

Angles



Labelling line segments

When a line has end points we say that it has **finite length**.
It is called a **line segment**.

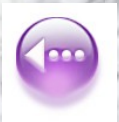
We usually label the end points with capital letters.

For example, this line segment



has end points A and B.

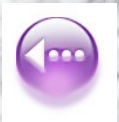
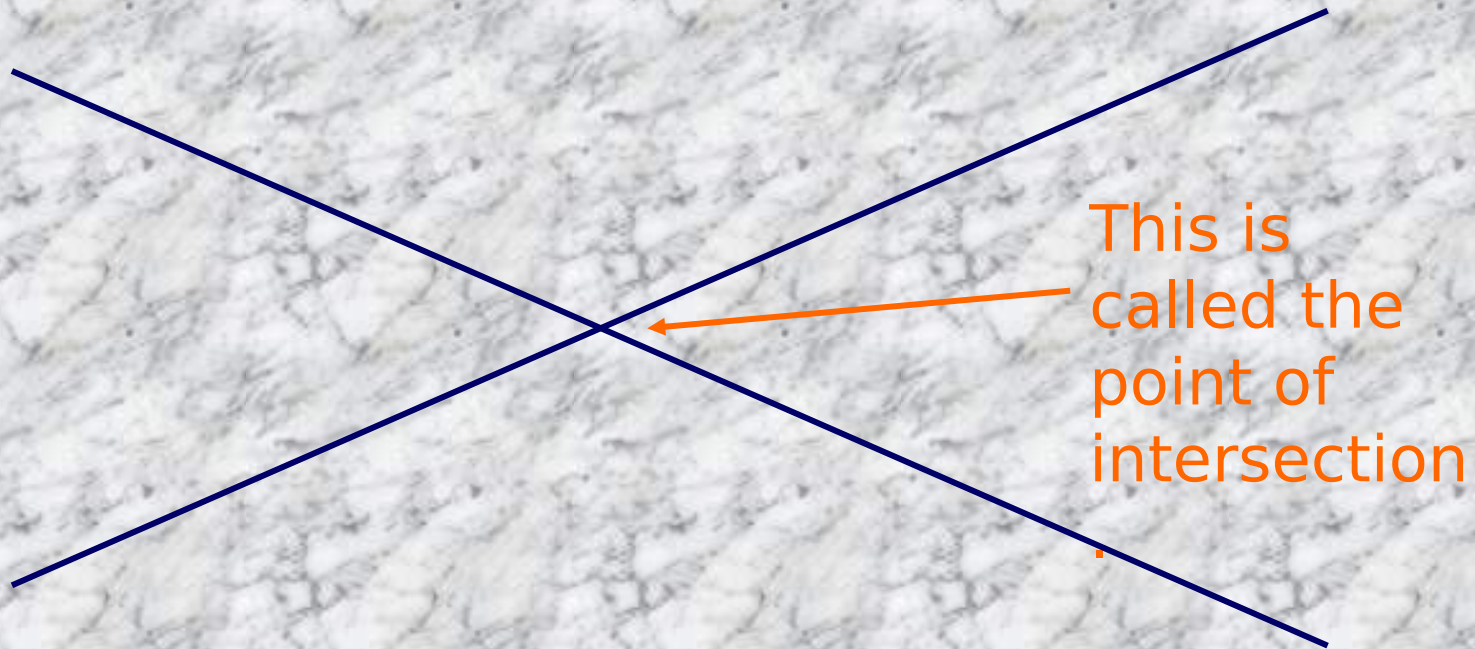
We can call this line, line segment AB.



Lines in a plane

A flat two-dimensional surface is called a **plane**.

Any two straight lines in a plane either **intersect** once ...



Lines in a plane

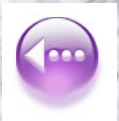
... or they are **parallel**.



We use arrow heads to show that lines are parallel.

