

Unit 4

Reasoning about shape

Five daily lessons

National
Numeracy Strategy

Year 4
Autumn term

Unit Objectives

Year 4

- Describe and visualise 3-D and 2-D shapes, including the tetrahedron and heptagon.
- Recognise equilateral and isosceles triangles.
- **Classify polygons using criteria such as number of right angles, whether or not they are regular, symmetry properties.**
- Make and investigate a general statement about familiar numbers and shapes by finding examples that satisfy it.

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Link Objectives

Year 3

- Classify and describe 3-D and 2-D shapes, referring to properties such as reflective symmetry and other properties.

(Key objectives in bold)

Year 5

- **Recognise properties of rectangles.**
- Classify triangles using criteria.
- Make and investigate a general statement about familiar numbers and shapes by finding examples that satisfy it.

This Unit Plan is designed to guide your teaching.

You will need to adapt it to meet the needs of your class.

Resources needed to teach this unit:

- Resource sheet 4.1
- Activity sheet 4.1
- Activity sheet 4.2
- Activity sheet 4.3
- OHT 4.1
- OHT 4.2
- OHT 4.3
- OHT 4.4
- Triangular dotted paper
- Whiteboards
- Large equilateral triangle
- Large isosceles triangle
- Selection of 2-D and 3-D shapes
- Feely box
- Square dotted paper
- A4 paper
- Mirrors
- Set of polygons

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Planning sheet	Day One	Unit 4 <i>Reasoning about shape</i>	Term: <i>Autumn</i>	Year Group: 4
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities / Focus Questions
<p>To describe and visualise 2-D and 3-D shapes</p> <p>VOCABULARY faces edges 3-D 2-D</p> <p>RESOURCES Selection of 2-D and 3-D shapes Feely box</p>	<ul style="list-style-type: none"> Put a mixed set of 2-D and 3-D shapes in a feely box, open at front so class can see it but child can't. Ask child to describe the shape by touch. <div>Q What words do we use to describe shapes?</div> <ul style="list-style-type: none"> List words on board to reinforce vocabulary. Repeat with different shapes. <div>Q Which mathematical words allow us to quickly identify a shape?</div>	<p>To describe and visualise 3-D and 2-D shapes, including the tetrahedron.</p> <p>VOCABULARY faces edges vertices angles tetrahedron</p> <p>RESOURCES Activity sheet 4.1</p>	<ul style="list-style-type: none"> Show children an oblong and a cuboid. <p>Explain that the oblong is a 2-D shape and the cuboid is a 3-D shape.</p> <div>Q What makes a shape 3-D?</div> <div>Q What do you notice about the faces of this 3-D shape?</div> <p>Hold up a square.</p> <div>Q What 3-D shape could this be a face of?</div> <p>(cube, square-based pyramid, cuboid)</p> <div>Q If one face of a 3-D shape is a square, what shape could the other faces be?</div> <ul style="list-style-type: none"> Draw on board different shapes of faces. Children complete Activity sheet 4.1. 	<ul style="list-style-type: none"> Show children an equilateral triangle. <div>Q Which 3-D shapes could this be a face of?</div> <p>(If children can't name any, ask them to describe or show using linking shapes).</p> <p>Discuss a 3-D shape made from four identical triangles.</p> <div>Q What would this shape look like?</div> <div>Q How many edges would it have?</div> <ul style="list-style-type: none"> Hold up a tetrahedron. <p>Explain that this shape is a tetrahedron and write up its name on the board.</p> <div> <p>By the end of the lesson children should be able to:</p> <ul style="list-style-type: none"> Name, classify and describe 2-D and 3-D shapes, including a sphere, cylinder, cube, cuboid, prism, pyramid, hemisphere, cone, and tetrahedron. <p>(Refer to supplement of examples, section 6, page 102.)</p> </div>

