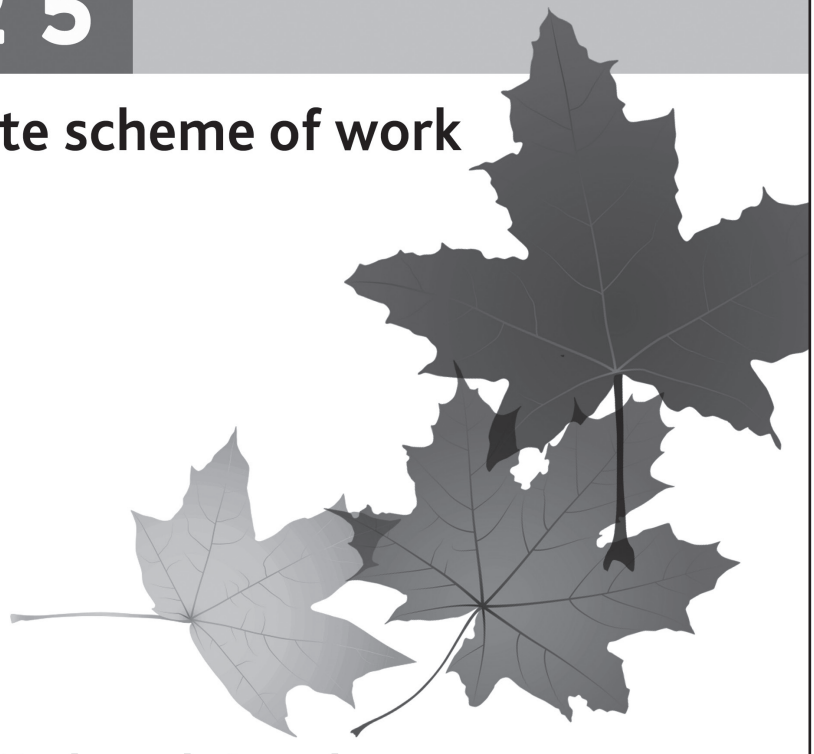
THE NATIONAL CURRICULUM OUTDOORS

YEAR 5

A complete scheme of work



Deborah Lambert,
Michelle Roberts and Sue Waite

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Bloomsbury Publishing Plc

50 Bedford Square, London, WC1B 3DP, UK

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First published in Great Britain, 2020 by Bloomsbury Publishing Plc

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A catalogue record for this book is available from the British Library

ISBN: PB: 978-1-4729-7621-5; ePDF 978-1-4729-8438-8

2 4 6 8 10 9 7 5 3 1

Printed and bound in the UK by Ashford Colour Press



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Dedication

We dedicate this book to all teachers who are willing to take their teaching outside the classroom and offer exciting learning opportunities, foster positive health and wellbeing outcomes and connect children with their natural environment. They are our hope for an education for excellence and sustainability.

We also dedicate it to Deborah's mum Jennifer Lilley for her support and guidance, her brother Jason Lilley for his shared passion for Art and her partner; Andy Rimmer for his patience and support throughout the writing process; to Michelle's partner Andy Mitchell for his continued support and excellent photographs and to her nephew and niece Robbie and Alice, who have inspired many of the KS2 ideas, alongside Coads Green Primary School; and to Sue's family, fellow committed nature and learning lovers.

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Photos and further resources

Illustrative photos and further resources are available online at www.bloomsbury.com/NC-Outdoors.

KEY STAGE 2 | Year 5

Maths

In this unit, children use and apply the Year 5 vocabulary linked to geometry from the 2014 National Curriculum for England, whilst exploring properties of angles and regular and irregular polygons in the outdoor learning area. They use problem-solving and team-building activities, including Raccoon Circles. You can find over 150 Raccoon Circle activities in *The Revised and Expanded Book of Raccoon Circles* by Jim Cain and Tom Smith, and you can download a free collection of Raccoon Circle activities at: www.teamworkandteamplay.com. The activities in this unit also provide opportunities for assessment for learning. Integral to the activities are vocabulary and objectives associated with calculation and estimation and measures.

To support inclusive practice or to extend learning, the space, task, equipment and people (STEP) approach can be adopted throughout this unit. By changing the space, task, equipment or people, the activity can be made more challenging or easier to understand, enabling all pupils to take part in the activity, as explained in the assessment chapter in this book. To support differentiation and individual needs, the Year 4 objectives are also referenced where appropriate.

The main activities offer opportunities for adult-directed whole class and smaller-group work, as well as opportunities for individual exploration and experimentation where appropriate.