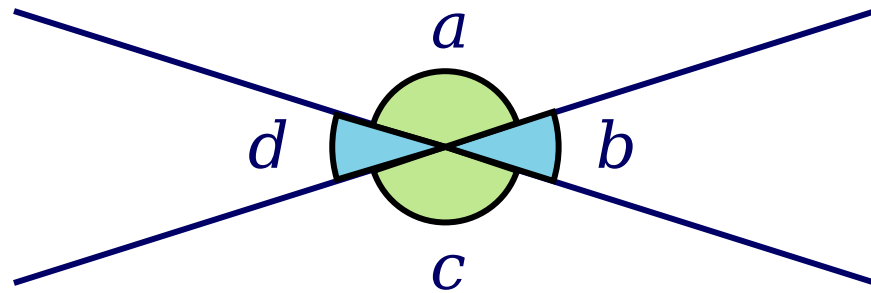
Parallel lines will never meet. They stay an equal distance apart.

This means that they are always **equidistant**.



Vertically opposite angles

When two lines intersect, two pairs of **vertically opposite angles** are formed.



$$a = c$$

and

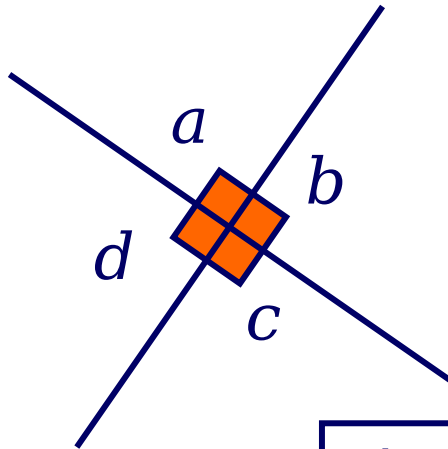
$$b = d$$

Vertically opposite angles are equal.



Perpendicular lines

What is special about the angles at the point of intersection here?



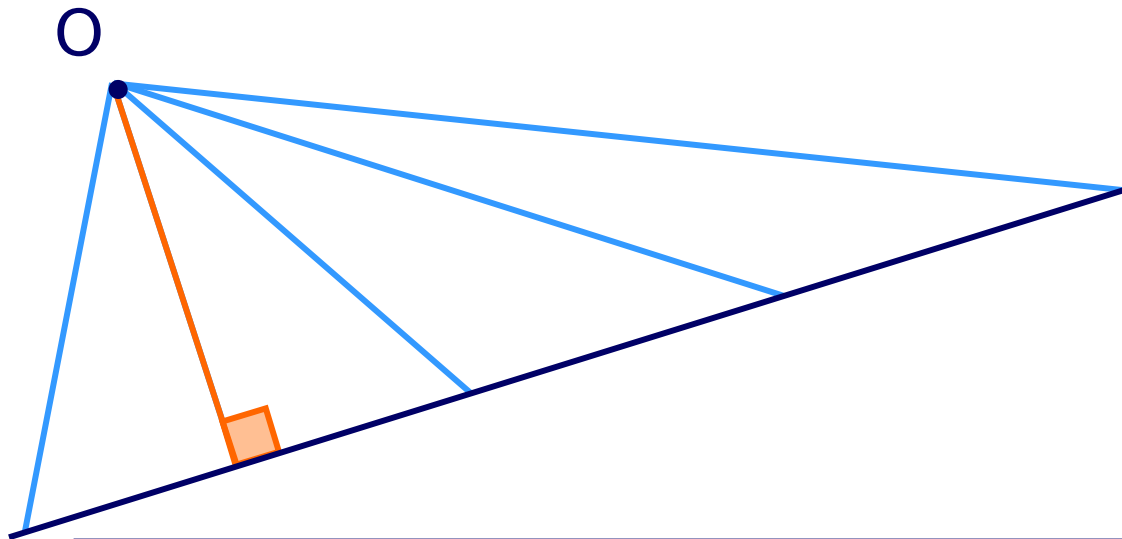
$$a = b = c = d = 90^\circ$$

Lines that intersect at right angles are called **perpendicular lines**.



The distance from a point to a line

What is the shortest distance from a point to a line?

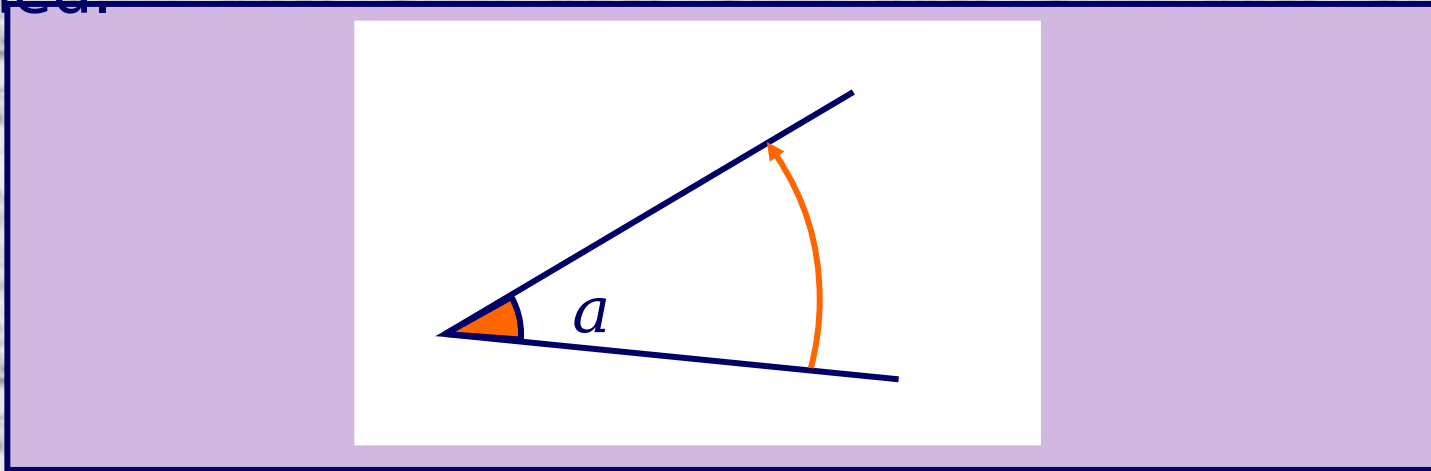


The shortest distance from a point to a line is always the **perpendicular distance**.



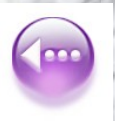
Angles

When two lines meet at a point an **angle** is formed.



