YEAR 8
KNOWLEDGE ORGANISERS

BLOCK: LINES AND ANGLES

Constructing, measuring and using geometric notation
Developing geometric reasoning

"MATHS OPENS DOORS"

YEAR 8 — LINES AND ANGLES

Constructing, measuring and using geometric notation

What do I need to be able to do?

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

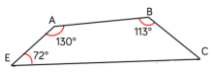
- Use letter and labelling conventions
- Draw and measure line segments and angles
- Identify parallel and perpendicular lines
- Recognise types of triangle
- Recognise types of quadrilateral
- Identify polygons
- Construct triangles (SAS, SSS, ASA)
- Draw Pie charts

Keywords

Frequency: the number of times a particular item appears in a set of data
Isosceles: having one pair of equal sides – can apply to triangles or trapezia
Pair of compasses: equipment used to draw arcs and circles, or to measure distances between points
Polygon: a closed 2-d shape made up with three or more straight sides
Protractor: a device used for measuring angles or turn
Right-angled triangle: a triangle containing one angle of 90°.
Rotation: a geometrical transformation in which a shape is turned around some fixed point
Scalene triangle: a triangle which has no equal sides or equal angles
Sector: a "pie-slice" part of a circle, bounded by two radii and an arc.

Letter and labelling convention

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

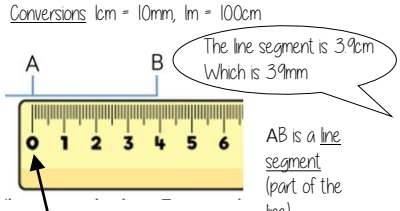


Angle Notation: three letters ABC
This is the angle at B = 113 °

Line Notation: two letters EC
The line that joins E to C

Draw and measure line segments

Conversions 1cm = 10mm, 1m = 100cm



AB is a line segment (part of the line)

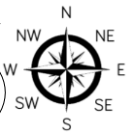
Make sure the start of the line is at 0.

Angles as measures of turn


Clockwise


Anti-Clockwise

East to South is a quarter turn clockwise




Quarter Turn
90°
Clockwise


Half Turn
180°


Three-quarter Turn
270°
Anti-Clockwise


Full Turn
360°

Classify angles


Acute Angles
0°< angle <90°


Right Angles
90°

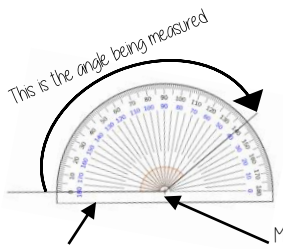
Right angle notation


Obtuse
90°< angle <180°


Reflex
180°< angle <360°

Straight Line
180°

Measure angles to 180°

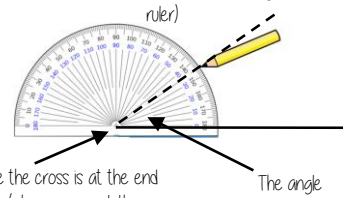


Read from 0° on the base line.
Remember to use estimation
This is an obtuse angle so between 90 ° and 180 °

Draw angles up to 180°

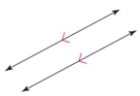
Draw a 35° angle

Make a mark at 35° with a pencil
And join to the angle point (use a ruler)

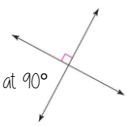


Parallel and Perpendicular lines

Parallel lines
Straight lines that never meet
(Have the same gradient)



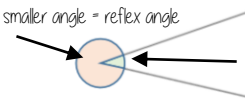
Perpendicular lines
Straight lines that meet at 90°



Angles over 180°

Use your knowledge of straight lines
180 ° and angles around a point
360 °

360 ° - smaller angle = reflex angle



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

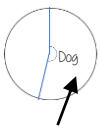

Rhombus
All sides equal size
Opposite angles are equal


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

Draw Pie Charts

Type of pet	Dog	Cat	Hamster
Frequency	32	25	3

32/60 "32 out of 60 people had a dog"



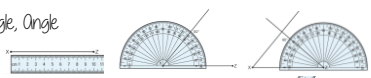
This fraction of the 360 degrees represents dogs

32/60 X 360 = 192°

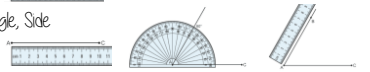
Use a protractor to draw
This is 192°

SAS, SSS, ASA constructions

Side, Angle, Angle



Side, Angle, Side



Side, Side, Side

Polygons

3	- Triangle	5	- Pentagon	8	- Octagon
4	- Quadrilateral	6	- Hexagon	9	- Nonagon
		7	- Heptagon	10	- Decagon

If all the sides and angles are the same, it is a **regular** polygon

YEAR 8 — LINES AND ANGLES

Geometric reasoning

What do I need to be able to do?