Planning sheet	Day Two	Unit 4 <i>Reasoning about shape</i>	Term: <i>Autumn</i>	Year Group: 4
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities / Focus Questions
<p>To describe and visualise 2-D shapes</p> <p>VOCABULARY equilateral rectangle</p> <p>RESOURCES 2-D shapes</p>	<ul style="list-style-type: none"> Quickly – Hold up different 2-D shapes and get the class to say their names. Ask the children to write down the names of five shapes. Say that they can cross out a shape when you describe something about that shape. e.g. Cross out your shape if it has four sides of the same length. The shape has three corners and three sides which can be different. The shape has five sides. The shape has four sides but is not a square. The winner is the one with all shapes crossed out. Discuss with the children why some shapes on the cards were not crossed out i.e the properties were not called out. <div>Q What could I have called out to allow you to cross out your shape?</div>	<p>To classify polygons using criteria such as number of right angles, whether or not they are regular, symmetry properties.</p> <p>VOCABULARY oblong hexagon polygon regular irregular heptagon angle</p> <p>RESOURCES Whiteboards Resource sheet 4.1</p>	<ul style="list-style-type: none"> Ask children to draw a four-sided shape on their whiteboards. Explain to the children that a polygon is a closed, 2-D shape with straight sides. <div>Q Have we all drawn polygons?</div> <p>Choose individual children's shapes to show and check if they are polygons.</p> <ul style="list-style-type: none"> Draw a four-sided shape which is <u>not</u> a polygon. <div>Q Why is my shape <u>not</u> a polygon?</div> <p>Look for curved sides, open shapes. Ask all the children to draw a seven-sided polygon on their whiteboards.</p> <div>Q What do we call a seven-sided shape?</div> <p>Establish that the shape is called a heptagon and look at some children's examples. Ask children to draw a six-sided polygon. Choose an irregular hexagon to show and a regular one.</p> <div>Q What makes a polygon regular?</div> <p>Establish that a regular polygon has sides of equal length and angles of equal size. Measure to demonstrate on regular hexagon.</p> <ul style="list-style-type: none"> Give children Resource sheet 4.1 and ask them to work with a partner to identify which polygons are regular and which irregular. 	<ul style="list-style-type: none"> Play 'guess my shape' e.g. My shape has six sides and is an irregular polygon. Draw what it might look like. Reinforce the definitions of polygon and regular. <div>Q A polygon always has six straight sides. True or false?</div> <p>Prove by drawing that the statement is false.</p> <div>Q Is an oblong a regular polygon?</div> <p>Discuss explanations.</p> <div>Q What is the least number of sides a polygon can have?</div> <p>Draw a shape with equal sides but unequal angles (rhombus, pentagon).</p> <div>Q Is this shape regular?</div> <p>Discuss the answers and reasons ensuring children realise that regular polygons have all sides <i>and</i> all angles equal.</p> <p>By the end of the lesson children should be able to:</p> <ul style="list-style-type: none"> Recognise that a polygon is a closed, flat shape with three or more straight sides and that regular polygons have all their sides and all their angles equal; Recognise and describe a heptagon. <p>(Refer to supplement of examples, section 6, page 102.)</p>

Planning sheet	Day Three	Unit 4 <i>Reasoning about shape</i>	Term: <i>Autumn</i>	Year Group: 4
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities / Focus Questions
<p>To describe and visualise 2-D shapes</p> <p>VOCABULARY polygon heptagon</p> <p>RESOURCES A4 paper</p>	<ul style="list-style-type: none"> Give every child a piece of A4 paper. <p>Ask them to fold it into a square.</p> <div>Q What are the properties of a square?</div> <div>Q By making one fold can you turn your square into a pentagon?</div> <p>Compare children's pentagons.</p> <p>Ask children to fold different polygons ensuring that they are confident of the properties.</p>	<p>To classify polygons using criteria such as number of right angles, whether or not they are regular, symmetry properties.</p> <p>VOCABULARY irregular regular at least one only one</p> <p>RESOURCES OHTS 4.1, 4.2 and 4.3 Resource sheet 4.1</p>	<ul style="list-style-type: none"> Show OHT 4.1 (polygon board). <p>Ask children to describe a particular polygon using correct vocabulary including regular and irregular.</p> <div>Q How could we group these polygons?</div> <div>Q What criteria could we use?</div> <p>Children should mention the number of sides, number of right angles, symmetry properties.</p> <ul style="list-style-type: none"> Show OHT 4.2 and ask questions similar to those that follow, ensuring answers are discussed and children are clear about the properties identified. <div>Q Which shapes have 1 right angle, 2 right angles...?</div> <div>Q Which shapes have only one line of symmetry? How many lines of symmetry does this shape have?</div> <div>Q Which shapes have 2 or more sides of equal length?</div> <p>Ensure language such as 'at least one', 'only one', 'one pair of equal sides'... is used.</p> <ul style="list-style-type: none"> Give children Resource sheet 4.1 (one between two) and show OHT 4.3. Introduce the Carroll diagram. <p>Select shapes from the polygon board (Resource sheet 4.1) and discuss with the class where they would be placed on the Carroll diagram and why.</p> <p>Children work in pairs to decide where at least five other shapes will be placed, giving reasons for their decisions.</p>	<ul style="list-style-type: none"> Show OHT 4.3. Point to a section on the Carroll diagram and ask children to draw a polygon which would fit there. Discuss the different polygons drawn. <div>Q What do these polygons have in common?</div> <p>Choose different polygons and ask children to explain where they would be placed on the Carroll diagram and why.</p> <div> <p>By the end of the lesson children should be able to:</p> <ul style="list-style-type: none"> Use different criteria to sort and classify polygons; Use a Carroll diagram to record their classifications. <p>(Refer to supplement of examples, section 6, page 102.)</p> </div>