You may wish to record the activities using a camera.

Natural connections

- Leaf and tree identification
- Using nature's clues to tell directions
- Care for the environment

Health and wellbeing

- Physical activity
- Teamwork
- Self-regulation and independence
- Risk management.

Word bank

Geometry – properties of shape

- regular and irregular polygons
- quadrilateral
- pentagon
- hexagon
- heptagon
- octagon
- nonagon
- decagon

Geometry – position and direction

- protractor
- vertex
- dimensions
- angles: right-angled, acute, reflex, obtuse
- degrees: 60°, 90°, 180°, 360°
- clockwise
- anticlockwise

Summary overview

Progression	Curriculum content	Learning experiences/activities
Lesson 1	Know that angles are measured in degrees. Estimate and compare acute, obtuse and reflex angles. Use the properties of rectangles to deduce related facts and find missing lengths and angles. Distinguish between regular and irregular polygons, based on reasoning about equal sides and angles.	Children use sticks to make and name as many geometric shapes as possible, also naming their properties. In team-building activities using a length of tubular webbing, they 'Shape up' and 'Step in' to explore the properties of a circle. Children revise and explore the properties of different regular polygons by creating them physically using specified criteria.
Lesson 2	Know that angles are measured in degrees. Use the properties of rectangles to deduce related facts and find missing lengths and angles. Distinguish between regular and irregular polygons, based on reasoning about equal sides and angles.	Children use 'Random pairing' and 'Walk and talk' to revise prior shape learning, before exploring irregular and regular polygons. They 'Step in' to describe properties. In smaller groups, they make polygon shapes, matching shape properties. They use 'Step in' to suggest ways of completing the task.
Lesson 3	Know that angles are measured in degrees. Estimate and compare acute, obtuse and reflex angles. Draw given angles and measure them in degrees (°).	Children explore the properties of acute, right-angled, obtuse and reflex angles using sticks. They create their names out of sticks and estimate and compare acute, obtuse and reflex angles. They create a tableau picture of stick people in a variety of activities, using acute, right-angled, obtuse and reflex angles.
Lesson 4	Know that angles are measured in degrees. Estimate and compare acute, obtuse and reflex angles. Draw given angles and measure them in degrees (°).	Following the introduction of a protractor in the classroom, the children use tubular webbing to estimate angles on a curve (e.g. on a netball semicircle). They use angles to create a picture in the style of Kandinsky, using found objects.
Lesson 5	Identify angles in one whole turn (total 360°), half turn (total 180°) and other multiples of 90°.	Children use the 'Pass the knot' activity to explore clockwise and anticlockwise turns. They identify angles in one whole turn (total 360°), half a turn (total 180°) and other multiples of 90°, following given instructions. They plot a course using turns across the outdoor learning area for another pair to follow.
Lesson 6	Identify 3D shapes, including cubes and other cuboids, from 2D representations.	Children build fires from 2D representations of 3D shapes. They decide which would best satisfy the fire triangle criteria and light a fire as modelled, understanding and managing the risks involved.

PREPARATION

Become familiar with the water knot used to join the lengths of tubular webbing (see www.bloomsbury.com/NC-Outdoors). This knot, also known as a tape knot, is strong under pressure but also easy to undo after use.

Prepare a set of 'properties of polygons' cards (see the examples on page 33).

Resources

- Collection of sticks
- 13 m length of tubular webbing or soft rope
- 6 m lengths of tubular webbing or soft rope
- 'Properties of polygons' cards

Previous learning

This progression builds on children's previous geometry learning.

CONSIDER

Health & Safety

Assess and evaluate hazards and risks in your setting. See the health and safety chapter.

LESSON OBJECTIVES

We are exploring, identifying and comparing the properties of regular polygons.

National Curriculum Content

- Know that angles are measured in degrees.
- Estimate and compare acute, obtuse and reflex angles.
- Use the properties of rectangles to deduce related facts and find missing lengths and angles.
- Distinguish between regular and irregular polygons, based on reasoning about equal sides and angles.
- Year 4: Compare geometric shapes based on their properties.
- Year 4: Identify acute and obtuse angles.
- Year 4: Identify lines of symmetry in 2D shapes presented in different orientations.

ADULT ROLES

- Support with making the shapes only when necessary, e.g. to control safety or to promote 'on task' behaviour, as a key element of the tasks is to work independently as a team.
- Allow experimentation but consider safety.
- Ask questions to encourage the use of mathematical vocabulary.

WARM UP IDEAS

Explain that over the next six weeks children will be exploring shape and angles in the outdoors.

Ask the children what maths they have done outdoors in the past.

Give a brief overview of the next few progressions and tell them that today's lesson will be about using named properties to create regular polygons. Can they define the term 'polygon'? Then give them the definition: a closed 2D shape with straight sides (which means it has at least three sides).

Introductory activity (groups of four)

Children identify trees from the area and collect 12 sticks no longer than their forearm to make as many polygons as possible.

Can they use mathematical vocabulary to describe the properties of the polygons they have made, e.g. number of sides, acute, right-angled and obtuse angles, lines of symmetry, what makes a polygon regular, etc.?

MAIN ACTIVITIES

Properties of regular polygons

Reintroduce the Raccoon Circles activities (see page 30 for more information on Raccoon Circles). The following activities require a long length of tubular webbing with its ends joined with a water knot.

Challenge 1 (whole class)

'Shape up' and 'Step in'

1. Holding the webbing at waist height, the class works together to make a perfect circle.
2. Carefully work together to place the webbing on the ground. This may take a few attempts. Just try again, remedying any problems as they occur.
3. When it is on the ground, the class walk around the outside of the circle, looking to see whether it matches the properties of a circle, in order to get a different perspective.
4. When they are back in their starting positions, revise vocabulary describing shapes by asking children one at a time to 'step in', stepping over the tape and into the circle, while stating one property of the circle, such as 'It has no corners or edges', 'It is a two-dimensional curved shape', etc.
5. Children may state that it has lines of symmetry, a diameter, radius and circumference. Actually walk along these lines to reinforce them and keep the session active.
6. Ask the children to 'step in' to name other polygon shapes that they know. Can they name the properties of these?
7. Ask the children what a regular polygon is. Give the definition: a shape whose sides are all the same length and whose angles are all equal.
8. Can they work out what an irregular polygon is? Give the definition: a shape whose sides are different lengths and whose angles are different sizes.

Challenge 2 (groups of four)

Make different regular polygons from a description of their properties

Introduce the 'properties of polygons' cards.

Groups choose a card, then work together to name and make a specific polygon from the given properties, using the tubular webbing as modelled above, e.g. a triangle, heptagon or decagon.

Properties of regular polygon cards

3 equal sides 3 equal angles	4 equal sides 4 equal angles
5 equal sides 5 equal angles	6 equal sides 6 equal angles
8 equal sides 8 equal angles	10 equal sides 10 equal angles

PLENARY

Encourage the children to explain what they have been doing in the session and state what they have found out about shapes.

EVALUATION/FOLLOW ON

- What went well and why?
- What didn't go as well as expected?
- What could be changed?
- Who stood out and why?

PREPARATION

Rehearse the water knot (see www.bloomsbury.com/NC-Outdoors).

Prepare cards in the format shown below for regular and irregular versions of all polygons between three and eight sides.

Resources

- 13 m length of tubular webbing or soft rope
- 6 m lengths of tubular webbing or soft rope
- 'Make your polygon' cards

Previous learning

Children may have experienced 'Random pairing' and 'Walk and talk' activities.

CONSIDER

Health & Safety

Assess and evaluate hazards and risks in your setting. See the health and safety chapter.

LESSON OBJECTIVES

We are working as a team to explore, describe and compare the properties of regular and irregular polygons.

National Curriculum Content

- Know that angles are measured in degrees.
- Use the properties of rectangles to deduce related facts and find missing lengths and angles.
- Distinguish between regular and irregular polygons based on reasoning about equal sides and angles.
- Year 4: Compare and classify geometric shapes, based on their properties and sizes.
- Year 4: Identify acute and obtuse angles and compare and order angles up to two right angles by size.
- Year 4: Identify lines of symmetry in 2D shapes presented in different orientations.

ADULT ROLES

- Encourage independence, working with a partner or as a team for support.
- Model the activities yourself, acknowledging the tricky parts and being positive about the management of any difficulties.
- Allow experimentation but consider safety.
- Ask questions to encourage the use of mathematical vocabulary.

Make your polygon cards

Irregular triangle	Regular octagon
3 sides of different lengths	8 equal sides
3 angles of different sizes	8 equal angles

WARM UP IDEAS

Explain that today children will be exploring the properties of regular and irregular polygons. Revise the terms 'polygon', 'regular' and 'irregular'.

Tell the children that they will be using the activities 'Random pairing' and 'Walk and talk' to revise prior shape learning before exploring 'regular' and 'irregular'.

