

The Circle

Learning the circle & Related Concepts

School Grade: K8/K9

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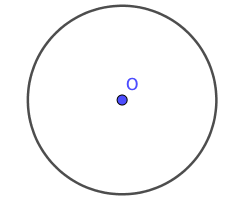
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# Circle definition

To understand what a circle is, we start with the concept of circumference.

*"A circumference is a closed line consisting of all the points on a plane which are equidistant from the same point on the same plane, called the center.”*

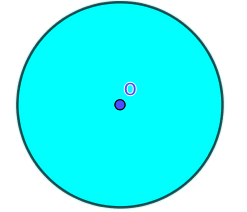


*Figure 1: Circumference*

The center of the circle is denoted by the letter O.

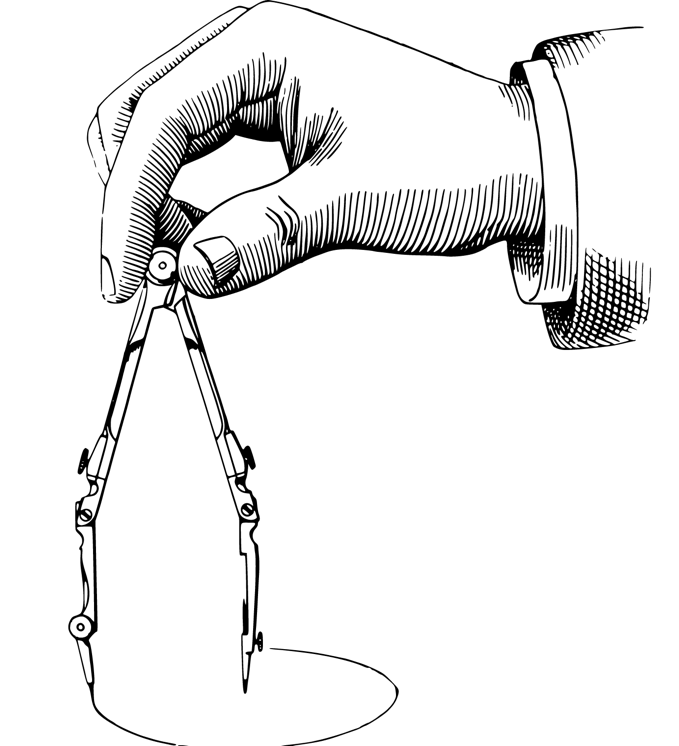
*"The circle is the part of the plane, i.e. the surface, consisting of all the points of a circle and all its interior points."*

The center of the circle coincides with the center of the circumference, which represents its contour, i.e. the perimeter.



*Figure 2: Circle*

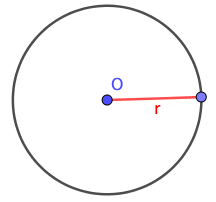
Circumference and circle are not the same geometric object. The circumference is a line and the circle is a surface. You can use a drawing tool called a compass to draw a circle. The opening of the compass corresponds to the distance of each of the circumference's points from the center.



*Figure 3:Compass from:* [*https://publicdomainvectors.org*](https://publicdomainvectors.org)

## Radius

The distance from any point on the circle to the center is called radius and is denoted by the symbol r.



*Figure 4. Radius of a circunference*

The center and radius of a circle are also the center and radius of the circle that the circle encloses.

A point belongs to the circle if its distance from the center is equal to the radius.

Immagine che contiene diverso

Descrizione generata automaticamente

*Figure 5. Points and circumference*

*OA<r ∉* circumference *OC>r ∉* circumference *OB>r ∈* circumference

A point will belong to the circle if its distance from the center is less than or equal to the radius.

Immagine che contiene orologio

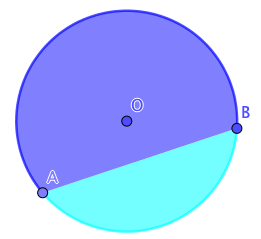
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*Figure 6. Points and circle*

*OA<r ∈* circle *OC>r ∉* circle *OB>r ∈* circle

# Parts of circumference and circle

Given two points A and B on a circle, the segment joining these two points is called the chord and divides the circle into two parts called circular segments.



