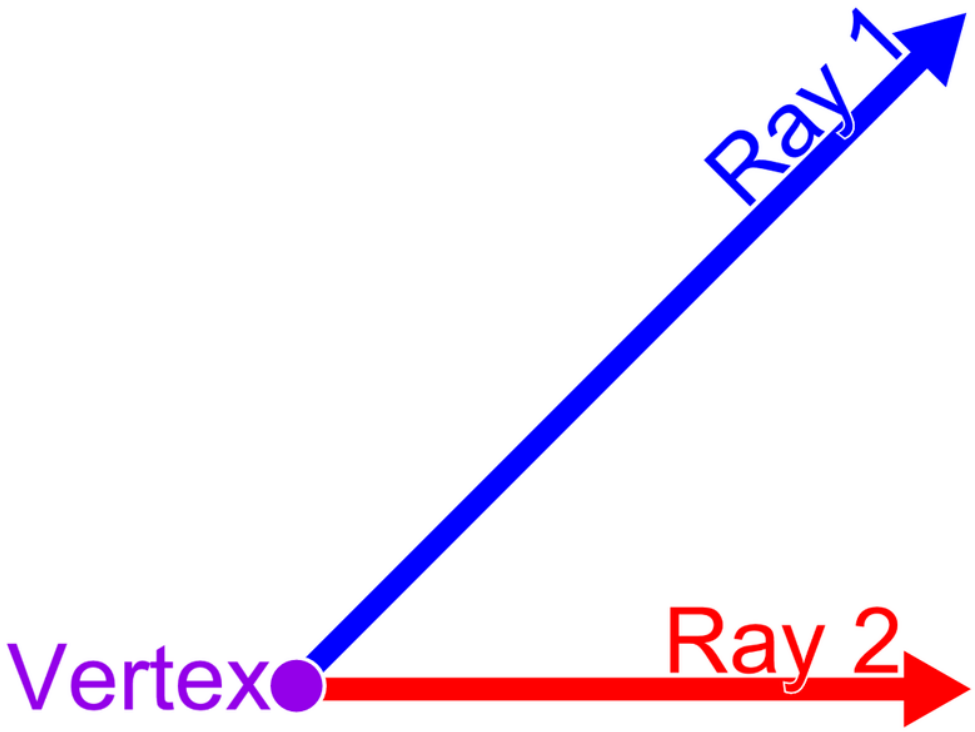
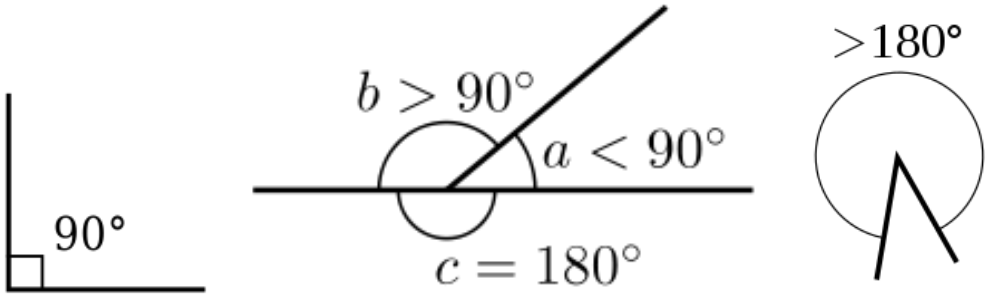
Angles

1 Definition

In Euclidean geometry, an angle is the figure formed by **two rays**, called the sides of the angle, sharing a common endpoint, called the **vertex** of the angle.



2 Types

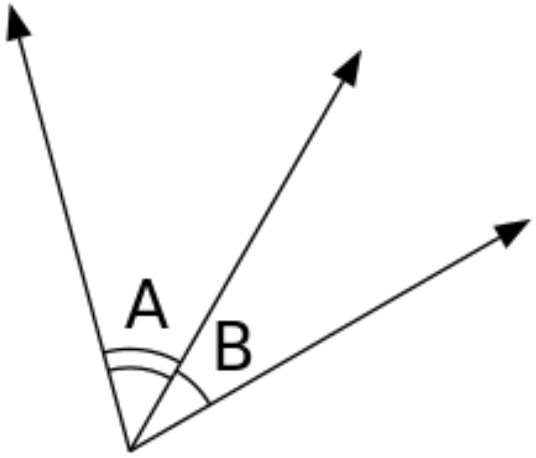


- an angle of $0° < a < 90°$ is called an **acute angle**
- an angle of $90°$ is called a **right angle**
- an angle of $90° < b < 180°$ is called an **obtuse angle**
- an angle of $c = 180°$ is called a **straight angle**
- an angle of $> 180°$ is called a **reflex angle**
- an angle of $360°$ is called a **complete turn**