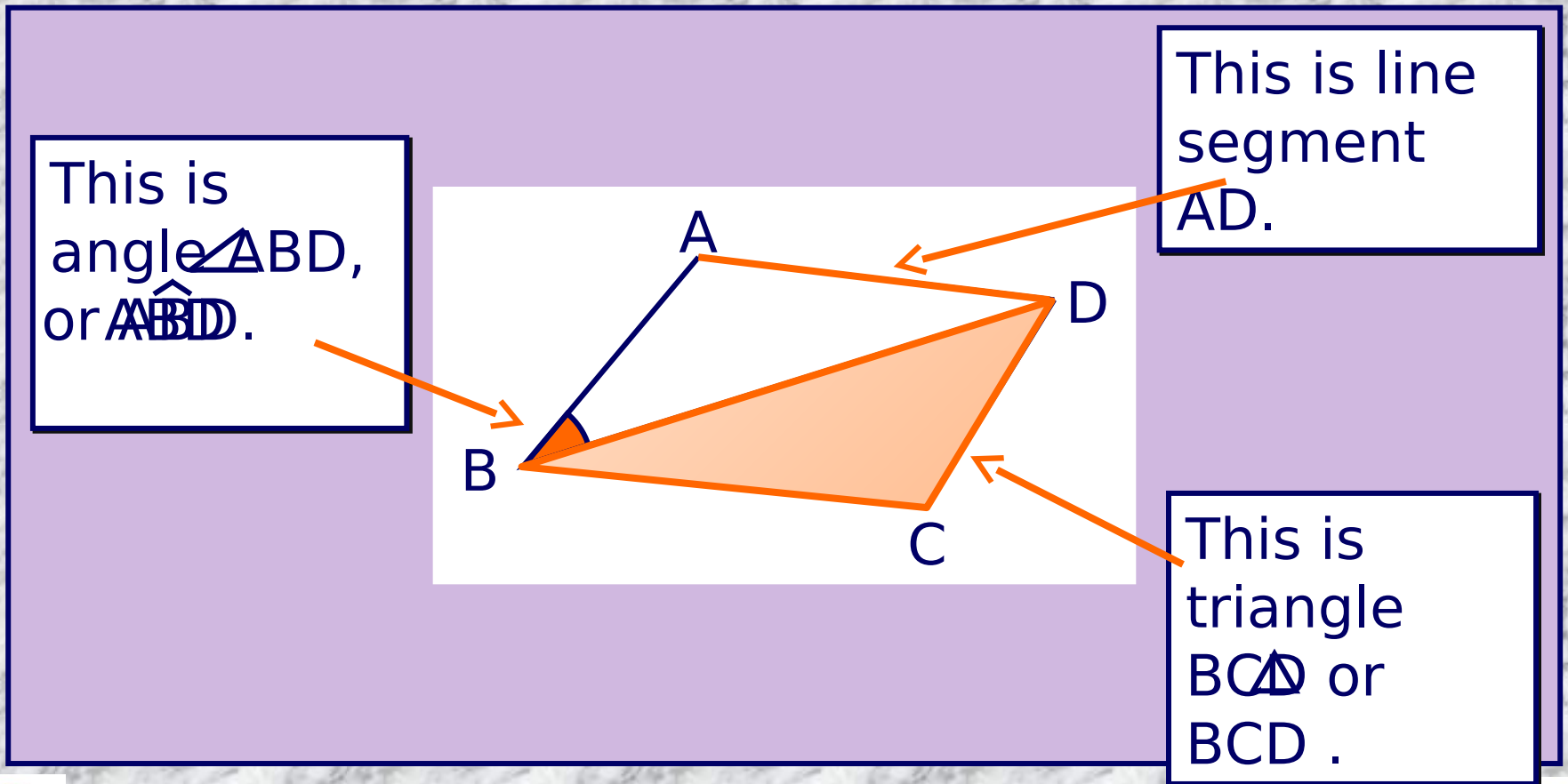
An angle is a measure of rotation from one of the line segments to the other.

We often label angles using lower-case letters or Greek letters such as θ , theta.



Labelling lines, angles and shapes

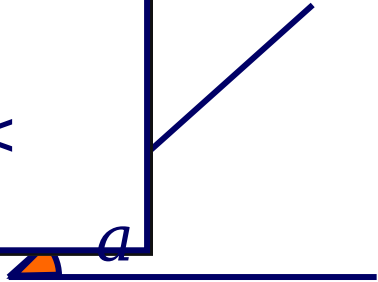
Sometimes, the vertices in a diagram are labelled with capital letters. For example,



