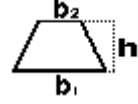


ملخص لقوانين المساحة والحجم لبعض الأشكال والمجسمات

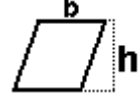
شبه المنحرف:

المساحة = $\frac{2}{1} \times$ مجموع طولي قاعدتيه المتوازيتين \times الارتفاع
المحيط = مجموع أطوال أضلاعه



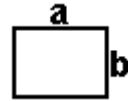
متوازي الأضلاع:

المساحة = القاعدة \times الارتفاع
المحيط = مجموع أطوال أضلاعه



المستطيل:

المساحة = الطول \times العرض
المحيط = $2 \times$ (الطول + العرض)

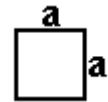


المعين:

المساحة = القاعدة \times الارتفاع
المساحة = $\frac{1}{2} \times$ طول القطر الأول \times طول القطر الثاني
المحيط = طول الضلع $\times 4$

المربع:

المساحة = طول الضلع \times نفسه
المحيط = طول الضلع $\times 4$



المثلث:

$$\text{المساحة} = \frac{1}{2} \times \text{القاعدة} \times \text{الارتفاع}$$

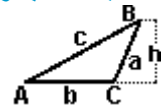
مساحة المثلث بمعلومية أطوال أضلاعه الثلاثة وتسمى هذه بقاعدة هيرون

ملاحظة: مساحة المثلث الذي أطوال أضلاعه أ، ب، ج' يساوي

$$\sqrt{c(c-a)(c-b)}$$

$$\text{حيث } c = \frac{a + b + c'}{2} \text{ نصف محيط المثلث.}$$

المحيط = مجموع أطوال أضلاعه



الدائرة:

$$\text{المساحة} = \pi \times \text{نق}^2$$

$$\text{المحيط} = 2 \times \pi \times \text{نق}$$



المساحة الكلية = $6 \times (\text{طول الحرف})$

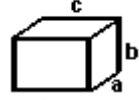


متوازي المستطيلات:

الحجم = الطول \times العرض \times الارتفاع

المساحة الجانبية = محيط القاعدة \times الارتفاع

المساحة الكلية = المساحة الجانبية + مساحة القاعدتين



الإسطوانة:

الحجم = مساحة القاعدة \times الارتفاع = $\pi \times \text{نق}^2 \times \text{ع}$

المساحة الجانبية = محيط القاعدة \times الارتفاع = $2 \times \pi \times \text{نق} \times \text{ع}$

المساحة الكلية = المساحة الجانبية + مساحة القاعدتين

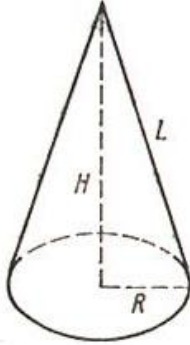


المخروط:

الحجم = $3/1 \times$ مساحة القاعدة \times الارتفاع = $3/1 \times \pi \times \text{نق}^2 \times \text{ع}$

المساحة الجانبية = نصف محيط القاعدة \times الارتفاع

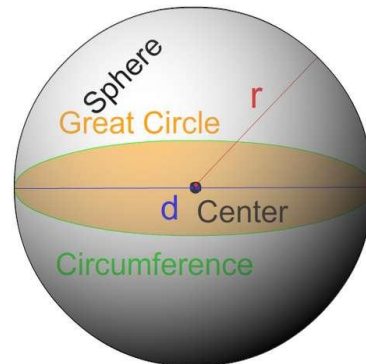
المساحة الكلية = المساحة الجانبية + مساحة القاعدة



الكرة

الحجم = $3/4 \times \pi \times \text{نق}^3$

المساحة الكلية = $4 \times \pi \times \text{نق}^2$



Area Formulas


([Math](#) | [Geometry](#) | Area Formulas)

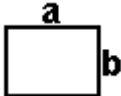
($\pi = 3.141592\dots$)

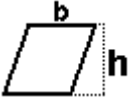
Area Formulas

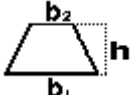
Note: "ab" means "a" multiplied by "b". "a²" means "a squared", which is the same as "a" times "a".


