PONTEFRACT ACADEMIES TRUST

SUMMER TERM OVERVIEW YEAR 6 – Maths

Term 3 Book – Mortal Engines

Block 1 -Topic: Geometry - Properties of Shape

Guide Time = 3 Weeks

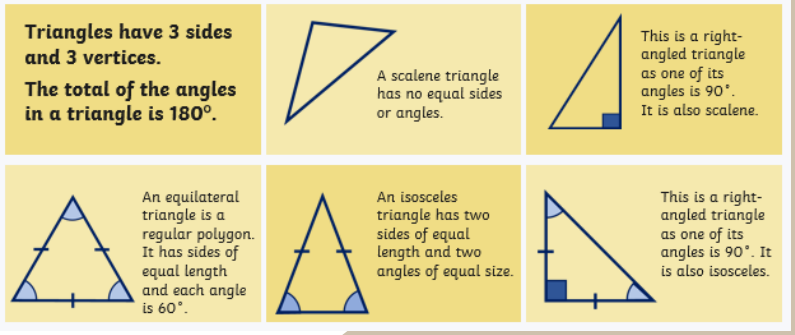
Assessment:	WRMH End of block / term assessments Fluent in Five & Rapid Reasoning Weekly Arithmetic Tests / Skills checks End of KS2 Statutory tests – year: 2018 and/or 2019. Daily retention activities / quizzes to ensure children are revisiting prior learning.
Links to prior learning (sequencing) and canon book	Canon Book – Mortal Engines Children will build upon prior knowledge of: • Measuring angles accurately using a protractor – linking this to their understanding of angle sizes. • Degrees in a right angle – making connections that two right angles form a straight line and four right angles around a point. • Properties of a triangle – making links and recognising key features of specific types of triangles. This will be used to solve missing angle problems. • Properties of 2D shapes in order to explore the interior angles in a parallelogram, rhombus, trapezium etc. • 2D and 3D shapes to identify three-dimensional shapes from their nets.
Links to other learning (cross fertilisation)	Active Maths - provide additional maths questions / problems based around angles and shapes. Consolidate and teach further concepts in an active way, which allows children to apply their knowledge and understanding mentally at another time / lesson: Ask pupils to show different angles using their arms – acute, right, obtuse & reflex. Geography – exploring the links between right angles, degrees on a straight line, and around a point to the use of a compass. How does our knowledge of angles help us to understand compass points and directions? DT – develop an understanding that buildings/structures would be unsafe without consideration of angles. Research an architects use of angles to ensure that building/structures will stay upright, and how a carpenter uses angles to ensure that door and windows fit and do not allow wind or rain into buildings. Link this understanding to the classroom.

Very Important Points (VIPs):

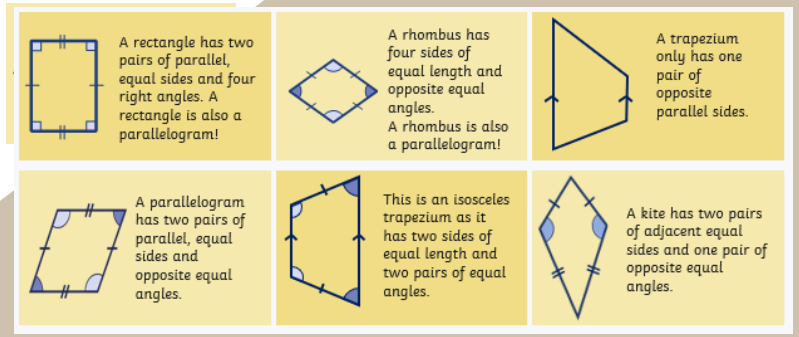
2D shapes have two dimensions – length and width.

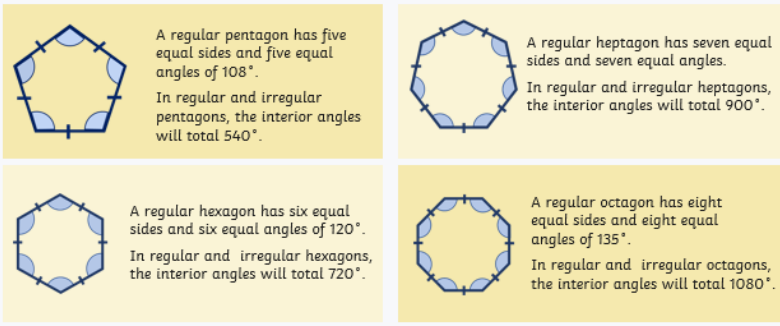
A polygon is a 2D shape with straight sides.