Planning sheet	Day Four	Unit 4 <i>Reasoning about shape</i>	Term: <i>Autumn</i>	Year Group: 4
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities / Focus Questions
<p>To describe and visualise 3-D and 2-D shapes.</p> <p>VOCABULARY polygon edges side right-angled triangle</p>	<ul style="list-style-type: none"> Use two or more of these visualisation activities: Imagine you have some squared paper on the table in front of you. Imagine colouring an L-shape on the paper. It is just one square wide. <div>Q How many edges does it have? Q How many corners does it have? Q What sort of polygon is it?</div> <p>Now imagine colouring a T-shape on your paper.</p> <div>Q How many edges does it have? Q How many corners does it have? Q What sort of polygon is it?</div> <p>Imagine you have a paper square and a pair of scissors. Imagine cutting off a corner of the square in one straight cut. Without saying anything, quickly draw the shape you 'cut off'. Now draw the shape you have left. Compare your two shapes with the rest of your group.</p> <div>Q What are the names of your two shapes?</div> <p>Imagine a large, yellow square on the table in front of you. Imagine a small, blue right-angled triangle lying inside the square. Push the right-angled triangle so that its right angle fits into a corner of the square. Now draw the yellow shape that is left. Compare your shape with the rest of the group.</p> <div>Q What is the name of your shape?</div> <p>(Visualisation activities from Shape and space booklet from the Five day course, pages 3 and 4.)</p>	<p>To classify polygons using criteria such as number of right angles, whether or not they are regular, symmetry properties.</p> <p>To make and investigate a general statement about familiar numbers or shapes by finding examples that satisfy it.</p> <p>VOCABULARY regular irregular reflective symmetry</p> <p>RESOURCES OHT 4.1 Regular polygons Mirrors Activity sheet 4.2</p>	<ul style="list-style-type: none"> Use OHT 4.1. <div>Q Can you identify a polygon which is symmetrical? How many lines of symmetry does it have?</div> <p>Children explain how they know a polygon is symmetrical.</p> <div>Q Name some symmetrical polygons?</div> <p>Children should suggest square, rectangle, regular hexagon, regular pentagon, equilateral and isosceles triangle, as well as some irregular pentagons. Give out Activity sheet 4.2 and ask the children to sort all the symmetrical polygons.</p> <ul style="list-style-type: none"> Focus on the regular polygons. <div>Q The number of lines of reflective symmetry in a regular polygon is equal to the number of sides of the polygon. Is this true?</div> <p>Let the children discuss this statement and give their opinions. Children then investigate the statement and prove it by showing examples.</p>	<ul style="list-style-type: none"> Begin by re-stating the last question from the main part of the lesson. <div>Q How can we prove this statement?</div> <p>Children provide examples they have used to prove the statement and explain how they found the number of lines of symmetry.</p> <ul style="list-style-type: none"> Begin to record a chart showing number of sides and number of lines of symmetry in named regular polygons. <div>Q Can you explain why this is true?</div> <p>Take feedback.</p> <p>HOMEWORK – Ask children to draw four different triangles and write about the differences using terms such as regular, right angles, lines of symmetry...</p> <div> <p>By the end of the lesson children should be able to:</p> <ul style="list-style-type: none"> Recognise that the number of lines of reflective symmetry in a regular polygon is equal to the number of sides of the polygon. <p>(Refer to supplement of examples, section 6, page 80.)</p> </div>

