Geometry

Facts

Contents

Identifying Lines

A line can be identified
by a letter. . .

a

This is line **a**.

or by two letters.

A —————— B

This is line **AB**.
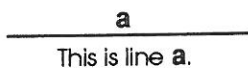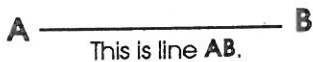
Lines of equal length can be identified by marking them with the same symbol.
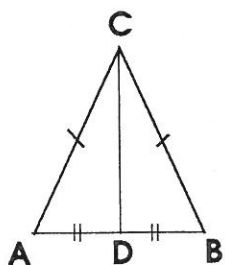
AC is of equal length to **CB**.

AC = CB

AD is of equal length to **DB**.
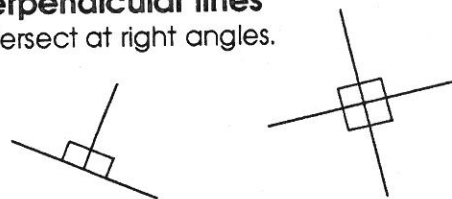
AD = DB

Types of Lines

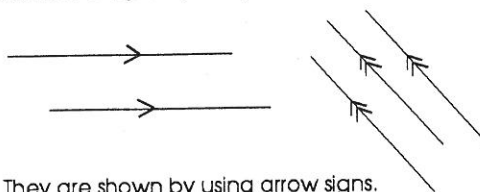### Horizontal and vertical lines

Vertical line

Horizontal line

Perpendicular lines
intersect at right angles.

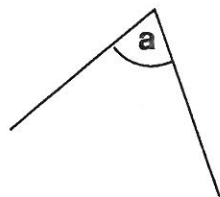### Parallel lines are always the same distance apart, they never meet.
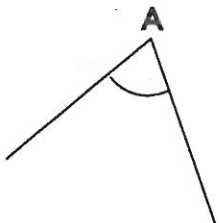
They are shown by using arrow signs.

Identifying Angles
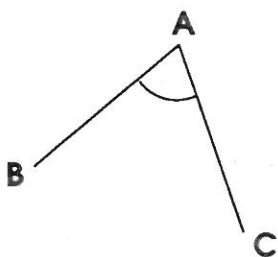
Angles can be identified
in different ways. . .
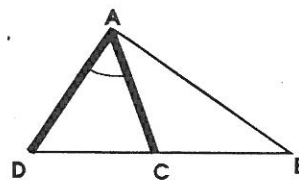
this is angle **a**

∠ **a**

this is angle **A**

∠ **A**

this is angle **BAC**

∠ **BAC**

or angle **CAB**

∠ **CAB**

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In this diagram . . .

this is ∠ **DAC**

or ∠ **CAD**.

this is ∠ **CAB**

or ∠ **BAC**.
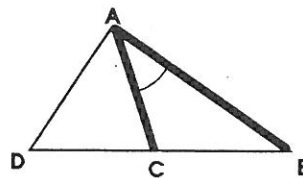
this is ∠ **DAB**

or ∠ **BAD**.
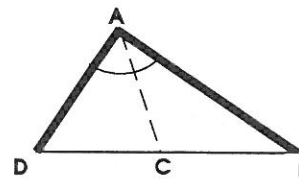
Angles of equal size can be identified by marking them with the same symbol.

∠ **DAC** = ∠ **DBC**

∠ **ACD** = ∠ **BCD**

∠ **CDA** = ∠ **CDB**
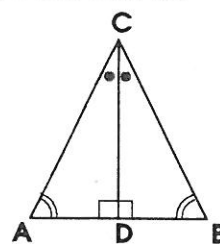
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Types of Angle

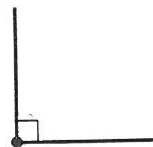## Acute angle
A turn of more than 0°
but less than 90°.

Right-angle
A turn of 90°.

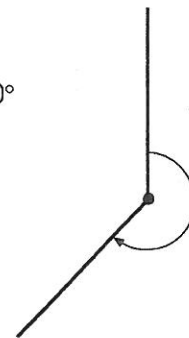## Obtuse angle
A turn of
more than 90°
but less than 180°.

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Straight line
A turn of 180°.