Types of angle

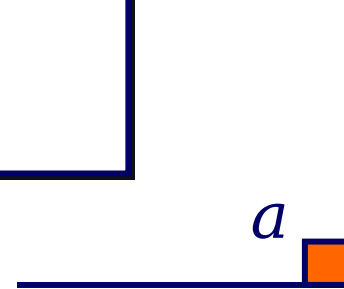
Acute angle

$$0^{\circ} < a < 90^{\circ}$$



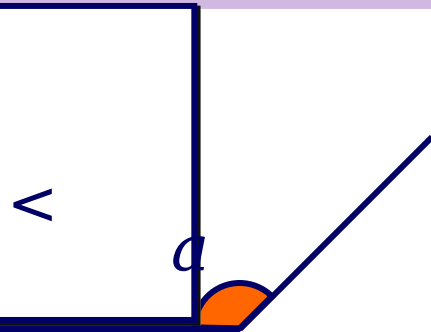
Right angle

$$a = 90^{\circ}$$



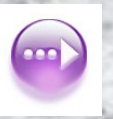
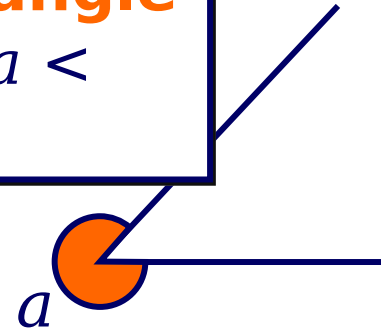
Obtuse angle

$$90^{\circ} < a < 180^{\circ}$$



Reflex angle

$$180^{\circ} < a < 360^{\circ}$$



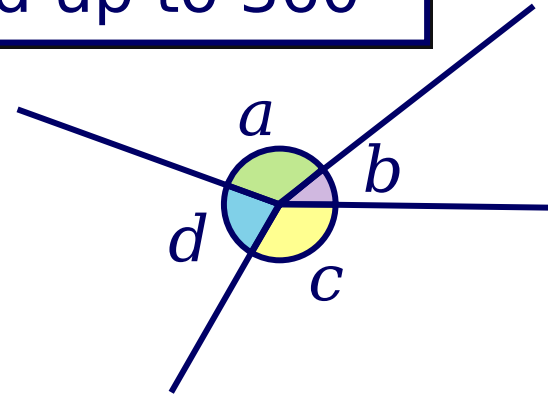
Angles on a straight line and at a point

Angles on a line
add up to 180°



$a + b + c = 180^\circ$
because there are
 180° in a half turn.

Angles at a point
add up to 360°

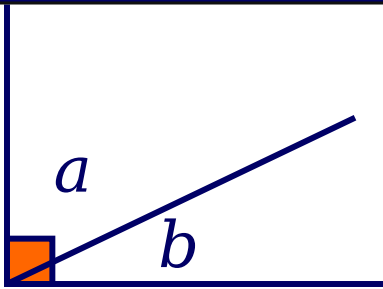


$a + b + c + d = 360^\circ$
because there
are 360° in a full
turn.



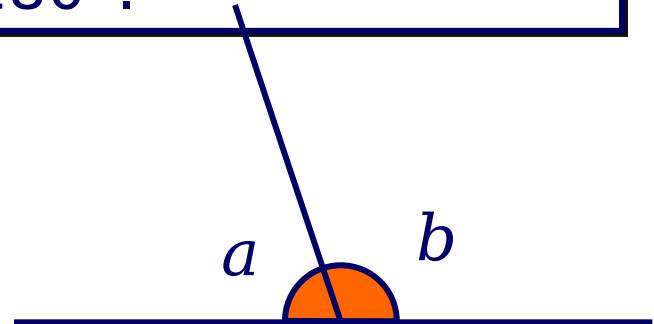
Complementary and supplementary angles

Two
**complementary
angles** add up to
 90° .

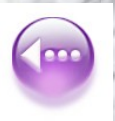


$$a + b = 90^\circ$$

Two
**supplementary
angles** add up to
 180° .