*Figure 7. Chord and circular segments*

By varying the points on the circumference we can draw infinite chords. A chord passing through the center is called a diameter.

Immagine che contiene elettronico, grafica vettoriale

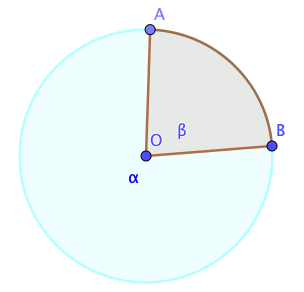
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*Figure 8. Diameter and semicircles*

Characteristics of the diameter are:

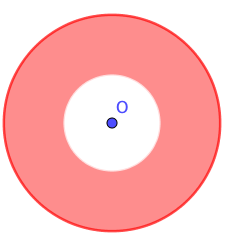
* has the length equal to twice the radius
* it is the chord of maximum length.
* It divides the circle into two equal parts called semicircles.

Two radii of the same circle divide it into two plane parts each of which is called a circular sector. The width of each sector is that of the angle formed by the radii.



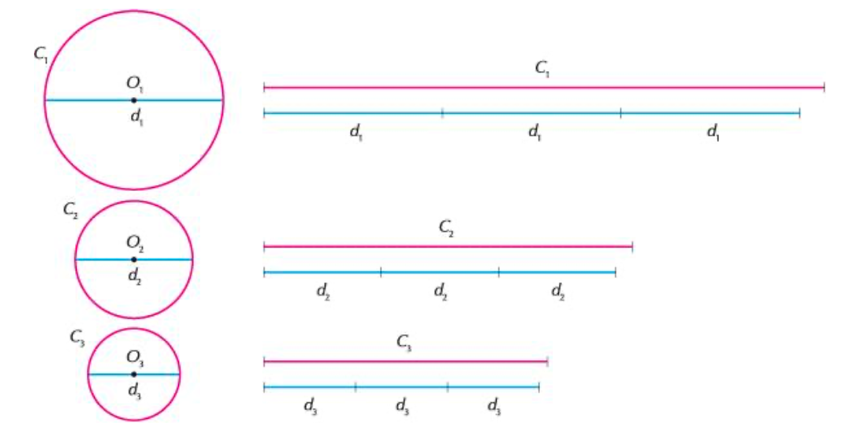
*Figure 9. Circular sector*

The circular crown is the part of the circle between two concentric circles, that is, two circles that are inside each other and have a common center.



*Figure 10. Circular crown*

## Length of a circumference



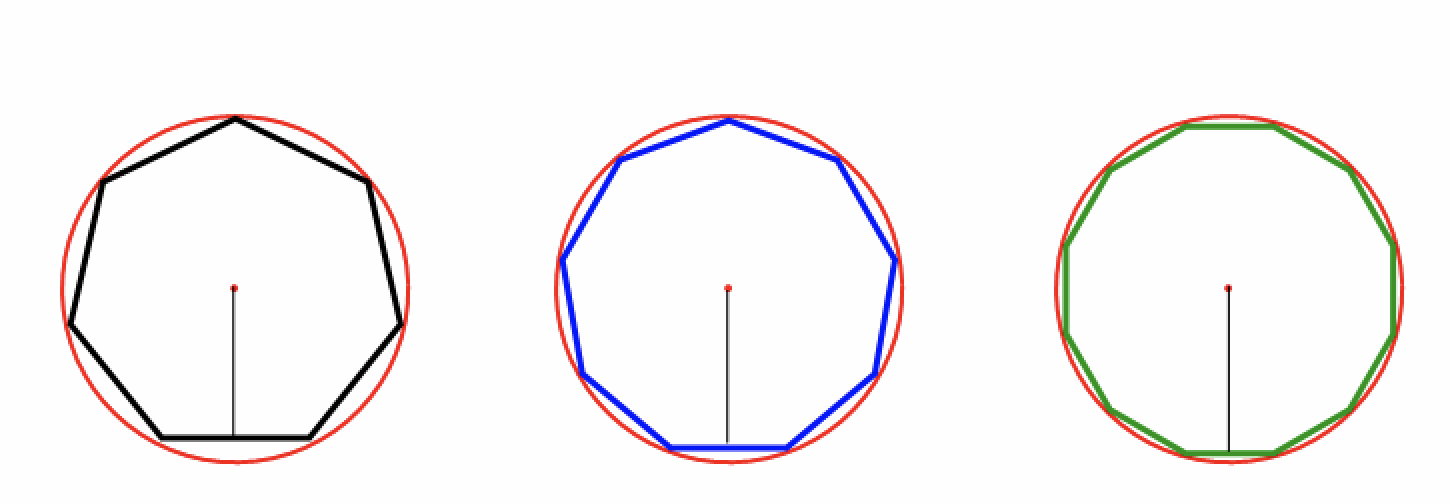
*Figure 11. Circumferences a straight line*