Reflex angle
A turn of more than 180°
but less than 360°.
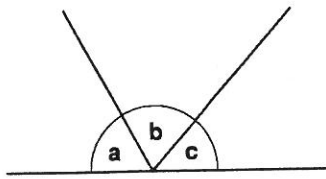
Complete turn
A turn of 360°.
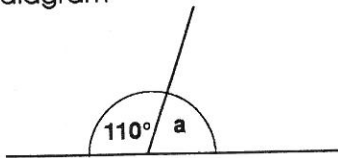
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Angles on a straight line

Angles on a straight line
add up to **180°**.

Angles **a** + **b** + **c** = 180°

In this diagram

$$110° + a = 180°$$
$$a = 70°$$

because 110° + 70° = 180°.

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Angles around a point

Angles around a point
add up to **360°**.
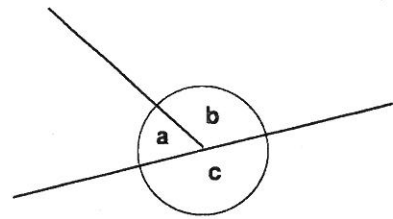
Angles **a** + **b** + **c** = 360°

In this diagram
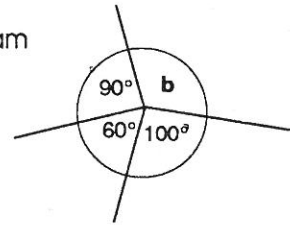
$$90° + 60° + 100° + b = 360°$$
$$b = 110°$$

because 90° + 60° + 100° + 110° = 360°.
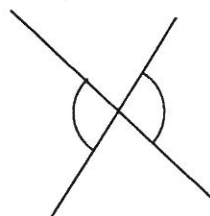
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Angles and intersecting lines

When two lines intersect **vertically opposite angles** are equal.
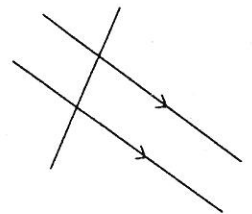
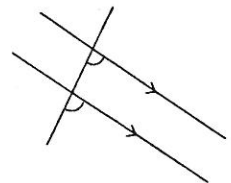These angles are equal . . .

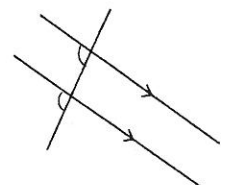and so are these.

10
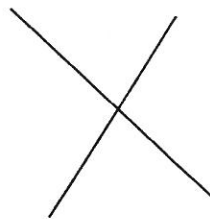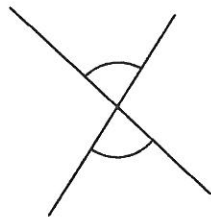
Angles and parallel lines

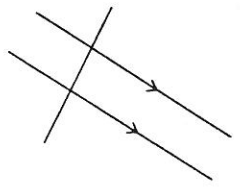When a line intersects parallel lines **corresponding angles** are equal.

These angles are equal . . .

and so are these.

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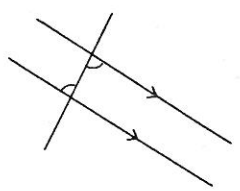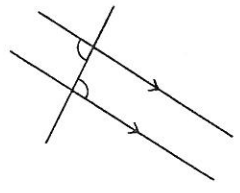**Turn over**

When a line intersects
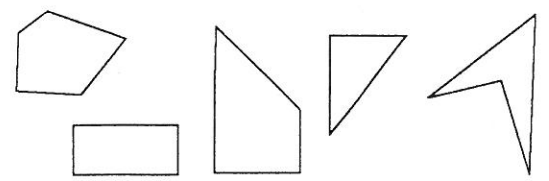parallel lines
alternate angles
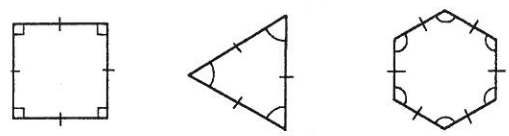are equal.

These angles
are equal . . .

and so are these.

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A **polygon** is a closed shape with
three or more straight lines.

A **regular polygon** is a polygon with
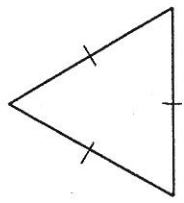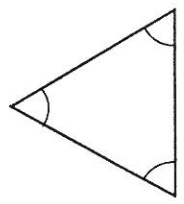equal sides and equal angles.

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Triangles

Triangles are polygons with three straight sides.

