

Geometry

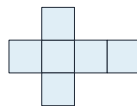
IGCSE Mathematics ■ Topic 4

IGCSE Mathematics

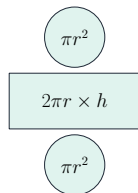


What we will cover

- 1 Angles & angle facts
- 2 Parallel-line angles
- 3 Triangles & polygons
- 4 Circle parts
- 5 Circle theorems
- 6 Bearings & similar shapes



Cube net
6 equal square faces



Cylinder net
2 circles + a rectangle

nets and surface area

Angle types



acute
 $< 90^\circ$



right
 $= 90^\circ$



obtuse
 $90^\circ - 180^\circ$



reflex
 $180^\circ - 360^\circ$



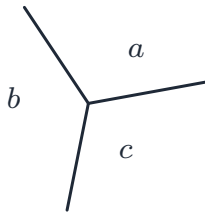
honeycomb

polygons

Angle facts



$$a + b = 180^\circ \text{ (straight line)}$$

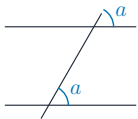


$$a + b + c = 360^\circ \text{ (round a point)}$$

Angles on a line add to 180° ; around a point to 360° ; **vertically opposite** 对顶角 angles are equal. Always **give the reason**.

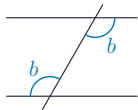
Parallel-line angles

Corresponding (F)



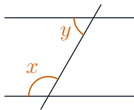
equal

Alternate (Z)



equal

Co-interior (C)

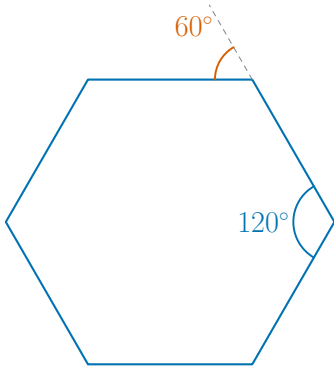


$$x + y = 180^\circ$$



similar shapes dolls

Triangles and polygons

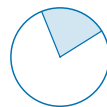
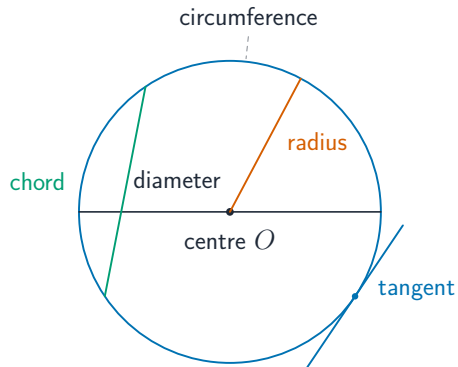


$$\text{interior} + \text{exterior} = 180^\circ$$

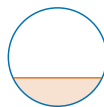


symmetry taj

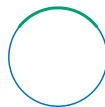
Circle parts



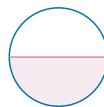
sector



segment



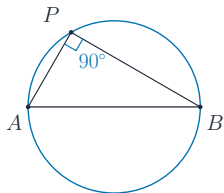
arc



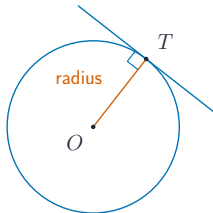
semicircle

radius 半径, **diameter** 直径, **chord** 弦, **tangent** 切线; a **sector** 扇形 is a slice, a **segment** 弓形 is cut off by a chord.

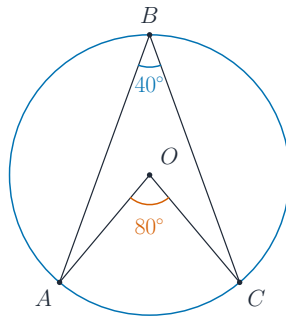
Circle theorems



angle in a
semicircle = 90°



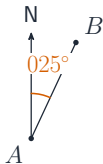
tangent meets
radius = 90°



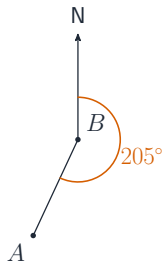
angle at centre = $2 \times$ angle at circumference

Angle in a **semicircle** 半圓 = 90° ; tangent $\perp$ radius. The angle at the **centre** is **twice** the angle at the circumference.

Bearings



Bearing of B from A



Bearing of A from B

A **bearing** 方位角 is measured clockwise from north, written with three digits. So due east is 090° and south-west is 225° .

Similar shapes

length
 $\times k$

area
 $\times k^2$

volume
 $\times k^3$

Similar 相似 shapes have the same angles & sides $\times$ a **scale factor** 比例因子 k .
(**Congruent** 全等 = identical.)

Quadrilaterals, symmetry and solids

quadrilaterals 四边形

angles sum to 360° :

square, rectangle, rhombus, kite

symmetry 对称

lines of reflection;

order of rotational symmetry

nets & solids 展开图

a net folds into a solid; add the faces for surface area

A **net** 展开图 is the key to surface area – unfold the solid, find each face's area, add them.

Worked example – angles on a straight line

Three angles on a straight line are x , 50° and 70° . Find x .

- Angles on a **straight line** add to 180° .
- $x + 50 + 70 = 180$
- $x + 120 = 180$
- $x = 60^\circ$

Learn the four: straight line 180° , point 360° , triangle 180° , quadrilateral 360° . In an exam, **name the rule** you used – it carries a mark.

Topic 4 – key takeaways

1 Parallel

F equal, Z equal, C add to 180°

2 Polygons

interior sum $(n - 2) \times 180^\circ$

3 Circles

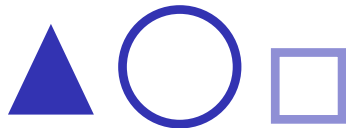
semicircle 90° ; centre = $2 \times$
circumference

4 Similar

area $\times k^2$, volume $\times k^3$

Check yourself

- 1 What do co-interior (C) angles add up to?
- 2 What is each exterior angle of a regular hexagon?
- 3 What is the angle in a semicircle?
- 4 If lengths scale by k , how does volume scale?



Answers 1. 180° 2. 60° 3. 90° 4. by k^3