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

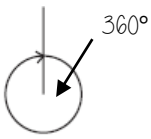
- Understand/use the sum of angles at a point
- Understand/use the sum of angles on a straight line
- Understand/use equality of vertically opposite angles
- Know and apply the sum of angles in a triangle
- Know and apply the sum of angles in a quadrilateral

Keywords

Concave quadrilateral: a quadrilateral with at least one reflex angle.
Convex quadrilateral: curved outwards – the opposite of convex. A convex quadrilateral has all angles less than 180°.
Interior angle: an angle inside a polygon
Isosceles: having one pair of equal sides – can apply to triangles or trapezia
Polygon: a closed 2-d shape made up with three or more straight sides.
Right-angled triangle: a triangle containing one angle of 90°
Scalene triangle: a triangle which has no equal sides or equal angles.
Sum: the result when two or more numbers are added together
Vertically opposite: a pair of angles directly opposite each other formed by the intersection of a pair of straight lines.

Sum of angles at a point

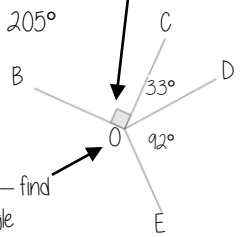
The sum of angles around a point is 360°

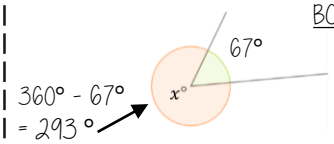


Find angle BOE

90° + 33° + 92° = 205°
360° - 205°
BOE = 155°

Angle notation – 90°



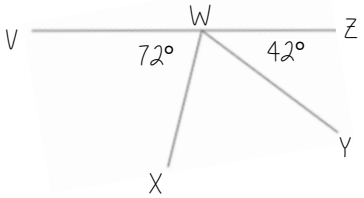


360° - 67°
= 293 °

Angle notation – find this missing angle

Sum of angles on a straight line

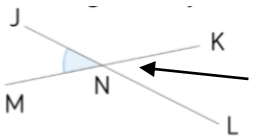
Adjacent angles that share a common point on a line add up to 180°



Find angle XWY

72° + 42° = 114°
180° - 114° = 66°

Vertically opposite angles

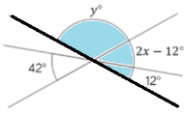


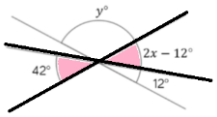
Angle JNM is vertically opposite to angle KNL

JNM = KNL

Vertically opposite angles are the same

Other angle rules still apply.
Look for straight line sums and angles around a point.

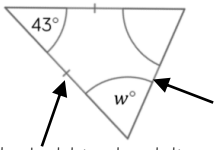




Form equations with information from diagrams:
$2x - 12 = 42$
$2x = 54$
$x = 27°$

Sum of angles in triangles

Sum of interior angles in a triangle = 180°



The two base angles will be the same size

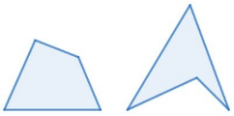
Look at triangle notation. This indicates an isosceles triangle
∴ 180 - 43 = 137
137 ÷ 2 = 68.5°

A triangle can only have ONE right angle

Have a go!
Tearing the corners from triangles forms a straight line which is therefore 180°

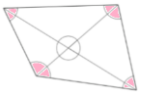
Sum of angles in quadrilaterals

Sum of interior angles in a quadrilateral = 360°

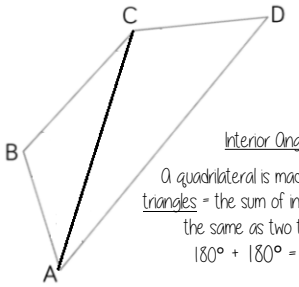


Convex Quadrilateral

Concave Quadrilateral



Interior angles are those that make up the perimeter (outline) of the shape



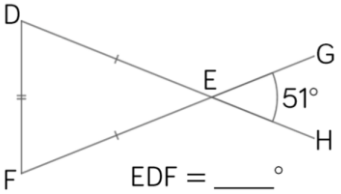
Interior Angles

A quadrilateral is made up of two triangles = the sum of interior angles is the same as two triangles:
180° + 180° = 360°

Angle Problems

Split up the problem into chunks and explain your reasoning at each point using angle notation

Keep working out clear and notes together



1. Angle DEF = 51° because it is a vertically opposite angle DEF = GEH
2. Triangle DEF is isosceles (triangle notation) ∴ EDF = EFD and the sum of interior angles is 180°
   180° - 51° = 129° 129° ÷ 2 = 64.5°
3. Angle EDF = 64.5°