Planning sheet	Day Five	Unit 4 <i>Reasoning about shape</i>	Term: <i>Autumn</i>	Year Group: 4
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities / Focus Questions
<p>To classify polygons using criteria such as number of right angles whether or not they are regular, symmetry properties.</p> <p>VOCABULARY right-angled properties</p> <p>RESOURCES 2-D polygons</p>	<ul style="list-style-type: none"> Slide a polygon with a right angle corner from behind a 'wall'. <div>Q What could this polygon be? Why?</div> <div>Q What could this polygon not be? Why not?</div> <div>Q If this polygon is a _____ what other properties would it have?</div> <p>Repeat for different polygons.</p> <p>(Ensure that if using commercially produced 2D shapes children cannot identify the shape by colour).</p>	<p>To recognise equilateral and isosceles triangles.</p> <p>VOCABULARY isosceles triangle equilateral triangle side angle equal</p> <p>RESOURCES Large equilateral triangle Large isosceles triangle Triangular dotted paper Activity sheet 4.3 OHT 4.4</p>	<ul style="list-style-type: none"> Ask children to visualise what a regular triangle would look like. <div>Q What can you tell me about the sides and angles of a regular triangle?</div> <div>Q How many lines of symmetry does it have?</div> <p>Explain that a regular triangle is called an equilateral triangle. Emphasise equal sides and angles and <i>equilateral</i>.</p> <ul style="list-style-type: none"> Hold up a paper equilateral triangle and demonstrate lines of symmetry by folding. <p>Refer to the previous day's homework and discuss some of the differences children found, particularly those referring to equal angles, right angles, equal sides or symmetry.</p> <ul style="list-style-type: none"> Give the children Activity sheet 4.3 and ask them to draw as many <i>different</i> triangles as they can by joining dots. <div>Q Can you sort your triangles into groups? What properties do the triangles in each group have in common?</div>	<ul style="list-style-type: none"> Ask children to come and draw an example of one of their triangles on OHT 4.3. <p>Discuss different triangles taking into account reflections and rotations by turning and flipping the transparency.</p> <ul style="list-style-type: none"> Look at a child's example of an isosceles triangle. <div>Q What can you tell me about this triangle?</div> <p>Establish that it has two equal sides, two equal angles and one line of symmetry. Demonstrate by folding a paper isosceles triangle if necessary.</p> <p>Ask children to identify all the isosceles triangles they have drawn by writing an I in the middle.</p> <div>Q Did anyone draw an equilateral triangle on the square dots?</div> <div>Q Why not?</div> <div> <p>By the end of the lesson children should be able to:</p> <ul style="list-style-type: none"> Recognise the angle and side properties of isosceles and equilateral triangles. <p>(Refer to supplement of examples, section 6, page 102.)</p> </div>