This gives them the chance to interact with children outside of their immediate friendship group. It is also a way of assessing learning by listening to the conversations!

MAIN ACTIVITIES

Polygon properties

Challenge 1 (whole class)

'Random pairing' and 'Walk and talk'

Join the ends of the long length of tubular webbing with a water knot.

1. Holding the webbing at waist height, the class carefully work together to place it on the ground as a perfect circle. This may take a few attempts.
2. Revise the 'step in' activity from Progression 1 by asking for volunteers to 'step in' to name and describe properties of a variety of regular polygons.
3. Once this has been done, invite every other child to step into the circle so that an equal number of children are outside and inside the circle.
4. 'Insiders' turn to the right and 'outsiders' turn to the left and walk around the circle in opposite directions, i.e. the insiders walk anticlockwise and the outsiders clockwise.
5. Once the children have walked around the circle and a bit more, call out 'Stop!' and the children turn to face the person nearest to them – an outsider facing an insider.
6. This is now their talking and sharing partner to share ideas and talk through answers.
7. The children stand shoulder to shoulder in their relative positions (with tubular webbing between them on the ground) and all walk in the same direction, e.g. all walk clockwise.
8. As they walk, they talk (but not all at the same time!) The insider is the listener and the outsider is the talker. The children swap places and roles at the knot.
9. Ask the children to share with their partner what they have learned so far about the properties of shapes and what they know about regular and irregular polygons. What new vocabulary can they remember and use?

Challenge 2 (groups of four)

Make regular and irregular polygons with properties matching the named polygon shape.

Introduce the 'Make your polygon' cards. Groups choose a card, then work together to make the named polygon, using the tubular webbing.

1. Holding the tape at waist height, the group works together to make the named polygon, satisfying the properties described on the card.
2. To check that it matches the properties criteria, the group carefully works together to place it on the ground. This may take a few attempts.
3. When it is on the ground, the group walks around the outside of the shape, looking to see whether it matches the properties of the named polygon on the card, in order to get a different perspective.
4. Children 'step in' to suggest ideas to complete the task, for the team to listen to and apply if they agree, e.g. making possible changes to the length of a side or an angle.
5. What could they use to check? Use their ideas to carry out checks.
6. Share the polygons with the whole class, identifying their properties and discussing the elements of teamwork used to complete the task.

PLENARY

Using the 'Walk and talk' activity above, the children explain to their walk and talk partner what they have found out about regular and irregular shapes and about working together.

Back in the classroom

Children can draw the shapes they created, adding captions and speech bubbles to describe their properties.

EVALUATION/FOLLOW ON

- What went well and why?
- What didn't go as well as expected?
- What could be changed?
- Who stood out and why?

PREPARATION

Resources

- Selection of sticks and twigs
- Large protractors

Previous learning

This extends and applies previous learning about angles.

CONSIDER

Health & Safety

Assess and evaluate hazards and risks in your setting. See the health and safety chapter.

LESSON OBJECTIVES

We are exploring and estimating angles and naming them.

National Curriculum Content

- Know that angles are measured in degrees.
- Estimate and compare acute, obtuse and reflex angles.
- Draw given angles, and measure them in degrees (°).
- Year 4: Identify acute and obtuse angles and compare and order angles up to two right angles by size.

ADULT ROLES

- Encourage independence, working with a partner or as a team for support.
- Model the activities yourself, acknowledging the tricky parts and being positive about the management of difficulties.
- Allow experimentation but consider safety.
- Ask questions to encourage the use of mathematical vocabulary.

WARM UP IDEAS

Explain that this session is about angles. What angles can children name and describe?

Can they think of real objects in the setting with:

- Acute angles, such as a swing frame, a partially opened door or the angle for using a fire striker.
- Right angles (lots!).
- Obtuse angles, such as a wide-opened door, roof trusses, scissors, etc.

Introductory activity (in pairs)

Explore angles, using sticks to assess and reinforce understanding.

1. Children collect sticks no longer than their hand from the area. Can they remember the trees that are in the area? Can they use clues, such as fallen leaves, to identify them?
2. Join two sticks at one end and identify the 'vertex' and the 'arms' or straight sides, which open and close to increase and decrease the size of the angle.
3. Use the sticks to create different angles from specified criteria, e.g. show me an angle less than 90°, show me an angle more than 90°, show me an angle more than 90° but less than 180°, show me an angle greater than 180°, show me an angle of 180°, etc.
4. In pairs, they repeat the modelled activity, with one partner specifying the angle and the other making it using sticks. They then swap over.
5. Can they describe and name different categories of angles?