Be careful!! Units count. Use the same units for all measurements. [Examples](#)

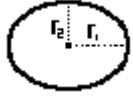
square = a^2 

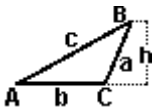
rectangle = ab 

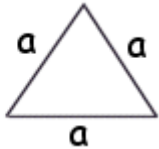
parallelogram = bh 

trapezoid = $\frac{h}{2} (b_1 + b_2)$ 

circle = πr^2 

ellipse = $\pi r_1 r_2$ 

triangle =	$\frac{1}{2}(bh)$		one half times the base length times the height of the triangle
------------	-------------------	---	---

equilateral triangle =	$\frac{\sqrt{3}}{4}(a^2)$ 
------------------------	---

triangle given SAS (two sides and the opposite angle)

$$= (1/2) a b \sin C$$

triangle given a,b,c = $\sqrt{s(s-a)(s-b)(s-c)}$ when $s = (a+b+c)/2$ (**Heron's formula**)

$$\text{regular polygon} = (1/2) n \sin(360^\circ/n) S^2$$

when $n = \#$ of sides and $S =$ length from center to a corner

Units

Area is measured in "square" units. The area of a figure is the number of squares required to cover it completely, like tiles on a floor.

Area of a square = side times side. Since each side of a square is the same, it can simply be the length of one side squared.

If a square has one side of 4 inches, the area would be 4 inches times 4 inches, or 16 square inches. (Square inches can also be written in².)

Be sure to use the same units for all measurements. You cannot multiply feet times inches, it doesn't make a square measurement.

The area of a rectangle is the length on the side times the width. If the width is 4 inches and the length is 6 feet, what is the area?

NOT CORRECT 4 times 6 = 24

CORRECT.... 4 inches is the same as 1/3 feet. Area is 1/3 feet times 6 feet = 2 square feet. (or 2 sq. ft., or 2 ft²).

Volume Formulas

([Math](#) | [Geometry](#) | [Volume Formulas](#))


(**$\pi = 3.141592\dots$**)

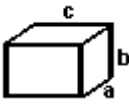
Volume Formulas


Note: "ab" means "a" multiplied by "b". "a²" means "a squared",

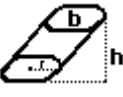
which is the same as "a" times "a". "b³" means "b cubed", which is the same as "b" times "b" times "b".

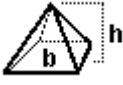
Be careful!! Units count. Use the same units for all measurements. [Examples](#)


cube = a^3 


rectangular prism = $a b c$ 

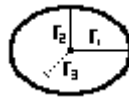
irregular prism = $b h$ 

cylinder = $b h = \pi r^2 h$ 

pyramid = $(1/3) b h$ 

cone = $(1/3) b h = 1/3 \pi r^2 h$ 

sphere = $(4/3) \pi r^3$ 

ellipsoid = $(4/3) \pi r_1 r_2 r_3$ 

Units

Volume is measured in "cubic" units. The volume of a figure is the number of cubes required to fill it completely, like blocks in a box.

Volume of a cube = side times side times side. Since each side of a square is the same, it can simply be the length of one side cubed.

If a square has one side of 4 inches, the volume would be 4 inches times 4 inches times 4 inches, or 64 cubic inches. (Cubic inches can also be written in³.)

Be sure to use the same units for all measurements. You cannot multiply feet times inches times yards, it is a perfectly cubed measurement.

The volume of a rectangular prism is the length on the side times the width times the height.

If the width is 4 inches, the length is 1 foot and the height is 3 feet, what is the volume?

NOT CORRECT 4 times 1 times 3 = 12

CORRECT.... 4 inches is the same as 1/3 feet. Volume is 1/3 feet times 1 foot times 3 feet = 1 cubic foot (or 1 cu. ft., or 1 ft³).