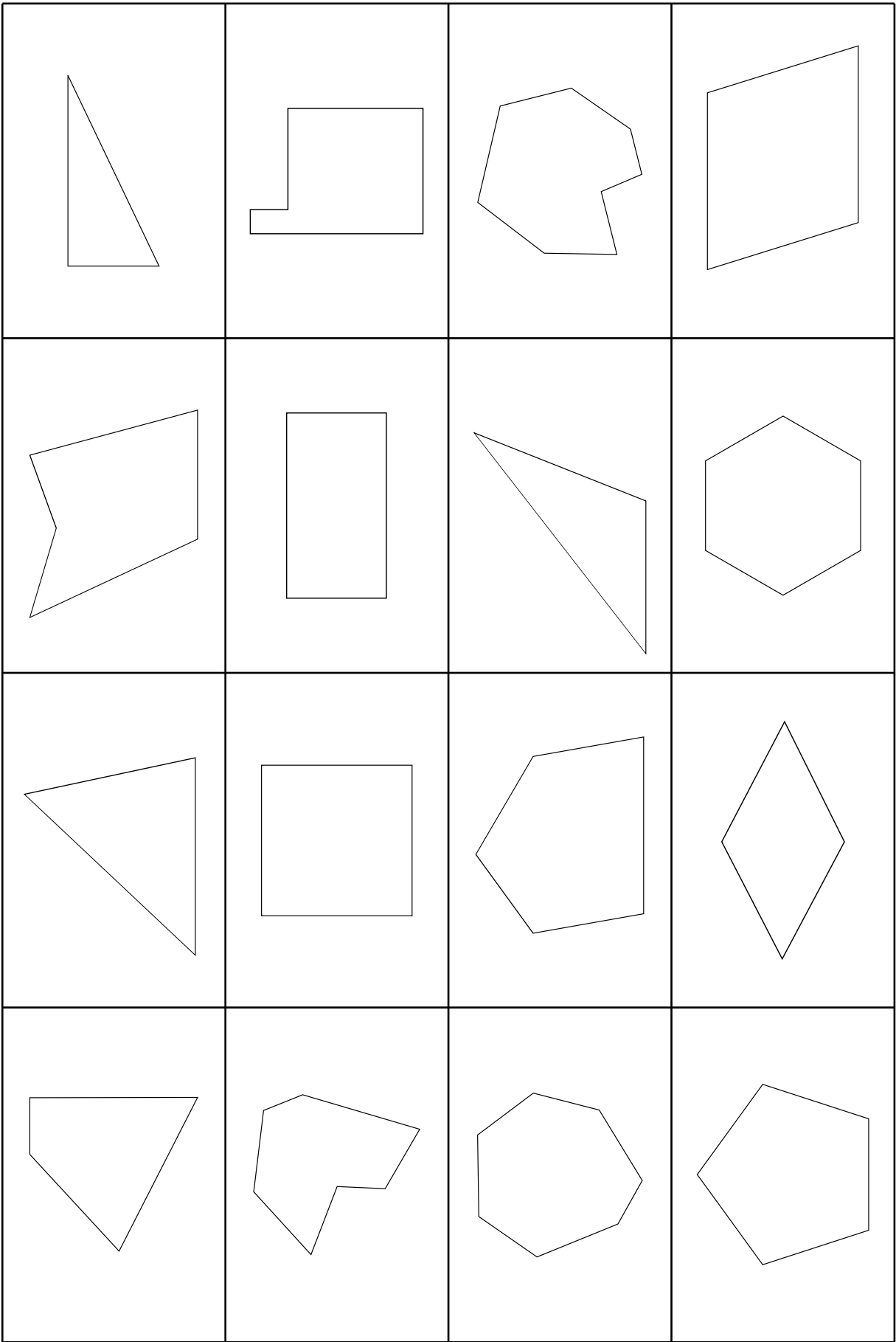
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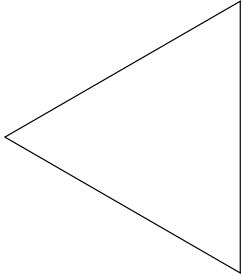
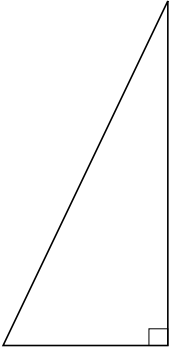
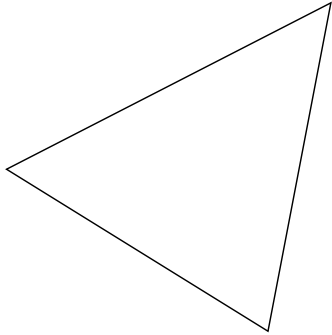
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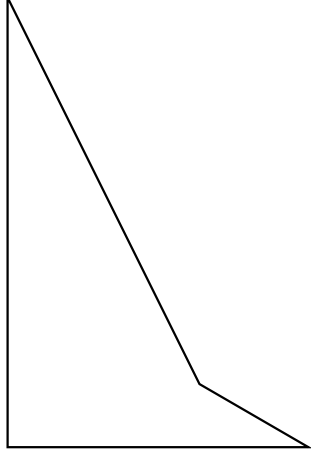
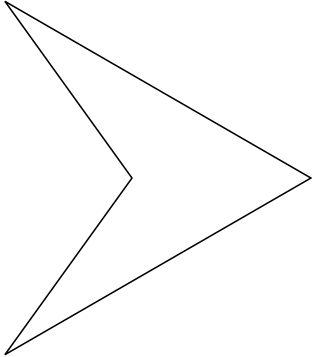
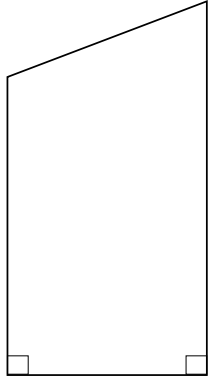
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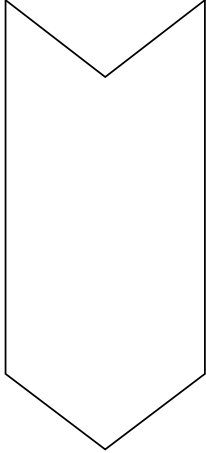
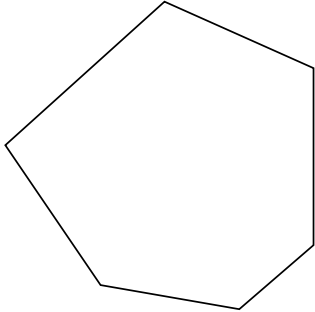
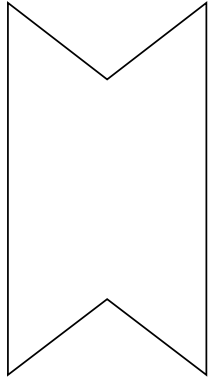
Triangles



Quadrilaterals



Hexagons



At least one face shape	Possible 3-D shapes	Shape of other faces

	At least one line of symmetry	No lines of symmetry
Regular		
Irregular		

NNS Unit Plans

		No right angles	
Three sides	At least one right angle		
More than three sides	At least one right angle		