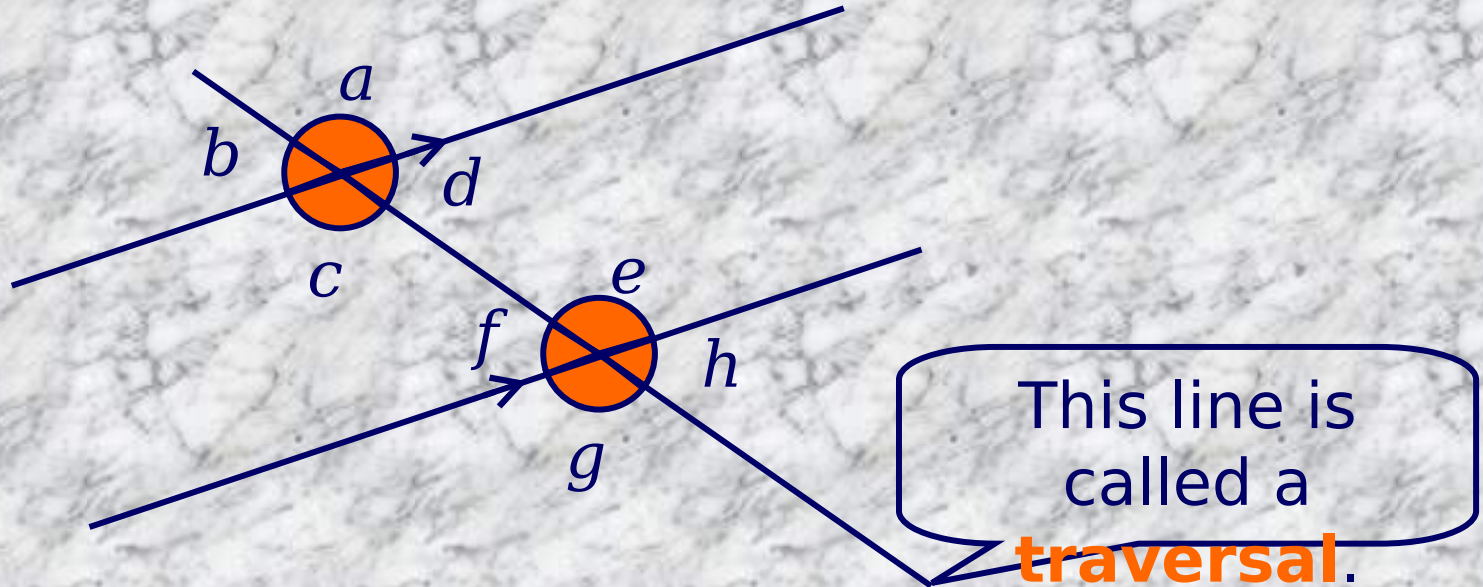


$$a + b = 180^\circ$$



Angles made with parallel lines

When a straight line crosses two parallel lines eight angles are formed.

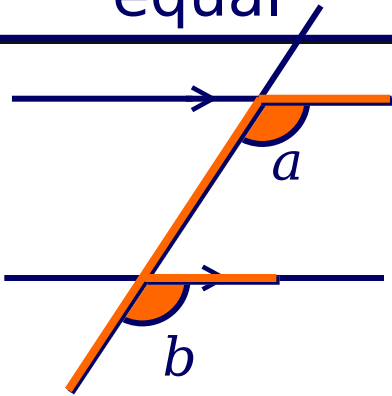


Which angles are equal to each other?