($\pi = 3.141592\dots$)

Surface Area Formulas

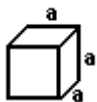
In general, the surface area is the sum of all the areas of all the shapes that cover the surface of the object.

[Cube](#) | [Rectangular Prism](#) | [Prism](#) | [Sphere](#) | [Cylinder](#) | [Units](#)

Note: "ab" means "a" multiplied by "b". "a²" means "a squared", which is the same as "a" times "a".

Be careful!! Units count. Use the same units for all measurements. [Examples](#)

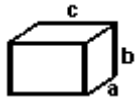
Surface Area of a Cube = $6 a^2$
--



(a is the length of the side of each edge of the cube)

In words, the surface area of a cube is the area of the six squares that cover it. The area of one of them is $a \cdot a$, or a^2 . Since these are all the same, you can multiply one of them by six, so the surface area of a cube is 6 times one of the sides squared.

$$\text{Surface Area of a Rectangular Prism} = 2ab + 2bc + 2ac$$



(a, b, and c are the lengths of the 3 sides)

In words, the surface area of a rectangular prism is the area of the six rectangles that cover it. But we don't have to figure out all six because we know that the top and bottom are the same, the front and back are the same, and the left and right sides are the same.

The area of the top and bottom (side lengths a and c) = $a \cdot c$. Since there are two of them, you get $2ac$. The front and back have side lengths of b and c. The area of one of them is $b \cdot c$, and there are two of them, so the surface area of those two is $2bc$. The left and right side have side lengths of a and b, so the surface area of one of them is $a \cdot b$. Again, there are two of them, so their combined surface area is $2ab$.

$$\text{Surface Area of Any Prism}$$



(b is the shape of the ends)

Surface Area = Lateral area + Area of two ends

(Lateral area) = (perimeter of shape **b**) * L

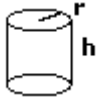
Surface Area = (perimeter of shape **b**) * L + 2*(Area of shape **b**)

$$\text{Surface Area of a Sphere} = 4 \pi r^2$$



(r is radius of circle)

$$\text{Surface Area of a Cylinder} = 2 \pi r^2 + 2 \pi r h$$



(h is the height of the cylinder, r is the radius of the top)

Surface Area = Areas of top and bottom + Area of the side

Surface Area = $2(\text{Area of top}) + (\text{perimeter of top}) * \text{height}$

Surface Area = $2(\pi r^2) + (2 \pi r) * h$

In words, the easiest way is to think of a can. The surface area is the areas of all the parts needed to cover the can. That's the top, the bottom, and the paper label that wraps around the middle.

You can find the area of the top (or the bottom). That's the formula for area of a circle (πr^2). Since there is both a top and a bottom, that gets multiplied by two.

The side is like the label of the can. If you peel it off and lay it flat it will be a rectangle. The area of a rectangle is the product of the two sides. One side is the height of the can, the other side is the perimeter of the circle, since the label wraps once around the can. So the area of the rectangle is $(2 \pi r) * h$.

Add those two parts together and you have the formula for the surface area of a cylinder.

Surface Area = $2(\pi r^2) + (2 \pi r) * h$

Tip! Don't forget the units.

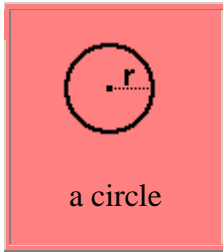
These equations will give you correct answers if you keep the units straight. For example - to find the surface area of a cube with sides of 5 inches, the equation is:

$$\text{Surface Area} = 6 * (5 \text{ inches})^2$$

$$= 6 * (25 \text{ square inches})$$

$$= 150 \text{ sq. inches}$$

Definition: A circle is the locus of all points equidistant from a central point.