If we take 3 circumferences, cut them out, and lay them out in a straight line, we can notice an important characteristic: the ratio between the length of the circumference and the length of the diameter remains constant regardless of the size of the circumference. This ratio is called pi (π). So, it turns out that for each circumference C we have that:

since the diameter is equal to 2 times the radius, we have:

then the length of a circumference is equal to 2 times the radius by pi.

## Area of circle



*Figure 11. Regular polygons*

In the image above, we see some circles in which regular polygons with an increasing number of sides have been inscribed (heptagono, ennagon, dodecagon) As the number of sides of the polygon increases, the perimeter of the polygon tends to coincide with the circumference, while the length of the apothem tends to be equal to that of the radius.

If we imagine a polygon with infinite sides, its perimeter will coincide with the circumference, the apothem will be equal to the radius and then the area of the polygon will be equal to the area of the circle.

The Area of a regular polygon is equal to the Perimeter times the apothem divided by 2. Considering the circle a regular polygon with infinite sides we can calculate its Area as

Where P is the length of circumference ( and Apothem is the radius (r):

then

## Area of circular crown and circular sector

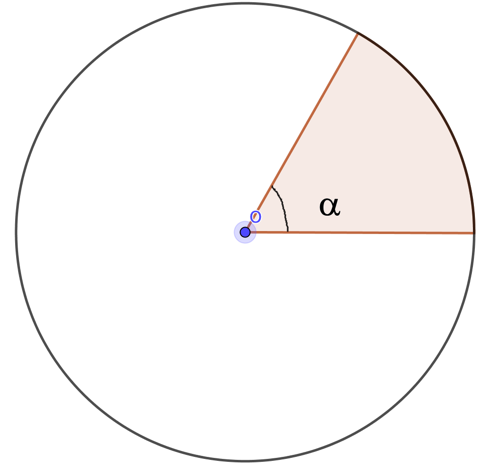
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*Figure 12. Circular crown*

The area of a circular circle is given by the area of the circle with the largest radius minus the area of the circle with the smallest radius. Turning to formulas we will have:

The area of the circular sector is equal to the area of the corresponding circle, divided by 360° and multiplied by the amplitude α of the sector expressed in degrees.



*Figure 12. Circular sector*

# Solved problems

1. Calculate the area of the circle having radius 10 cm
2. Calculate the area of the circle having Circumference 56,52 dm
3. Calculate the area of the circle sector having and radius=10cm
4. Calculate the amplitude of the angle at the center of a circular sector having the area of 5702,24 square meter belonging to a circumference 414,48 m long.

# National Evaluation Exercise

(Eighth grade examination - Italy:

<https://drive.google.com/file/d/1VgNy0layut0O45Jqu42MnEu4ufw3ScpB/view?usp=sharing>)

1 The development of the lateral surface of a cone is a circular sector with an angle at the center of 216° and area of 540 π cm2. Calculate:

(a) the radius of the circle to which the circular sector belongs;

# References

https://www.youtube.com/watch?v=YwcVRkxLEx4