YEAR 8
KNOWLEDGE ORGANISERS

BLOCK: DEVELOPING GEOMETRY

Angles in parallel lines and polygons

Area of trapezia and circles

"MATHS OPENS DOORS"

YEAR 8 – DEVELOPING GEOMETRY…

Angles in parallel lines and polygons

What do I need to be able to do?

By the end of this unit you should be able to:

- Identify alternate angles
- Identify corresponding angles
- Identify co-interior angles
- Find the sum of interior angles in polygons
- Find the sum of exterior angles in polygons
- Find interior angles in regular polygons

Keywords

Angle: the amount of turn between two rays (lines) meeting at a common point. An angle is measured in degrees.

Isosceles: having one pair of equal sides – can apply to triangles or trapezia

Parallel: straight lines which are always the same distance apart and never touching

Polygon: a closed 2-d shape made up with three or more straight sides.

Regular (polygon): a regular polygon has all sides equal and all angles equal

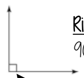
Sum:: the result when two or more numbers are added together

Transversal: a straight line that cuts across two or more other lines

Basic angle rules and notation

R

Acute Angles
0°< angle <90°

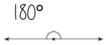


Right Angles
90°

Right angle notation

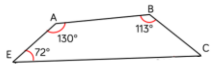
Obtuse
90°< angle <180°

Reflex
180°< angle <360°



Straight Line
180°

The letter in the middle is the angle
The arc represents the part of the angle



Angle Notation: three letters **ABC**
This is the angle at B = 113 °
Line Notation: two letters **EC**
The line that joins E to C.

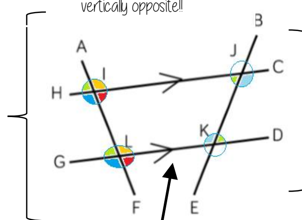
Vertically opposite angles
Equal
Angles around a point
360 °

Parallel lines

Still remember to look for angles on straight lines, around a point and vertically opposite!!

Lines AF and BE are **transversals** (lines that bisect the parallel lines)

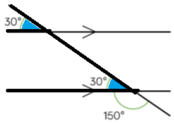
Corresponding angles often identified by their **"F shape"** in position



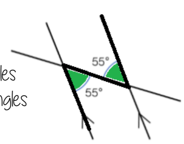
Alternate angles often identified by their **"Z shape"** in position

This notation identifies parallel lines

Alternate/ Corresponding angles

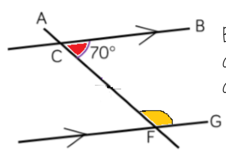


Because alternate angles are equal the highlighted angles are the same size



Because corresponding angles are equal the highlighted angles are the same size

Co-interior angles



Because co-interior angles have a sum of 180° the highlighted angle is 110°

As angles on a line add up to 180° co-interior angles can also be calculated from applying alternate/ corresponding rules first

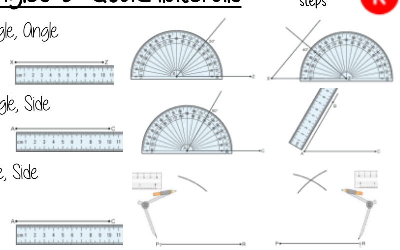
Triangles & Quadrilaterals

Link to steps R

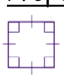
Side, Angle, Angle

Side, Angle, Side

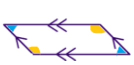
Side, Side, Side



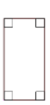
Properties of Quadrilaterals



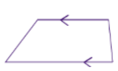
Square
All sides equal size
All angles 90°
Opposite sides are parallel



Parallelogram
Opposite sides are parallel
Opposite angles are equal
Co-interior angles



Rectangle
All angles 90°
Opposite sides are parallel



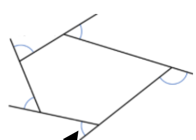
Trapezium
One pair of parallel lines

Rhombus
All sides equal size
Opposite angles are equal

Kite
No parallel lines
Equal lengths on top sides
Equal lengths on bottom sides
One pair of equal angles

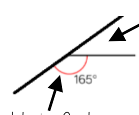
Sum of exterior angles

Exterior angles all add up to 360°



Exterior Angles
Are the angle formed from the straight-line extension at the side of the shape

Using exterior angles



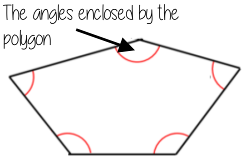
Interior angle + Exterior angle = straight line = 180°
Exterior angle = 180 – 165 = 15°

Number of sides = 360° ÷ exterior angle
Number of sides = 360 ÷ 15 = 24 sides

Sum of interior angles

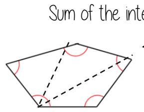
(number of sides – 2) x 180

Interior Angles
The angles enclosed by the polygon



This is an **irregular** polygon – the sides and angles are different sizes

Sum of the interior angles = (5 – 2) x 180

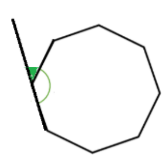


This shape can be made from three triangles
Each triangle has 180°

Sum of the interior angles = 3 x 180
= 540°

Remember this is **all** of the interior angles added together

Missing angles in regular polygons



Exterior angle = 360 ÷ 8 = 45°

Interior angle = $\frac{(8-2) \times 180}{8} = \frac{6 \times 180}{8}$ = 135°

Exterior angles in regular polygons = 360° ÷ number of sides

Interior angles in regular polygons = $\frac{(\text{number of sides} - 2) \times 180}{\text{number of sides}}$

YEAR 8 – DEVELOPING GEOMETRY…

Area of trapezia and Circles

What do I need to be able to do?

