
$A=\frac{\pi R^2}{360}\alpha-A_{ABC}$
$if\ \alpha>180$
$A=\frac{\pi R^2}{360}\alpha+A_{ABC}$

$A$ — Area

## Arc of a Circle

A curved portion of a circle.




$l=R\,\alpha\,\frac{\pi}{180}$
$A=\frac{\pi R^2}{360}\alpha$

$A$ — Area

## Square

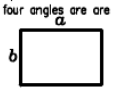
A quadrilateral with opposite sides parallel.


$A=a^2$
$A=\frac{1}{2}d^2$
$P=4*a$
$d=a\sqrt{2}$

$P$ — Perimeter
$A$ — Area

## Rectangle

A quadrilateral with adjacent perpendicular (all four angles are are therefore right angles).

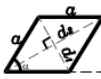



$A=ab$
$A=\frac{1}{2}a^2$
$P=2*(a+b)$

$P$ — Perimeter
$A$ — Area

## Rhombus

A parallelogram with all sides equal

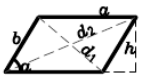



$P=4*a$
$A=ah$
$A=a^2*sin\alpha$
$A=\frac{1}{2}d_1*d_2$
$d=a\sqrt{2}$
$d_2=2a*cos\frac{\alpha}{2}$
$d_1=2a*sin\frac{\alpha}{2}$
$d_1^2+d_2^2=4a^2$

$P$ — Perimeter
$A$ — Area

## Parallelogram

A quadrilateral with opposite sides parallel.

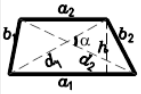



$P=2(a+b)$
$A=a*h$
$d_1^2+d_2^2=2(a^2+b^2)$
$A=ab*sin\alpha$

$P$ — Perimeter
$A$ — Area

## Trapezoid

A quadrilateral with at least one pair of parallel sides




$P=a_1+a_2+b_1+b_2$
$A=\frac{a_1+a_2}{2}h$
$A=\frac{1}{2}d_1*d_2*sin\alpha$

$A$ — Area
$P$ — Perimeter

## Kite

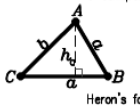
A quadrilateral with two pairs of distinct adjacent sides equal in length.


$P=2(a+b)$
$h=\sqrt{a^2-\frac{p^2}{4}}$
$h+q=\sqrt{a^2-\frac{p^2}{4}}+\sqrt{b^2-\frac{p^2}{4}}$

$P$ — Perimeter

## Triangle - common

A polygon (plane figure) with 3 angles and 3 sides.




s—semiperimeter of the triangle:

$s=\frac{P}{2}=\frac{a+b+c}{2}$
$A=\frac{1}{2}ah_a$
$A=\frac{1}{2}ab*sinC$

Heron's formula

$A=\sqrt{s(s-a)(s-b)(s-c)}$

$A$ — Area
$P$ — Perimeter

## Equilateral Triangle

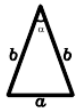
A triangle with all three sides of equal length.


$P=3a$
$R=\frac{a\sqrt{3}}{4}$
$r=\frac{a\sqrt{3}}{6}$
$R=2r$
$A=\frac{a^2}{4}\sqrt{3}$

$P$ — Perimeter
$A$ — Area

## Isosceles Triangle

A triangle with two sides of equal length.

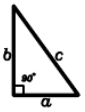



$P=a+2b$
$A=\frac{1}{2}b^2*sin\alpha$
$A=\frac{a}{4}\sqrt{4b^2-a^2}$

$P$ — Perimeter
$A$ — Area

## Right Triangle

A triangle with one right angle.




$P=a+b+c$
$c=\sqrt{a^2+b^2}$
$A=\frac{ba}{2}$

$P$ — Perimeter
$A$ — Area

# Three-dimensional figures

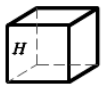
## Prism

A prism is a solid that has two parallel faces which are congruent polygons at both ends


$V=A*H$

$A$ — Area of base
$P$ — Perimeter of base
$V$ — Volume

## Rectangular Parallelepiped




$A=P*H$
$V=A*H$

$A$ — Area of base
$P$ — Perimeter of base
$V$ — Volume

## Cone

A cone is a solid with a circular base. It has a curved surface which tapers (i.e. decreases in size) to a vertex at the top.


$V=\frac{1}{3}\pi r^2 H$
$S=\pi rl+\pi r^2$

$H$ — Height
$r$ — Radius of base
$S$ — Surface area
$V$ — Volume
$l$ — the slant height

## Frustum of a Right Circular Cone


$V=\frac{1}{3}\pi H(R_1^2+R_2^2+R_1R_2)$
$S=\pi(R_1+R_2)*l$
$S_{tot}=\pi(R_1+R_2)*l$

$S_{tot}$ — Total surface area
$S$ — Surface area
$R_1, R_2$ — Radius of bases
$l$ — the slant height
$H$ — Height
$V$ — Volume

## Pyramid

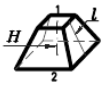
A pyramid is a solid with a polygonal base and several triangular lateral faces.


$V=\frac{1}{3}A*H$
$S$ — Add the area of the base to the sum of the areas of all of the triangular faces

$A$ — Area of base
$P$ — Perimeter of base
$V$ — Volume
$S$ — Surface area

## Frustum of a Pyramid

The portion of a pyramid that lies between the base and a plane cutting through it parallel to the base.




$S=\frac{1}{2}(P_1+P_2)*l$
$V=\frac{1}{3}(A_1+A_2+\sqrt{A_1A_2})*H$

$A_1, A_2$ — Area of bases
$H$ — Height
$P_1, P_2$ — Perimeter of bases
$l$ — Slant height
$V$ — Volume
$S$ — Surface area

## Sphere

A sphere is a solid in which all the points on the round surface are equidistant from a fixed point, known as the centre of the sphere


$V=\frac{4}{3}\pi r^3$
$S=4\pi r^2$

$V$ — Volume
$r$ — Radius of base
$S$ — Surface area

## Hemisphere

A hemisphere is half a sphere, with one flat circular face and one bowl-shaped face.


$V=\frac{2}{3}\pi r^3$
$S=2\pi r^2$

$V$ — Volume
$r$ — Radius of base
$S$ — Surface area

## Hollow cylinder

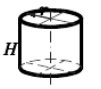
$S=2\pi rH+2\pi RH+2(\pi R^2-\pi r^2)$


$V=\pi H(R^2-r^2)$

$H$ — Height
$R, r$ — Radius of base
$V$ — Volume
$S$ — Surface area

## Cylinder

A cylinder is a solid that has two parallel faces which are congruent circles. The line connecting the centers of the bases is called the axis.




$V=\pi r^2 H$
$S=2\pi r^2+2\pi rh$

$H$ — Height
$r$ — Radius of base
$V$ — Volume
$S$ — Surface area