Maths and Me: 2nd Class – Short-Term Plan, Unit 9: Location and Transformation (January: Weeks 3&4)

Shape and Space > Spatial Awareness and Location; Transformation; Shape

Strand(s) > Strand Unit(s)

have completed the focus of learning. Learning Experiences: 🖸 concrete activity; 🖸 digital activity; 🕑 activity; 🕑 activity; 🕑 Key: Elements: (U&C) Understanding and Connecting; (C) Communicating; (R) Reasoning; (A&PS) Applying and Problem-Solving. CM: Cuntas Miosúil: please tick when you

Additional information for planning

Progression Continua	See '2nd Class <i>Maths and Me</i> Progression Continua Overview' for a detailed breakdown of how all progression continua are covered.	
Maths Language	See '2nd Class <i>Maths and Me</i> Maths Language Overview', individual lesson plans and Unit 9 Maths Language Cards.	
Equipment	See '2nd Class Maths and Me Maths Equipment Overview' and individual lesson plans.	
Inclusive Practices	 See Let's Strengthen and Let's Deepen suggestions throughout lesson plans. See Unit 9 Let's Strengthen Suggestions for Teachers. (These address the Common Misconceptions and Difficulties listed below.) See Unit 9 Let's Strengthen PCM. See Unit 9 Let's Deepen PCM. 	
Integration	See individual lesson plans.	

Background and rationale

- Location and Transformation is the second Shape and Space unit in *Maths and Me*. It is a combined unit, exploring the topics of Spatial Awareness and Location and Transformation.
- While the children have previously explored simple maps and grids, this is the first time that they are introduced to using a grid system and grid references, i.e. letters along the horizontal, numbers along the vertical, and references which are expressed as an ordered pair (e.g. F2). In grid systems and grid references, the object is located in the area or space created by the intersecting lines.
- In later classes, the children are introduced to pairs of coordinates, e.g. (6, 4), as another way to represent location. In the coordinate system, the location of the object is a specific point at the intersection of the lines.
- Turns: While the primary focus of this unit is on full, half and quarter turns, if appropriate, challenge some children to also explore the effects of three quarter turns.
- The progression continua for levels d, e, f, g and h refer to two specific types of symmetry: line symmetry, introduced at level d, and rotational symmetry, not formally explored until level g. Therefore, in *Maths and Me* for Senior Infants to Second Class, the children will only be exploring line symmetry. As line symmetry is also referred to as reflective or mirror symmetry, *Maths and Me* uses the term 'mirror symmetry', both to help create a distinction between the children's understanding of this type of symmetry and their later understanding of rotational symmetry, and to emphasise the importance of incorporating the use of mirrors as an essential piece of equipment when exploring this concept.
- While the cardinal points (north, south, east and west) are not explicitly taught in this unit, if these directions arise organically from the pupils' own discussion and directions, they should be acknowledged and incorporated.
- Patterns: This unit also provides opportunities to develop understanding of some pattern types, e.g. symmetrical, tessellating, in preparation for Unit 11 Patterns. (See also in the same unit: Patterns: Supporting Learning.)

The theme of this unit is **The Zoo**. This theme provides a real-life context with which the children can identify (i.e. a trip to the zoo or another family-friendly destination) and use simple maps to navigate.

Common misconceptions and difficulties

For a child to be able to flexibly visualise position, direction and the effects of movement and transformation on shapes and objects, they must have ample experience of manipulating the physical representations. Therefore, experiences with concrete materials and equipment are vital and should be enabled as much and as often as possible.

- The children may confuse right and left (even if they have been using these directions since Senior Infants), particularly when the orientation of the object is different from their own orientation, and clockwise/anti-clockwise.
- They may struggle to remember that in a grid reference, the letter comes first.
- They may struggle to visualise and identify half and quarter turns. (Making a turn yourself requires the ability to visualise yourself from above as you turn a fraction of a circle, clockwise or anticlockwise. It may help for the children to initially use a cut-out, with obvious front, back and sides, that can be physically turned.)
- They may struggle to identify right angles if the lines making the angle are oriented any other way than horizontal and vertical.
- They may incorrectly assume that where a shape is halved, this is also a line of symmetry.
- They may create a duplicate/repeat image (see below) when trying to create a mirror image.



The Unit 9 Let's Strengthen Suggestions for Teachers address the common misconceptions and difficulties listed above.

Mathematical models and representations

- 3-D and aerial representations of various objects and shapes
- Grids and grid references to aid location
- Directional icons and symbols, including turns
- **Representations of tessellations**
- Pattern blocks
- Tangrams
- Pentominoes
- Geoboards
- Pegboards
- Teaching clocks
- Programmable bot toys
- Base ten blocks
- Interlocking cubes







Example of a tessellation

Teaching tip

The following manipulative printables are available to support this unit: Nets of 3-D Shapes, Blank Square Grid, Analogue Clock, Tangram, Pentominoes and Base Ten Blocks. Click on the resources icon on the Maths and Me book cover on edcolearning.ie

Day 1, