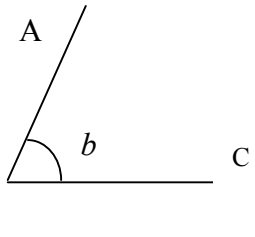
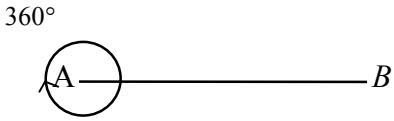
Properties of Angles

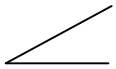
When two lines meet an angle is formed.
Angles are measured in degrees using a protractor.
65 degrees is written 65°.
The angle of b° shown below is called the angle ABC because we can draw the angle by starting at A, moving to B and then to C.



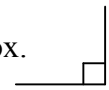
The total angle swept out by the line AB when it is rotated until it comes back to its original position is 360°.



An angle that is less than 90° is called acute.

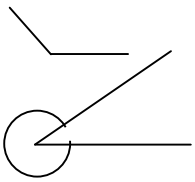


An angle which is exactly 90° is called a **right angle** and often denoted by a box.
The lines are at right angles or perpendicular.



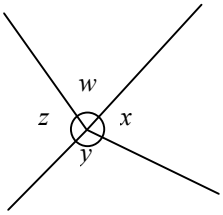
An angle of more than 90° but less than 180° is called **obtuse**.

An angle of more than 180° but less than 360° is called **reflex**.

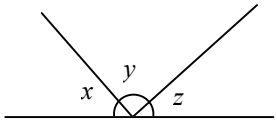


Properties of Angles and Straight Lines

1. *The total angle at a point is 360°*
$w + x + y + z = 360^0$

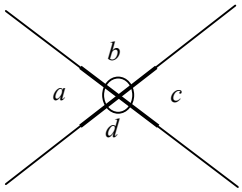


2. *The total angle on a straight line is 180°*
In the diagram, $x + y + z = 180^0$



3. *When two straight lines cross, vertically opposite angles are equal.*

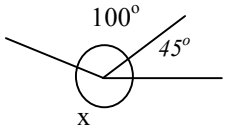
In the diagram,
- angles a and c are equal,
- angles b and d are equal.



O is called a **vertex**, so these pairs of equal angles are called **vertically opposite.** Look for angles in an 'X' shape.

Examples

1. Angles that fit round a point add up to 360°



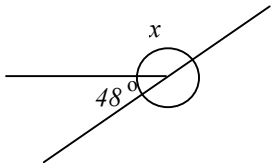
Angle x must be 215° because
100 + 45 +215 = 360

Work this out as: 100 + 45 = 145 360 – 145 = 215

2. Angles that fit on a straight line add up to 180 °

Angle x must be 132° because
48 + 132 = 180

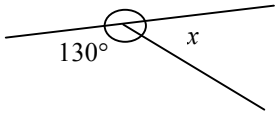
Work this out as: 180 – 48 = 132



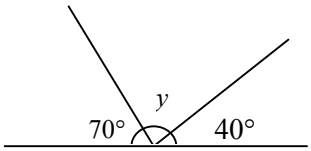
Exercise 1

In the diagrams below, find the size of each lettered angle.

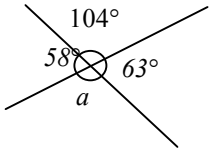
1.



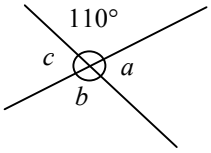
2.



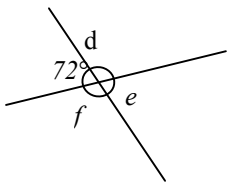
3.



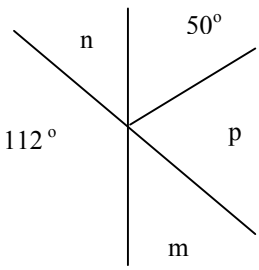
4.



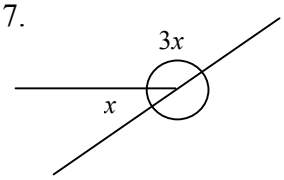
5.



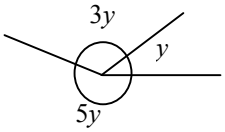
6.