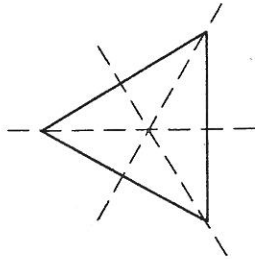An **equilateral triangle** . . .
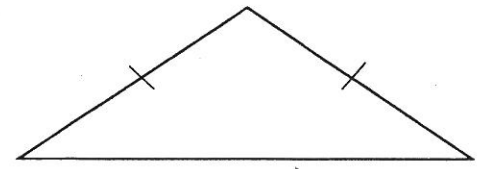
has three equal sides. . .

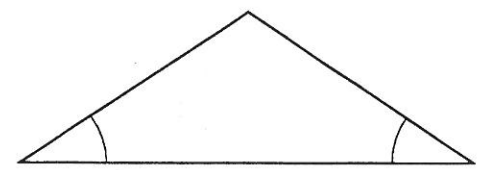three equal angles. . .

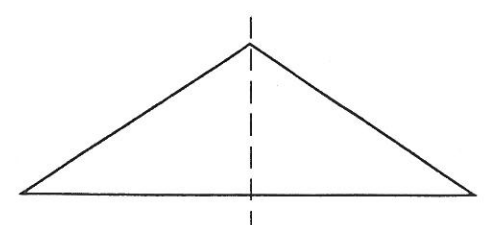three lines of symmetry.

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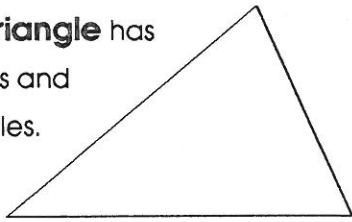An **isosceles triangle** . . .

has two equal sides. . .

two equal angles . . .
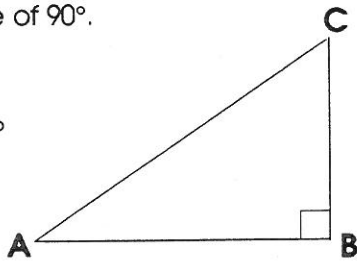
one line of symmetry.

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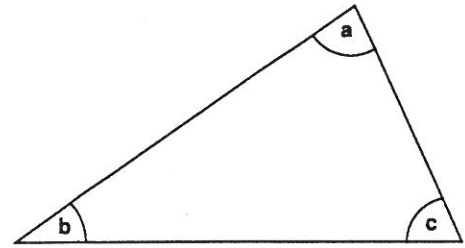A **scalene triangle** has
no equal sides and
no equal angles.

A **right-angled triangle**
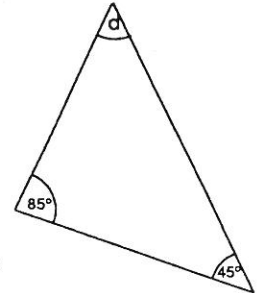has one angle of 90°.

$\angle$ **ABC** = 90°

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Interior angles of a triangle

Angles **a + b + c = 180°**

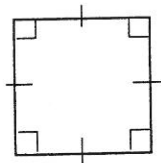In this diagram

$85° + 45° + $ **d** $ = 180°$

d $ = 50°$

because $85° + 45° + $ **50°** $ = 180°$

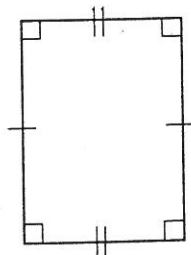For *exterior angles of a triangle* see page 22.

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Quadrilaterals

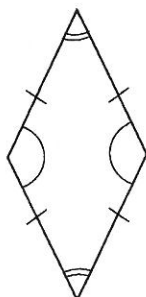Quadrilaterals are polygons with four straight sides.

A **square** has . . .
four equal sides
four equal angles
opposite sides parallel
four lines of symmetry.

A **rectangle** has . . .
opposite sides equal
four equal angles
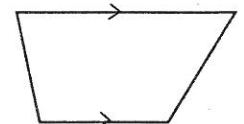opposite sides parallel
two lines of symmetry.

A **rhombus** has . . .
four equal sides
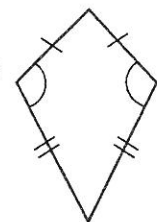opposite angles equal
opposite sides parallel
two lines of symmetry.