Definitions Related to Circles

arc: a curved line that is part of the circumference of a circle

chord: a line segment within a circle that touches 2 points on the circle.

circumference: the distance around the circle.

diameter: the longest distance from one end of a circle to the other.

origin: the center of the circle

pi (π): A number, 3.141592..., equal to (the circumference) / (the diameter) of any circle.

radius: distance from center of circle to any point on it.

sector: is like a slice of pie (a circle wedge).

tangent of circle: a line perpendicular to the radius that touches ONLY one point on the circle.

Diameter = 2 x radius of circle

Circumference of Circle = PI x diameter = 2 PI x radius

where **PI = π = 3.141592...**

Area of Circle:

area = πr^2



Length of a Circular Arc: (with central angle θ)

if the angle θ is in degrees, then length = $\theta \times (\pi/180) \times r$

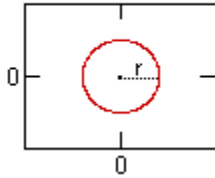
if the angle θ is in radians, then length = $r \times \theta$

Area of Circle Sector: (with central angle θ)

if the angle θ is in degrees, then area = $(\theta/360) \times \pi r^2$

if the angle θ is in radians, then area = $((\theta/(2\pi)) \times \pi r^2$

Equation of Circle: (Cartesian coordinates)



for a circle with center (\mathbf{j}, \mathbf{k}) and radius (\mathbf{r}) :

$$(x-\mathbf{j})^2 + (y-\mathbf{k})^2 = \mathbf{r}^2$$

Equation of Circle: (polar coordinates)

for a circle with center $(0, 0)$: $\mathbf{r}(\theta) = \text{radius}$

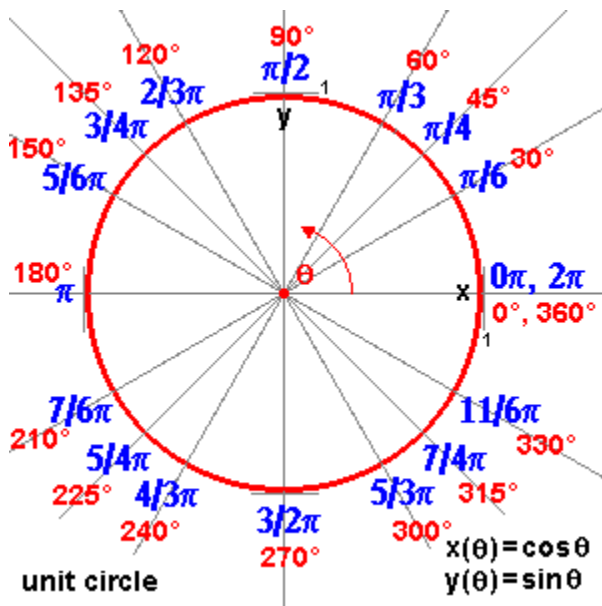
for a circle with center with polar coordinates: (c, α) and radius \mathbf{a} :

$$\mathbf{r}^2 - 2c\mathbf{r} \cos(\theta - \alpha) + c^2 = \mathbf{a}^2$$

Equation of a Circle: (parametric coordinates)

for a circle with origin (j, k) and radius r :

$$\mathbf{x}(t) = \mathbf{r} \cos(t) + \mathbf{j} \quad \mathbf{y}(t) = \mathbf{r} \sin(t) + \mathbf{k}$$




($\pi = 3.141592\dots$)

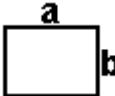
Perimeter Formulas

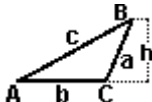
The perimeter of any polygon is the sum of the lengths of all the sides.


Note: "ab" means "a" multiplied by "b". "a²" means "a squared", which is the same as "a" times "a".

Be careful!! Units count. Use the same units for all measurements. [Examples](#)

square = $4a$ 

rectangle = $2a + 2b$ 

triangle = $a + b + c$ 

circle = $2\pi r$ 

circle = πd (where d is the diameter)

The perimeter of a circle is more commonly known as the circumference.

Units