MAIN ACTIVITIES

Angle estimation

Explain to the children that now they can compare, describe and name acute, right, obtuse and reflex angles, they are going to use these to explore the angles in their names.

Challenge 1 (whole class and individual)

Identify the angles in your name

Demonstrate to the children how capital letters can be made using straight lines (sticks).

- Which letters have acute angles, e.g. A, M, W?
- Which letters have right angles, e.g. L, H, T?
- Which letters have obtuse angles, e.g. K, X, Y?

Children work individually to collect enough sticks to make their names using straight lines.

- Whose name has the most angles?
- Whose name has the most acute/right-angled/obtuse angles?
- Did anyone find a reflex angle, such as over the top of the A?



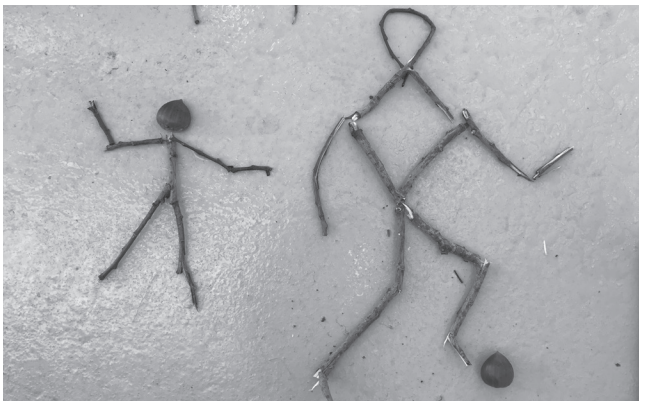
Challenge 2 (whole class and individual)

Use different angles to make stick people

Demonstrate to the children how a simple stick person can be 'drawn' on the ground using straight lines (sticks).

Model how the sticks can be placed and added to, to show a stick person in different positions. Can they identify angles used in the figure? Children create a tableau or picture showing a group of stick people doing something, e.g. a stick person on a bike or playing football. They could also create stick animals if they want to.

They identify and describe the angles in their picture.



PLENARY

Encourage the children to explain what they have been doing in the session and state what they have found out about angles.

Back in the classroom

Children add captions or instructions to photos of their stick names and stick people, demonstrating their understanding of angles. For example, the children could label the different types of angles they can see in the photos. These photos could also be used as starting points for creative writing.

EVALUATION/FOLLOW ON

- What went well and why?
- What didn't go as well as expected?
- What could be changed?
- Who stood out and why?

PREPARATION

Source a collection of sticks and natural objects suitable for the pictures prior to the session. If the children are not going to use tools, cut the sticks to size.

Resources

- Netball court (the D part around the goal) or draw a semicircle in chalk
- 13 m length of tubular webbing
- Collection of sticks and natural objects
- Images of paintings by Kandinsky: www.wassilykandinsky.net
- Bow saws, loppers, secateurs and safety gloves

Previous learning

Practice with using a protractor in the classroom would be beneficial prior to this session.

CONSIDER

Health & Safety

Assess and evaluate hazards and risks in your setting. See the health and safety chapter.

LESSON OBJECTIVES

We are exploring angles and using these to create images based on the artist Kandinsky, using natural materials.

National Curriculum Content

- Know that angles are measured in degrees.
- Estimate and compare acute, obtuse and reflex angles.
- Draw given angles, and measure them in degrees (°).
- Year 4: Identify acute and obtuse angles and compare and order angles up to two right angles by size.

ADULT ROLES

- Encourage independence, working with a partner or as a team for support.
- Model the activities yourself, acknowledging the tricky parts and being positive about the management of difficulty.
- Ask questions to encourage the use of mathematical vocabulary.

WARM UP IDEAS

Following the introduction of how to use a protractor in the classroom, tell the children that this week they will be practising using a giant protractor to estimate angles, before using angles to create natural artwork.

Introductory activity

The children stand around the curved part of the semicircle facing inwards.

1. Tell the children that this represents the protractor 'curve'.
2. The goal line of the court represents the 'baseline' of the protractor.
3. The netball post represents the 'origin' of the protractor or 'vertex' of the angle. If the post is not in place, then the teacher or a child can stand at that point.
4. Ask the children what a protractor is used for, and then what angle it can measure up to.
5. Can they point to the person standing at 90°, 45°, 135°, etc.?
6. The person at the specified angle 'steps in', stepping over the line into the semicircle.