Polygons are compared and classified according to the properties of their sides and angles.



A quadrilateral is a polygon with four sides.



	Thematic Questions: The World Beyond Us: How does Elon Musk use shapes and angles to help him to design spacecraft? The World Around Us: What 3-D shapes are the oldest buildings still standing in the world? Have building designs changed shape throughout history, why? Modern Britain: How do engineers use angles to ensure sports stadiums are safe for increasing numbers of people to attend? Healthy Bodies & Healthy Minds: How do athletes and personal trainers use their knowledge of angles to improve performance? Culture: Why are drums cylindrical in shape? Technology in Action: How has technology helped with the calculation of angles within shapes?	
Links to future learning	The skills and knowledge taught in this block will be built upon in KS3. **Y7:** • Accurately draw, measure, and identify types of angles. • Use facts to solve problems involving unknown angles on a line and at a point. • Understand and use properties of triangles and quadrilaterals. **Y8:** • Use the properties of faces, surfaces, edges and vertices of cubes, cuboids, cylinders, pyramids, cones and spheres to solve problems in 3D. • Construct and interpret plans and elevations of 3D shapes.	We can use the link between geometry and algebra to help us to draw 2D shapes and find unknown angles. **Regular Polygons** As the number of sides a polygon has increases by one, we add another 180° to the total of the interior angles. When n = number of sides, we can use this formula to find the size of each angle in a regular polygon: Sum of Interior Angles = (n - 2) × 180° **Each Angle = $\frac{(n-2) \times 180°}{n}$** 3D shapes have three dimensions – length, width and depth. 3D shapes can be compared and classified according to the properties of their faces, edges and vertices. A polyhedron is a 3D shape with flat faces. Spheres, cylinders and cones are not polyhedrons as they have curved surfaces. A shape net shows which 2D shapes can be folded and joined to make a 3D shape.
Character/Wider Development ('50 things', cultural capital, skills)	**Relate and use this knowledge and understanding in real-life contexts and make these relevant and purposeful links:** In the construction industry, angles determine whether a building is safe or not. Architects and contractors need to calculate angles very precisely to create a structure which stands upright and allows rainwater to run off the roof. Furthermore, without ensuring all structures are built with straight lines, construction workers cannot guarantee that windows and doors will fit. If these angles and lines are calculated incorrectly, or they are not built accurately, the structure could collapse, leave draughty gaps, or allow ingress of water. Construction workers use the knowledge they learned in school about lines and angles to make these important decisions on which our safety depends.	

Shape	Sides	Total of Interior Angles
Triangle	3	180°
Square	4	360°
Pentagon	5	540°
Hexagon	6	720°

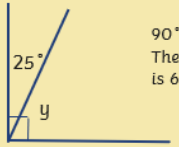
Lines and angles are extremely important in many aspects of real life. A comprehensive understanding of this topic will also help dancers, engineers, photographers and many more professions, so it is important to ensure children are well equipped to improve their confidence and understanding of angles and lines.

Build something as part of a team: children can plan, build and evaluate a model of an airship, utilising their understanding of angles and lines to ensure that the model is structurally sound.
Find their way with a map and a compass: children can use their understanding of angles around a point to support the accurate use of a compass.
Go bowling: bowling is a game where the ten pins are placed in an equilateral triangle at the end of a lane. Bowlers have to consider what the optimum angle would be to bowl in a straight line to knock down the most pins.
See a person in their place of work: children could visit an engineer to discuss the use of angles and lines on their work. This can also then be linked strongly to the canon text around a discussion about London being one great engine.

Angles measure the distance between lines.

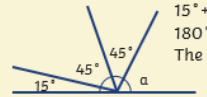
Acute Angles	Obtuse Angles	Reflex Angles
		
Any angle **less than 90°** is called an acute angle.	Any angle **greater than 90°** and **less than 180°** is called an obtuse angle.	Any angle **greater** than **180°** is called a reflex angle.

Angles on a right angle total 90°.



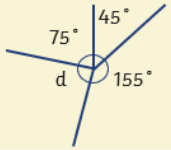
90° - 25° = 65°
The missing angle is 65°.

Angles on a straight line total 180°.



15° + 45° + 45° = 105°
180° - 105° = 75°
The missing angle is 75°.

Angles around a point total 360°.



45° + 75° + 155° = 275°
360° - 275° = 85°

The missing angle is 85°.

Opposite angles are equal on intersecting lines.

56° + 56° = 112°
360° - 112° = 248°
248° ÷ 2° = 124°
Angle a is 124°

Fat Questions:
How do shapes and angles exist and impact our daily lives?

Would life be different without any consideration or understanding of angles?

Do you think that vehicles would be as advanced without knowledge or understanding of shapes and angles?

OVERVIEW OF TEACHING SEQUENCE

Key Facts / Learning	Learning Focus or Key Question	Learning Outcomes (NC)	Key Words/ Vocabulary	Greater Depth/SEND	Misconceptions	Activities and Resources
Week 1 - 3 Properties of Shape	To measure with a protractor. To understand angles. To apply an understanding of angles around a point. To understand vertically opposite angles. To explore the interior angles in triangles. To apply knowledge of the properties of triangles. To calculate angles in a triangle.	Draw 2-D shapes using given dimensions and angles. Compare and classify geometric shapes based upon their properties and sizes and find unknown angles in any triangles, quadrilaterals and regular polygons. Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.	angles, protractor, scale, compass points, acute, obtuse, reflex, right angle, degrees, vertically opposite, North, North-East, East, South-East, South, South-West, West, North-West, clockwise, anti-clockwise, notation, equilateral, isosceles, scalene, right-angled, interior, exterior, hatch marks, parallelogram, rhombus, trapezium, square, rectangle, kite, vertex, quadrilateral, pentagon, hexagon, heptagon, scale, two-dimensional, three-dimensional, net.	GD: Children are introduced to more complex and wider reasoning and problem-solving questions / concepts. Children will have multi-step reasoning problems to solve, applying prior learning as well as current. Children will need to use depth of mathematical knowledge to provide clear mathematical explanation and reasoning to problems. SEND: Assessment and analysis of prior knowledge is needed. Teacher to assess and base planning and resources in a bespoke manner. 'Pre-topic' diagnostic quizzes are particularly useful here. Children will focus on and use concrete and pictorial resources to support and develop their understanding, e.g.	Children may not use a protractor correctly by not reading from the correct scale or incorrectly positioning the base line or central point. Children may not be able to calculate reasoning and problem-solving based questions if they become confused between the different names and sizes of angles. A lack of clarity around which direction clockwise and anti-clockwise are, as well as confusion over North/South and East/West. Children may not link the interior angles in a triangle to the number of degrees on a straight line. Also, a failure to recognise or apply understanding around vertically opposite angles will cause issues in missing angle problems. Misconceptions around the interior angles in various polygons could cause problems around angle calculation. Children may not apply an understanding of measures	Pre-teaching of key concepts is vital to allow for children to commence tasks immediately within lessons and ensure prior learning is revisited and secure. DTMs to be created using the following resources and based on CTs AFL of their class/cohort. Further cross-curricular links can and should be made to the 6 themes, for a wider context, which develops children's wider development / character. WRMH: click here Third Space Learning: https://thirdspacelearning.com/ Classroom Secrets: click here NCETM – resources / activities for DTMs Mastery_Assessment_Y6_High_Res.pdf Maths Frame: click here Slides / resources saved on trust shared.

	To understand angles in quadrilaterals. To calculate angles in polygons. To draw shapes accurately. To recognise and use nets of 3-D shapes.			the use of hundred squares and number lines to support the calculation of missing angles. Top tips for how to use a protractor accurately will need to be introduced visually. Nets of 3D shapes to be utilised alongside a range of 2D and 3D shapes. Use of real-life contexts should always be used to support all children's learning as they are able to see the relevance and purpose of this learning and apply it to an 'everyday' situation.	when drawing shapes to specification, i.e. mm, cm & m. Children may not apply their understanding of the properties of 3-D shapes in order to help them to create 3-D nets. *AFL to be consistently used, to address misconceptions found within own classes / cohorts of children and address where applicable.*	

Context (big picture learning):
Mathematics is an important, creative discipline that helps us to understand and change the world. We want all of our children within the Pontefract Academies Trust to experience all that mathematics has to offer and to develop a sense of curiosity about the subject with a clear understanding. When they leave us, we want them to continue their love of maths and use it continuously and positively in their future lives.
We foster a positive 'growth mind-set' attitude and we promote the fact that we believe that all children can achieve in mathematics. We teach for secure and deep understanding of mathematical concepts through manageable, bespoke steps and cross fertilize at every opportunity. VIPs (Very Important Points) are implemented in every lesson to ensure knowledge and skills are revisited and retained over time.
We use mistakes and misconceptions as an essential part of learning and provide challenge through rich and sophisticated reasoning and problem-solving activities. At our school, the majority of children will be taught the content from their year group only. They will spend time becoming true masters of content, applying and being creative with new knowledge in multiple ways.

