Meta Title: The Relationship between a Circle's Chord and Its Length

Meta Description: Learn about the definition, length, and key theorems related to chords in a circle. Discover formulas and techniques for calculating the length of a chord and understand the relationship between a chord and other elements of a circle.

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Definition of a Chord in a Circle

In geometry, a chord of a circle is a straight line segment whose endpoints both lie on the circle. The word "chord" is from the Latin chorda, meaning "string, cord." Chords can be classified according to the length of the line segment that they contain. A chord that passes through the center of the circle is called a diameter. The length of a chord is the distance between its endpoints. The midpoint of a chord is the point that divides the chord into two equal segments. The perpendicular bisector of a chord is a line that is perpendicular to the chord and passes through its midpoint.

Length of a Chord in a Circle

The length of a chord in a circle depends on the radius of the circle and the distance from the center of the circle to the chord. If the radius of the circle is r and the distance from the center of the circle to the chord is d, then the length of the chord can be found using the following formula:

length = 2 * sqrt(r^2 - d^2)

where sqrt is the square root function.

For example, if the radius of the circle is 5 units and the distance from the center of the circle to the chord is 3 units, then the length of the chord is:

length = 2 * sqrt(5^2 - 3^2)

= 2 * sqrt(25 - 9)

= 2 * sqrt(16)

= 2 * 4

= 8 units

Note that this formula only works for chords that are not diameters. If the chord is a diameter, then its length is simply twice the radius of the circle.

Formulas for Calculating Chord Length

There are several formulas that you can use to calculate the length of a chord in a circle. These formulas depend on the information that you have available. Here are a few examples:

1. If you know the radius of the circle and the length of the chord, you can use the following formula to find the distance from the center of the circle to the chord:

d = sqrt(r^2 - $(\text{length}/2)^2$)

2. If you know the radius of the circle and the distance from the center of the circle to the chord, you can use the following formula to find the length of the chord:

length = 2 * sqrt(r^2 - d^2)

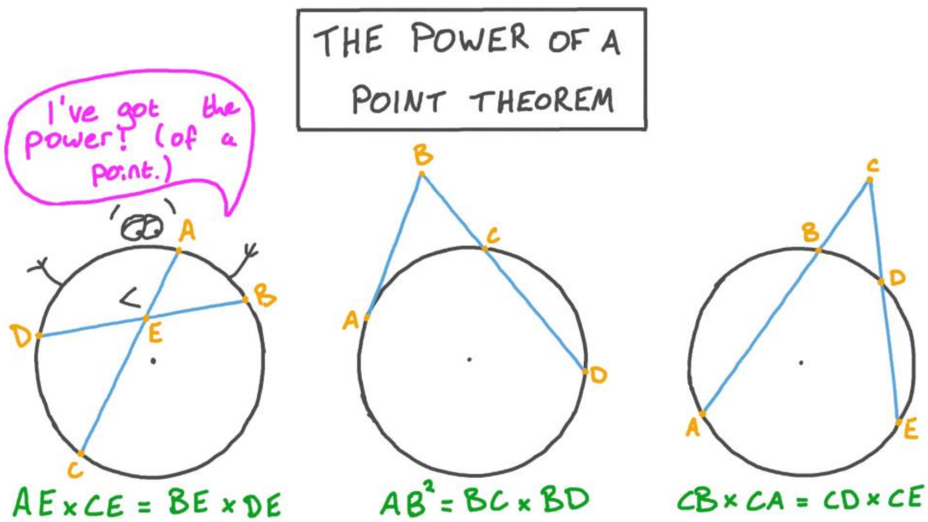
3. If you know the length of the chord and the distance from the center of the circle to the chord, you can use the following formula to find the radius of the circle:

r = sqrt($(\text{length}/2)^2$ + d^2)

Theorems Involving Chords in a Circle

There are several theorems involving chords in a circle that you may find useful. Here are a few examples:

1. The Power of a Point Theorem: If a chord of a circle is extended to intersect the another chord at a second point, then the product of the lengths of the two line segments of the first chord is equal to the product of the lengths of the second chords.



2. The Converse of the Power of a Point Theorem: If the product of the lengths of two chords of a circle is equal to the product of the lengths of the two line segments formed by extending the chords to intersect the circle at a second point, then the two chords are congruent (that is, they have the same length).
3. The Chord-Chord Theorem: If two chords of a circle intersect, then the product of the lengths of the two chords is equal to the product of the lengths of the line segments formed by the intersection.
4. The Chord-Secant Theorem: If a chord intersects a secant of a circle at a point that is not the center of the circle, then the product of the lengths of the two line segments formed by the intersection is equal to the product of the lengths of the chord and the secant.

a. Theorems on Chord Length

Several theorems involve the lengths of chords in a circle. Here are a few examples:

1. The Length of the Median of a Triangle
2. The Length of the Inradius of a Triangle
3. The Length of the Median of an Isosceles Triangle
4. The Length of the Perpendicular Bisector of a Chord

b. Theorems on Chord Placement

Several theorems involve the placement of chords in a circle. Here are a few examples:

1. The Chord-Chord Theorem
2. The Chord-Secant Theorem
3. The Perpendicular Bisector Theorem
4. The Inscribed Angle Theorem

c. Theorems on Chord Relationships

Several theorems involve the relationships between chords in a circle.

1. The Power of a Point Theorem
2. The Converse of the Power of a Point Theorem
3. The Chord-Chord Theorem
4. The Chord-Secant Theorem

FAQs

Here are a few frequently asked questions about chords in a circle:

- **What is the definition of the chord in a circle?**

  A chord in a circle is a straight line segment whose endpoints both lie on the circle.

- **What are some theorems involving chords in a circle?**

  There are several theorems involving chords in a circle, including the Power of a Point Theorem, the Chord-Chord Theorem, the Chord-Secant Theorem, and the Perpendicular Bisector Theorem.

- **What is the midpoint of a chord in a circle?**

  The midpoint of a chord in a circle is the point that divides the chord into two equal segments.

- **What is the perpendicular bisector of a chord in a circle?**

  The perpendicular bisector of a chord in a circle is a line that is perpendicular to the chord and passes through its midpoint.