

Geometry - Points, Lines, Segments and Angles - Lesson

Common Core G-CO.A.1 · maths-pdf.fr/en/

A segment is the part of a line between two endpoints, and a ray starts at one point and goes on forever. A midpoint splits a segment into two equal parts, and an angle bisector splits an angle into two equal angles. Segment and angle addition give equations such as $AB + BC = AC$ for unknown lengths and angles.

Geometry · Common Core State Standards: **G-CO.A.1**

Key facts

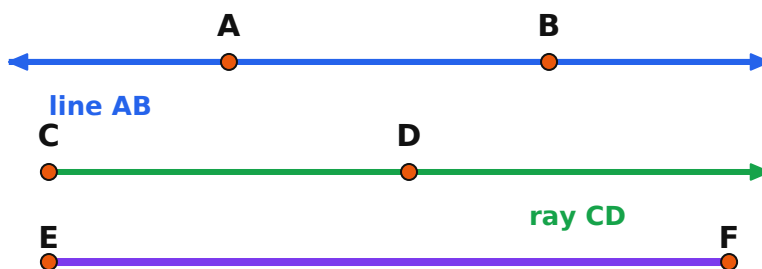
- Point, line and plane are undefined terms; segments, rays and angles are defined from them.
- Segment addition: if B is between A and C, then $AB + BC = AC$.
- A midpoint at coordinate $(a + b)/2$ splits a segment into two congruent segments.
- Angle addition: $m\angle ABD + m\angle DBC = m\angle ABC$ when ray BD is inside the angle.
- A circle is all points in a plane at one fixed distance (the radius) from the center.

What are points, lines and planes?

Geometry starts from a few ideas that are described but not defined with other words. A **point** names a location and has no size. A **line** is a straight path that goes on forever in both directions. A **plane** is a flat surface that goes on forever. Every other definition in the course is built from these three.

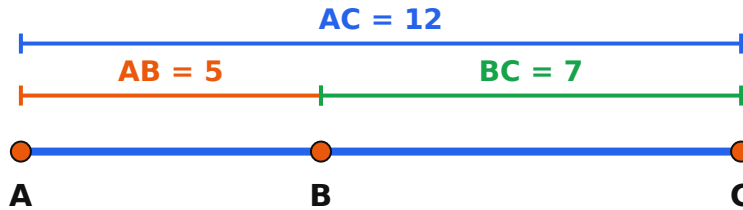
Segment and ray

A **line segment** is the part of a line between two endpoints and has a length. A **ray** starts at one endpoint and goes on forever in one direction.



How do you find the length and midpoint of a segment?

On a number line, the length of the segment from a to b is $|b-a|$. The **midpoint** is the point that splits a segment into two congruent parts, and its coordinate is the average $\frac{a+b}{2}$.

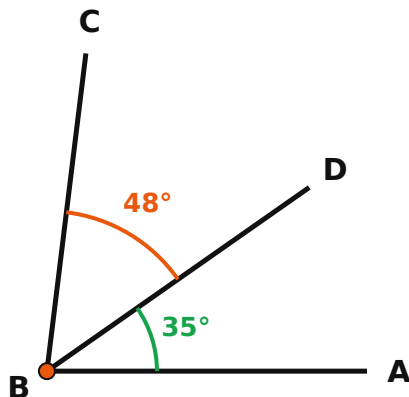


If B is between A and C, then $AB + BC = AC$.

The **Segment Addition Postulate** says that when B is between A and C, $AB + BC = AC$. Use it to write an equation when a length has a variable.

What is an angle and how do angles add?

An **angle** is formed by two rays with the same endpoint, called the vertex. Its measure is written $m\angle ABC$ and is given in degrees. An **angle bisector** is a ray inside the angle that splits it into two angles with equal measures.



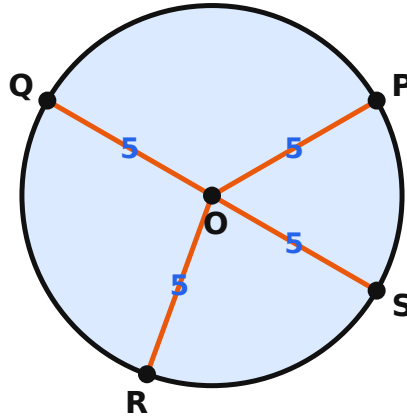
Angle addition: $m\angle ABD + m\angle DBC = m\angle ABC$, so $35^\circ + 48^\circ = 83^\circ$.

Angle relationships

Two angles are **complementary** when their measures add to 90° and **supplementary** when they add to 180° . Two lines are **perpendicular** when they meet at a 90° angle. Two lines in the same plane are **parallel** when they never meet.

How is a circle defined?

A **circle** is the set of all points in a plane that are the same distance from a fixed point called the center. That distance is the radius.



Every point of the circle is 5 units from the center O.

How do you solve a segment or angle problem with a variable?

1. Draw the figure and label every known length or angle measure.
2. Choose the postulate that fits: segment addition, angle addition, midpoint or bisector.
3. Write an equation and solve for the variable.
4. Substitute back to find each part, then check that the parts add to the whole.

Example: Point B is between A and C, $AB = 3x + 1$, $BC = 2x + 4$ and $AC = 30$. Then $5x + 5 = 30$, so $x = 5$, $AB = 16$ and $BC = 14$. Check: $16 + 14 = 30$.

Questions about points, lines, segments and angles

What is the difference between a line, a ray and a segment?

A line goes on forever in both directions, a ray has one endpoint and goes on forever in one direction, and a segment has two endpoints and a measurable length.

How do you find the midpoint of a segment?

Average the coordinates of the endpoints. On a number line from 4 to 18 the midpoint is $(4 + 18)/2 = 11$. In the plane, average the x-values and the y-values separately.

What does an angle bisector do?

It splits an angle into two angles with equal measures. If a 76 degree angle is bisected, each

new angle measures 38 degrees.

What is the difference between complementary and supplementary angles?

Complementary angles add to 90 degrees and supplementary angles add to 180 degrees. A 37 degree angle has a 53 degree complement and a 143 degree supplement.

Why are point, line and plane called undefined terms?

Any definition would need other geometric words, which would need definitions in turn. So geometry describes these three ideas and uses them to define everything else precisely.