Folder name and link to resources: Trust shared > Primaries > Departments > KS2 > Planning Cycle B > Summer 1: Mortal Engines > Maths >

Year 6 Knowledge Organiser: Properties of Shapes

PONTEFRACT ACADEMIES TRUST

Fat Questions:

How do shapes and angles exist and impact our daily lives?

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Intent

We aim to develop and progress our understanding of shapes in order to equip us with the ability to solve real world problems that require a mathematical solution. With these skills, we can help to improve the world in which we live.

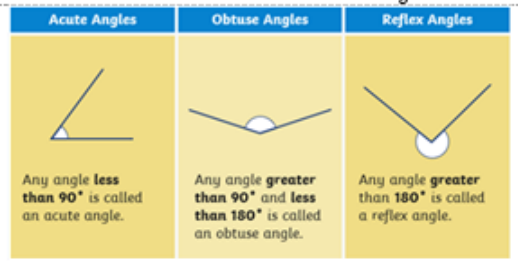
Key vocabulary

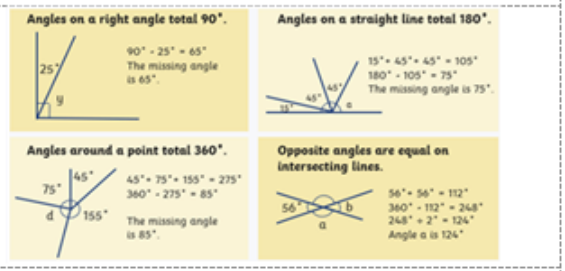
angles, protractor, scale, compass points, acute, obtuse, reflex, right angle, degrees, vertically opposite, clockwise, anti-clockwise, notation, equilateral, isosceles, scalene, right-angled, interior, exterior, hatch marks, parallelogram, rhombus, trapezium, square, rectangle, kite, vertex, quadrilateral, pentagon, hexagon, heptagon, scale, two-dimensional, three-dimensional, net.

To see the full list of vocabulary, please refer to our resource walls.

VIPs:

- Angles measure the distance between lines:





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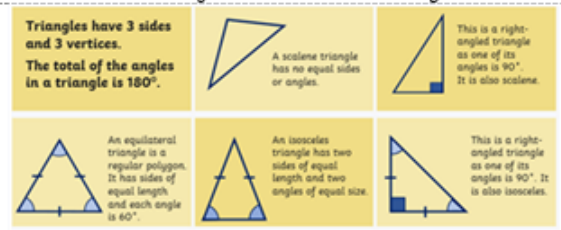

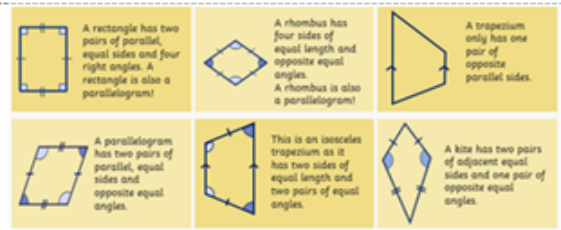

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Regular Polygons

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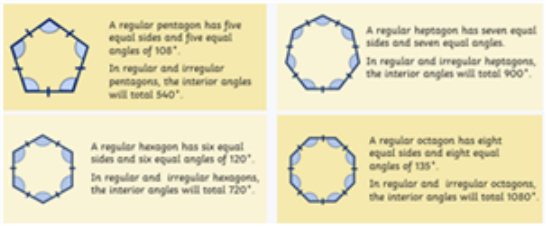
When n = number of sides, we can use this formula to find the size of each angle in a regular polygon:

Sum of Interior Angles = (n - 2) x 180°

$$\text{Each Angle} = \frac{(n-2) \times 180^\circ}{n}$$



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Using a Protractor

Place the cross at the point of the angle.
Read from the zero on the outer scale.
Count the degree line carefully.