3 Adjacent Angle Pairs

Two angles are **adjacent angles** if and only if:

- they share a common vertex and a common ray, AND
- they lie on the opposite sides of the common ray

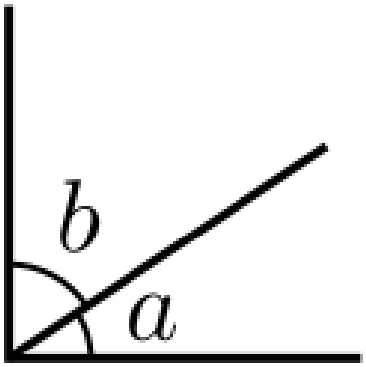


Angles A and B are adjacent angles.

4 Combining Angle Pairs

4.1 Complementary Angles

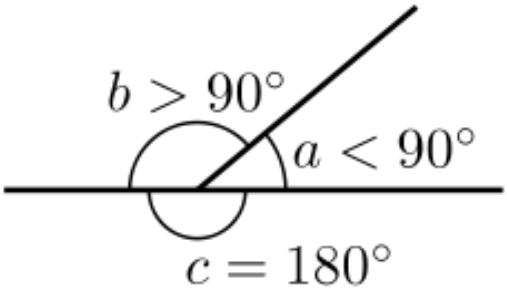
Two angles are said to be **complementary angles** if their sum is 90°.



Since $a + b = 90°$, a and b are complementary.

4.2 Supplementary Angles

Two angles are said to be **supplementary angles** if their sum is 180°.

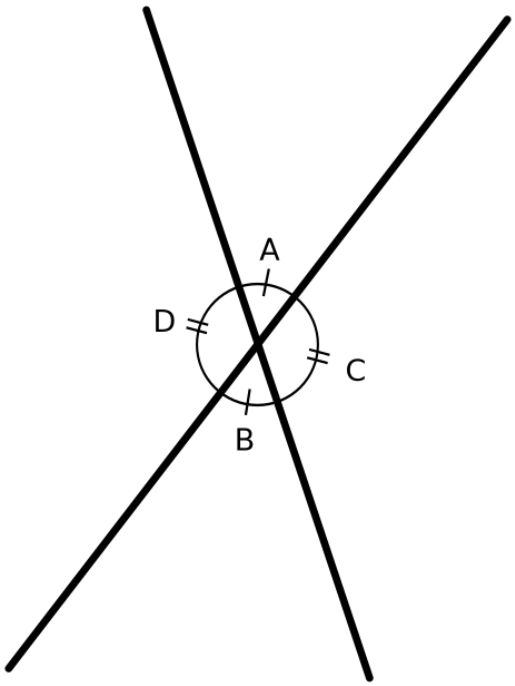


Since $a + b = 180°$, a and b are supplementary.

5 Equivalence Angle Pairs

5.1 Vertically Opposite Angles

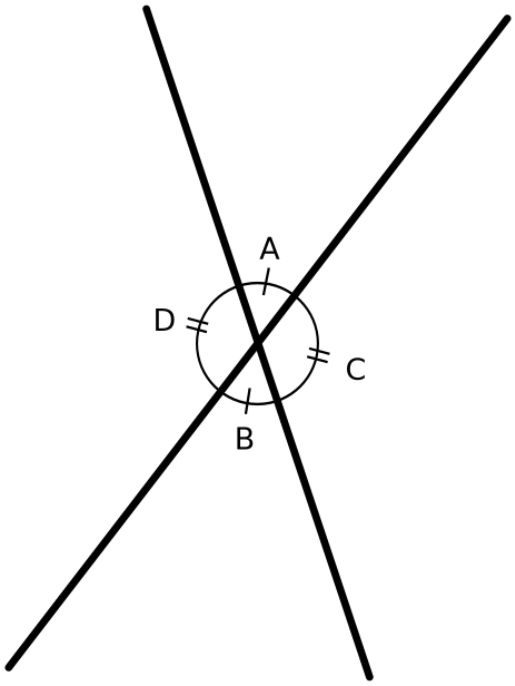
When two straight lines intersect at a point, four angles are formed. Pairwise these angles are named according to their location relative to each other. Vertically opposite angles are **equal in size**.



There are 2 pairs of vertically opposite angles. One pair is A and B. The other pair is C and D.

5.2 Angles at a Point

A, B, C and D are also called angles at a point. Angles at a point add up to one turn.