Corresponding, alternate and interior angles

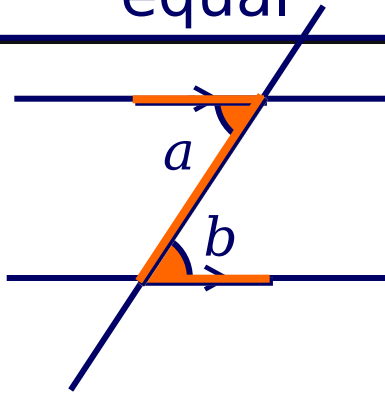
Corresponding angles are equal



$$a = b$$

Look for
an F-
shape

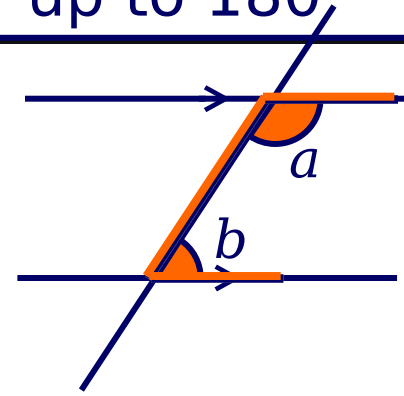
Alternate angles are equal



$$a = b$$

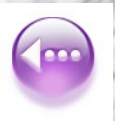
Look for a
Z-shape

Interior angles add up to 180°

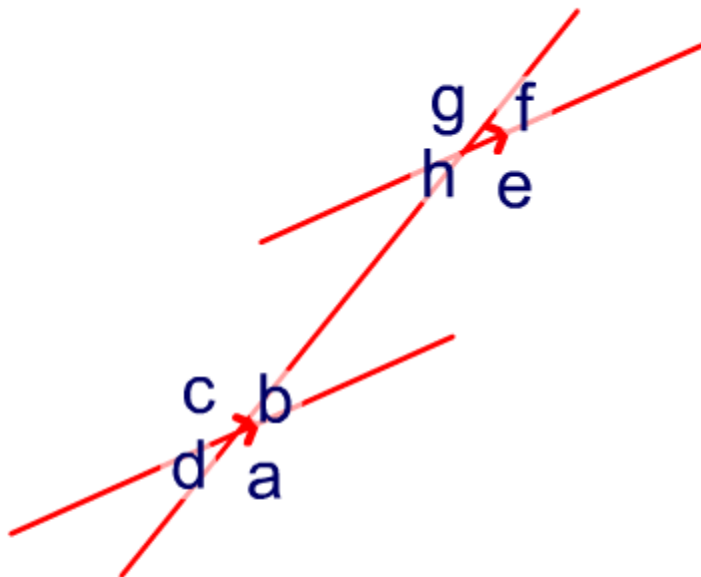


$$a + b = 180^\circ$$

Look for a
C- or U-
shape



Angles and parallel lines



e and g

Alternate

Corresponding

Interior

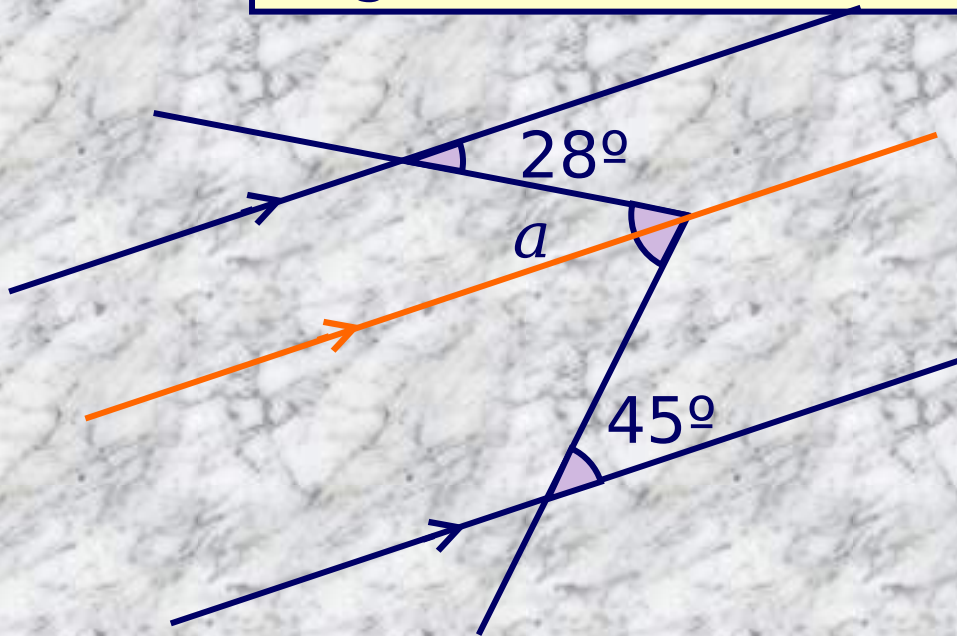
Vertically opposite

?



Calculating angles

Calculate the size of angle a .



Hint: Add another parallel line.

$$a = 28^\circ + 45^\circ = 73^\circ$$