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A **parallelogram** has . . .
opposite sides equal
opposite angles equal
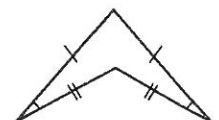opposite sides parallel
no lines of symmetry.
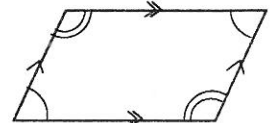
A **trapezium** has . . .
one pair of parallel sides
no lines of symmetry.

A **kite** has . . .
two pairs of adjacent equal sides
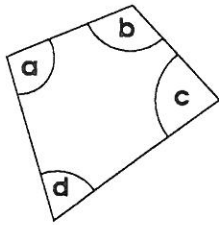one pair of equal angles
one line of symmetry.

An **arrowhead** has . . .
two pairs of adjacent equal sides
one reflex angle
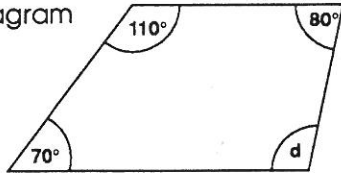two equal angles
one line of symmetry.

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Angles of a quadrilateral

Interior angles of a quadrilateral
add up to 360°.

Angles **a** + **b** + **c** + **d** = 360°

In this diagram

80°+ 110° + 70° + **d** = 360°

d = 100°

because 80° + 110° + 70° + 100° = 360°

For **exterior angles of a quadrilateral** see page 22.

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Other polygons

A five sided polygon
is a **pentagon**.

A six sided polygon
is a **hexagon**.

A seven sided polygon
is a **heptagon**.

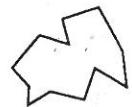An eight sided polygon
is an **octagon**.

A nine sided polygon
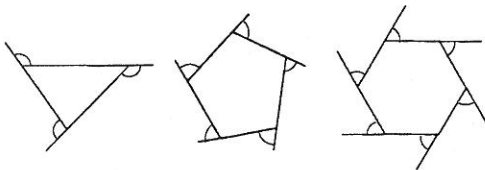is a **nonagon**.

A ten sided polygon
is a **decagon**.

A twelve sided polygon
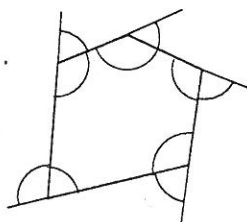is a **dodecagon**.

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Angles of polygons

The **exterior angles** of **all** polygons
add up to 360°.

The sum of the **interior angles** of
a polygon is
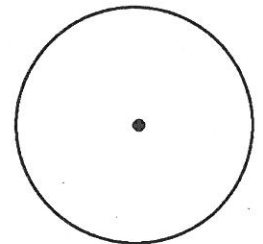
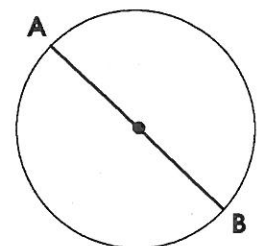**(Number of sides x 180)** − sum of the exterior angles

For a pentagon. . .

the sum of the interior angles is

(5 x 180°) − 360° = 540°.

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Lines in circles

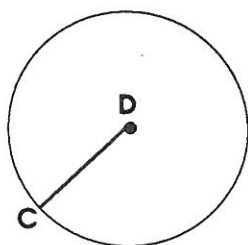The **circumference**
is the perimeter of a
circle.

A **diameter** is any
straight line that joins
two points of the
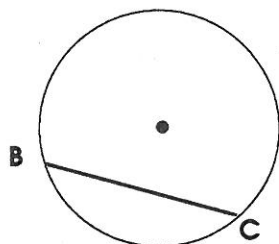circle and passes
through the centre.

AB is a diameter.

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A **radius** is the distance from the centre to a point on the circle.
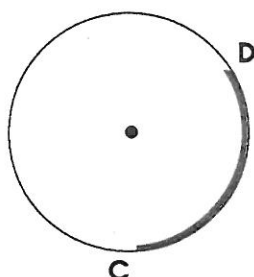
CD is a radius.

A **chord** is a line joining any 2 points on a circle.

BC is a chord.

An **arc** is part of the circumference of a circle.
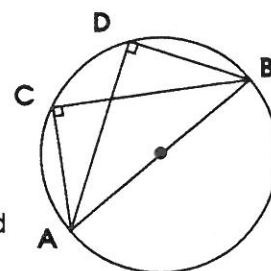
CD is an arc.