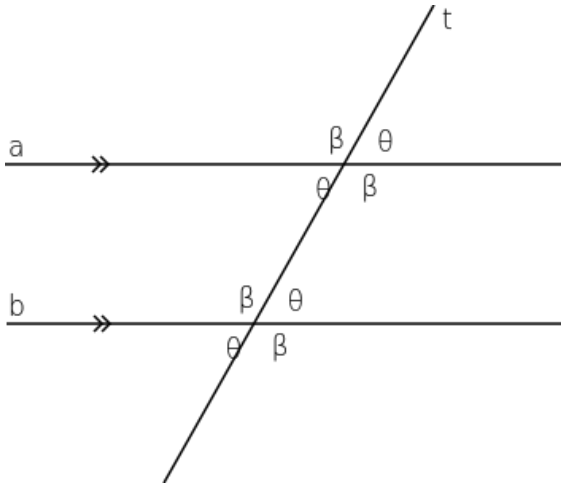


In this case, $A + B + C + D = 360°$.

6 Parallel Lines and Angles of a Transversal

6.1 Parallel Lines

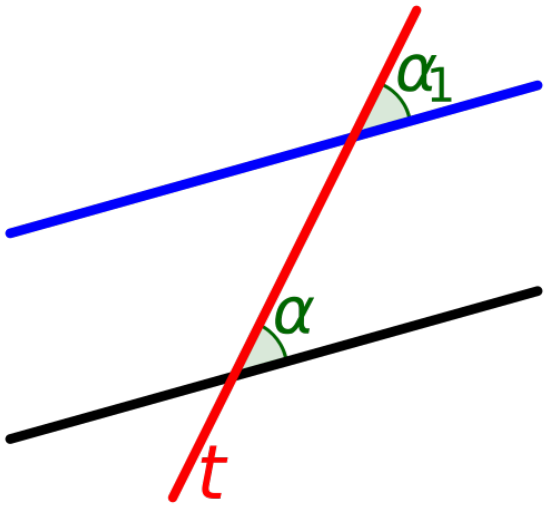
Parallel lines are the straight lines that never intersect. In geometry, we use a pair of arrows to indicate parallel lines.



Lines a and b are parallel. This relationship can be expressed as $a \parallel b$.

6.2 Corresponding Angles

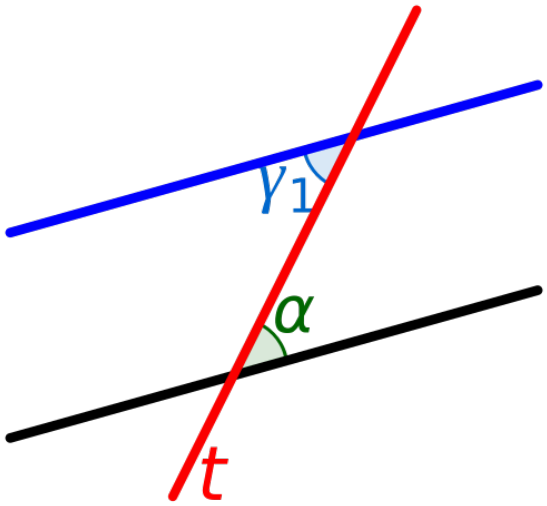
Two angles are said to be **corresponding angles** if they have the same relative positive at the each intersection where a line, called a transversal, cuts across a pair of parallel lines. The corresponding angles are equal to each other.



In this case, line t is the transversal with α and α_1 begin a pair of corresponding angles. This means $\alpha_1 = \alpha$.

6.3 Alternate Angles

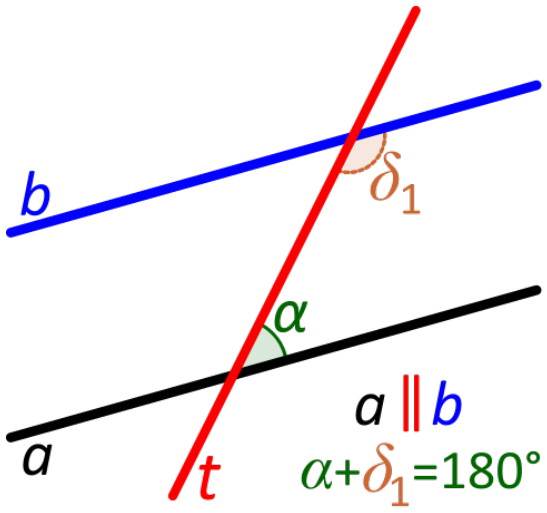
Two angles are called **alternate angles** if they lie on the different side of the transversal. The alternate angles are equal to each other.



In this case, line t is the transversal with α and γ_1 begin a pair of alternate angles. This means $\gamma_1 = \alpha$.

6.4 Consecutive Interior Angles

Two angles are known as **interior angles** if they lie on the same side of the transversal. The interior angles are **supplementary**.



In this case, line t is the transversal with α and δ_1 begin a pair of interior angles. This means $\alpha + \delta_1 = 180°$.