By the end of this unit you should be able to:

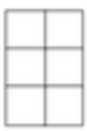
- Recall area of basic 2D shapes
- Find the area of a trapezium
- Find the area of a circle
- Find the area of compound shapes
- Find the perimeter of compound shapes

Keywords

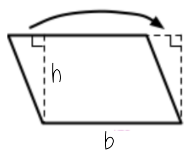
Area: the amount of space inside the boundary of a 2-d shape.
Congruent: two shapes are congruent when they are identical, except that one may be a different way round to the other.
Formula: a rule or fact written in mathematical symbols
Infinity: an idea that something never ends
Perimeter: the distance around the boundary of a 2-d shape
Perpendicular: at right angles (90°) to.
Pi (π): the ratio of a circle's circumference to its diameter. The numerical value of π is 3.14159265…
Sector: a "pie-slice" part of a circle, bounded by two radii and an arc.

Area – rectangles, triangles, parallelograms

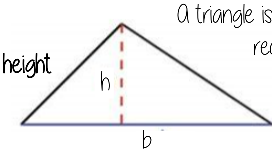
Rectangle
Base x Height



Parallelogram/ Rhombus
Base x Perpendicular height



Triangle
½ x Base x Perpendicular height

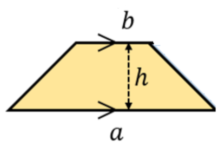


A triangle is half the size of the rectangle it would fit in

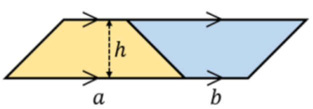
Area of a trapezium

Area of a trapezium

$$\frac{(a+b) \times h}{2}$$



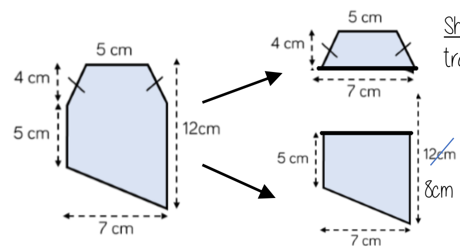
Why?



- Two congruent trapeziums make a parallelogram
- New length (a + b) x height
- Divide by 2 to find area of one

Compound shapes

To find the area compound shapes often need splitting into more manageable shapes first. Identify the shapes and missing sides etc. first.



Shape A - Isosceles trapezium

Shape B- nonstandard trapezium

Shape A + Shape B = total area

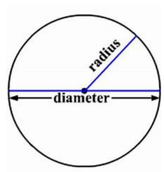
$\frac{(5+7) \times 4}{2} + \frac{(5+8) \times 7}{2} = 24 + 45.5 = 69.5cm^2$

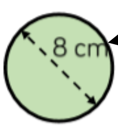
Units

Area of a circle (Non-Calculator)

Read the question – leave in terms of π or if $\pi \approx 3$ (provides an estimate for answers)

Area of a circle
π x radius^2



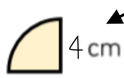


Diameter = 8cm
∴ Radius = 4cm

π x radius^2
= π x 4^2
= π x 16
= 16π cm^2

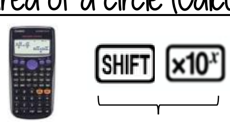
Find the area of one quarter of the circle

Radius = 4cm



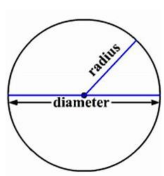
Circle Area = 16π cm^2
Quarter= 4π cm^2

Area of a circle (Calculator)



How to get π symbol on the calculator

Area of a circle
π x radius^2



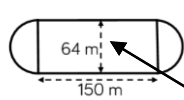
It is important to round your answer suitably – to significant figures or decimal places. This will give you a decimal solution that will go on forever!

Compound shapes including circles

Circumference
π x diameter

Compound shapes are not always area questions. For Perimeter you will need to use the circumference

Spotting diameters and radii



This dimension is also the diameter of the semi circles

Arc lengths = π x 64
= 64π

Don't need to halve this because there are 2 ends which make the whole circle

Arc lengths + Straight lengths = total perimeter

= 64π + 150 + 150
= $(300 + 64\pi)$ m
OR = 501.1 m

Still remember to split up the compound shape into smaller more manageable individual shapes first