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The angle at any point of the circumference standing on a diameter is 90°.

AB is the diameter.
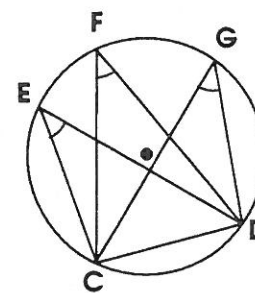
∠ **ACB** and ∠ **ADB** stand on the diameter.

∠ **ACB** = ∠ **ADB** = 90°

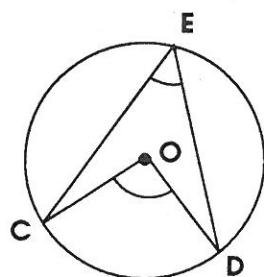The angles at any point of the circumference standing on the same arc are equal.

∠ **CED**, ∠ **CFD** and ∠ **CGD** stand on arc **CD.**

∠ **CED** = ∠ **CFD** = ∠ **CGD**

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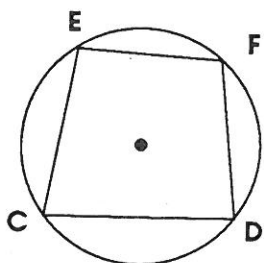The angle at the centre is twice the angle at any point on the circumference standing on the same arc.

∠ **COD** = 2∠ **CED**

The sum of opposite angles of a cyclic quadrilateral is 180°.

∠ **ECD** + ∠ **EFD** = 180°
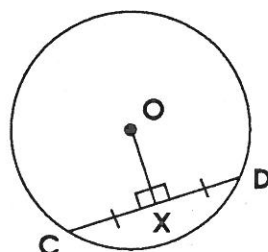∠ **CEF** + ∠ **CDF** = 180°

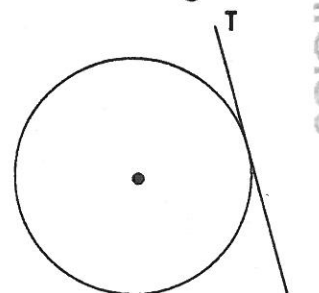The line drawn from the centre of a circle to the midpoint of a chord is perpendicular to the chord.
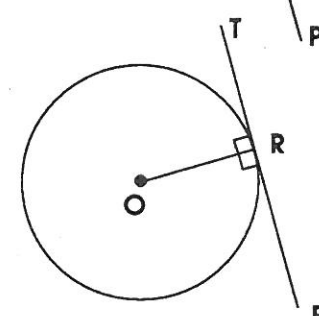
CX = **XD**
∠ **OXC** = ∠ **OXD** = 90°

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A **tangent** is a straight line which touches the circumference of a circle at one point only.
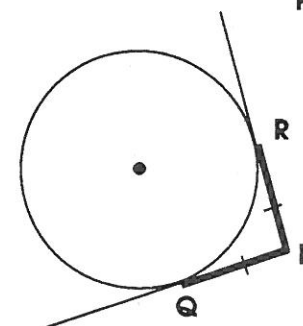
TP is a tangent.

The radius to the point of contact is perpendicular to the tangent.
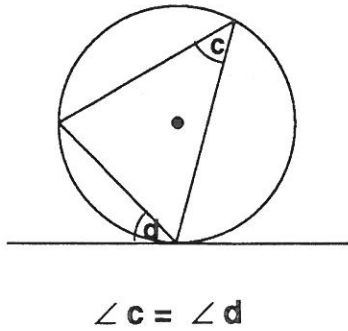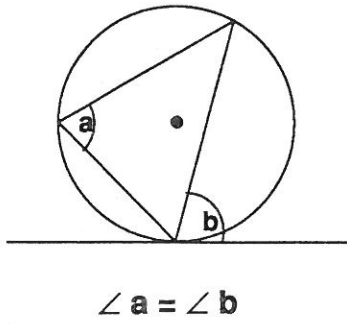
∠ **ORT** = ∠ **ORP** = 90°

Two tangents are drawn from the same point outside a circle. **R** and **Q** are the points of contact.

PR = **PQ**

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Circles

The angle between a tangent and a chord is equal to any angle made by that chord in the alternate segment of the circle.

$$\angle a = \angle b$$

$$\angle c = \angle d$$

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