7.

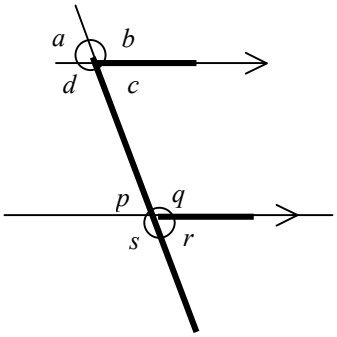


8.



Angles between parallel lines

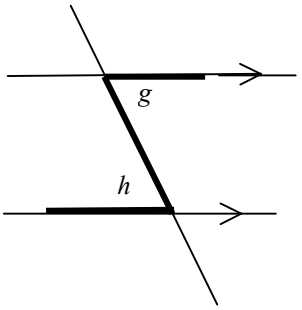
1. *If parallel lines are cut by another line, corresponding angles are equal.*
In the diagram, the parallel lines are arrowed.



- angles *a* and *p* are equal,
- angles *b* and *q* are equal,
- angles *c* and *r* are equal,
- angles *d* and *s* are equal.

These pairs of angles are called **corresponding angles**.
Look for an 'F' shape.

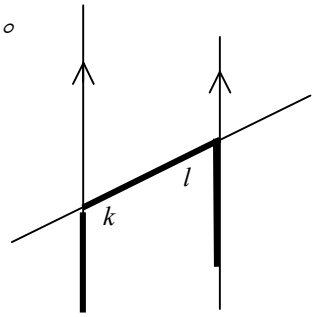
2. *Alternate angles between parallel lines are equal*



In the diagram, $g = h$.

They are on different sides of the line crossing the parallels. This is why they are called **alternate angles.**
Look for a 'Z' shape.

3. *Interior angles between parallel lines add up to 180°*

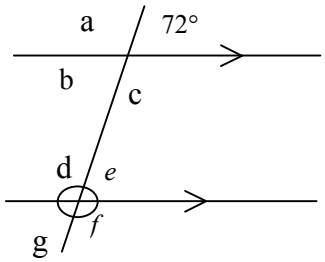


In the diagram, $k + l = 180°$.

They are called **interior angles**.

Worked Example 1.

Find the angles marked with letters in this diagram:

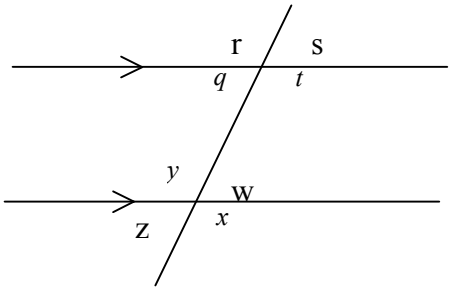


a = **b =**
c =

d = **e =**
f = **g =**

Worked Example 2.
Look at this diagram, write as many pairs as you can of
(a) vertically opposite

(b) corresponding

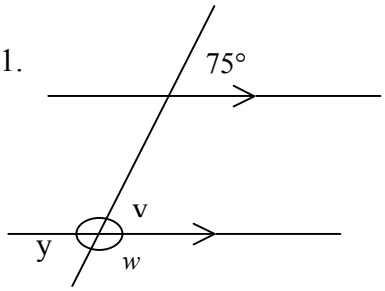


(c) alternate

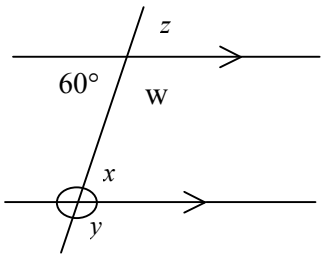
(d) interior angles

Exercise 2
In the diagrams below, find the size of each lettered angle.

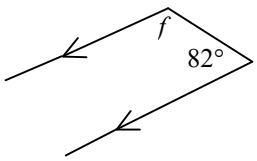
1.



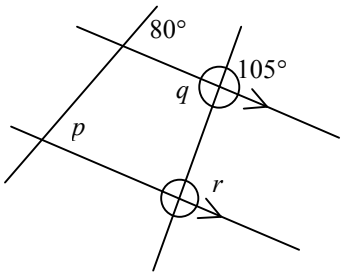
2.



3.



4.



5.