# Angles and Intersecting Lines


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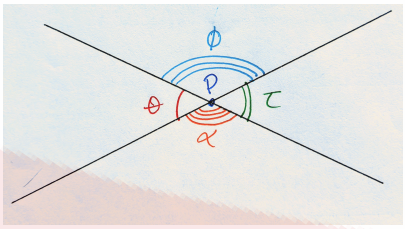
# Angles and intersecting lines

## How are the angles about the point of interseciton of two lines related?

Let's consider two intersecting lines at the point $P$.




There are 4 angles $\theta,\ \phi,\ \tau,\ \alpha$. How are these four angles related? $\theta = \tau,\ \phi = \alpha$

### Opposite angles

Angles $\phi$ and $\alpha$ are called *opposite angles* because they are opposite the point of intersection of the two lines. Opposite angles are equal. So we have,

$$\begin{aligned} \phi &= \alpha \text{ and} \\ \theta &= \tau \end{aligned}$$

### Adjacent angles

Angles $\phi$ and $\theta$ are called *adjacent angles* because they are on the same side of the two lines. Adjacent angles sum to 180°. So we have,

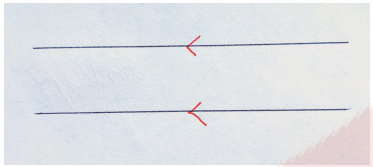
$$\begin{aligned} \theta + \alpha &= 180^\circ \text{ and} \\ \phi + \phi &= 180^\circ \end{aligned}$$

All the angles around the point of intersection sum to 360°. So from our diagram above we have,

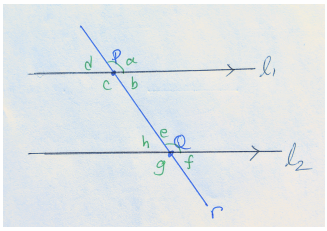
$$\theta + \phi + \tau + \alpha = 360^\circ$$

### Parallel lines

What are parallel lines? Two lines are said to be *parallel* if they are the same distance or equidistant, for every point on each line in both directions for even.

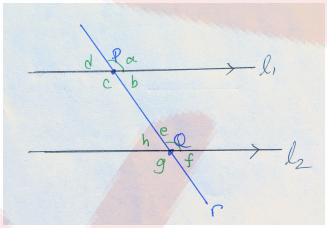


Let's consider a line intersecting two parallel lines and the angles created.

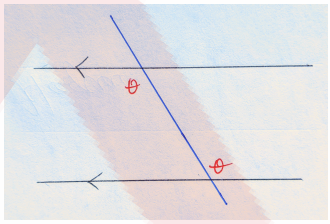



There are four angles aroud each point of intersections $P$ and $Q$ above. Let's define a few terms and properties of the lines of the diagram above.

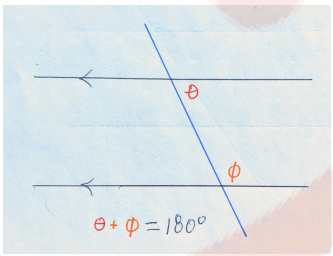
1. **Transversal**: This line $r$ intersecting the two parallel lines is called the *transversal*.




2. **Corresponding angles**: Angles $a$ and $e$, for example, are called *corresponding angles* and are equal.
3. **Alternate angles**: Angles $c$ and $e$, say, are called *alternate angles* and are equal.




4. **Interior angles**: Angles $b$ and $e$ are called *interior angles* and sum to 180°.



## Exercises

From the figure below, identify the following:

a) which lines are parallel, if any?

b) which line(s) are transversals, if any.

c) what are the values of the unknown angles $s, t, u, v, x, yz$?

d) What is the corresponding angle to $u$? What is it's value?

e) What anlge is alternate to $x$? And what is its value?