



YEAR 7
KNOWLEDGE ORGANISERS



BLOCK: LINES AND ANGLES

Constructing, measuring and using
geometric notation
Developing geometric reasoning

"MATHS OPENS DOORS"

YEAR 7 — 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 $1\text{cm} = 10\text{mm}$, $1\text{m} = 100\text{cm}$

The line segment is 3.9cm
Which is 39mm

AB is a line segment (part of the line)

Make sure the start of the line is at 0.

Angles as measures of turn

Quarter Turn 90° Clockwise

Half Turn 180° Anti-Clockwise

Three-quarter Turn 270° Anti-Clockwise

Full Turn 360°

East to South is a quarter turn clockwise

Classify angles

Acute Angles
 $0^\circ < \text{angle} < 90^\circ$

Obtuse
 $90^\circ < \text{angle} < 180^\circ$

Reflex
 $180^\circ < \text{angle} < 360^\circ$

Right Angles
 90°

Right angle notation

Straight Line
 180°

Measure angles to 180°

This is the angle being measured

The base line follows the line segment

Make sure the cross is at the point the two lines meet

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)

Make sure the cross is at the end of the line (where you want the angle)

The angle

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°

360° - smaller angle = reflex angle

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

Measure the smaller angle first (less than 180°)

Properties of Quadrilaterals

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

Rectangle
All angles 90°
Opposite sides are parallel

Rhombus
All sides equal size
Opposite angles are equal

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

Trapezium
One pair of parallel lines

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

$\frac{32}{60}$ "32 out of 60 people had a dog"

This fraction of the 360 degrees represents dogs

$\frac{32}{60} \times 360 = 192^\circ$

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

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Geometric reasoning

What do I need to be able to do?

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

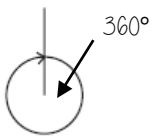
- Understand/use the sum of angles at a point
- Understand/use the sum of angles on a straight line
- Understand/use equality of vertically opposite angles
- Know and apply the sum of angles in a triangle
- Know and apply the sum of angles in a quadrilateral

Keywords

- Concave quadrilateral:** a quadrilateral with at least one reflex angle
- Convex quadrilateral:** curved outwards — the opposite of concave. 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

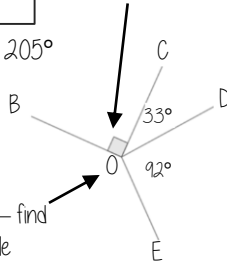
Sum of angles at a point

The sum of angles around a point is 360°

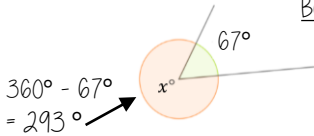


Find angle BOE
 $90^\circ + 33^\circ + 92^\circ = 205^\circ$
 $360^\circ - 205^\circ$
BOE = 155°

Angle notation — 90°

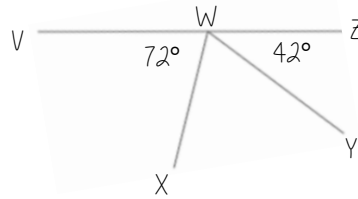


Angle notation — find this missing angle



Sum of angles on a straight line

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

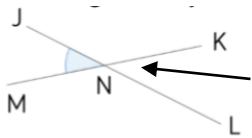


Find angle XWY

$$72^\circ + 42^\circ = 114^\circ$$

$$180^\circ - 114^\circ = \underline{66^\circ}$$

Vertically opposite angles

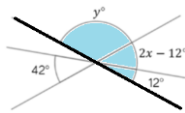


Angle JNM is vertically opposite to angle KNL

$$JNM = KNL$$

Vertically opposite angles are the same

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

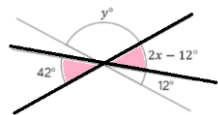


Form equations with information from diagrams

$$2x - 12 = 42$$

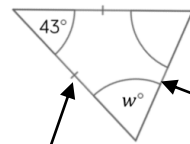
$$2x = 54$$

$$x = 27^\circ$$



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
 $\therefore 180 - 43 = 137$
 $137 \div 2 = 68.5^\circ$

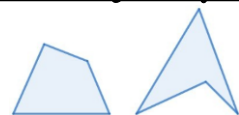
A triangle can only have **ONE** right angle



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

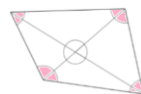
Sum of angles in quadrilaterals

Sum of interior angles in a quadrilateral = 360°

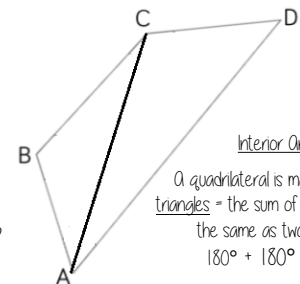


Convex Quadrilateral

Concave Quadrilateral



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

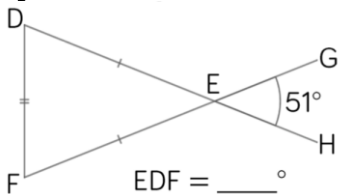


Interior Angles

A quadrilateral is made up of two triangles = the sum of interior angles is the same as two triangles
 $180^\circ + 180^\circ = 360^\circ$

Angle Problems

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



EDF = °

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

Keep working out clear and notes together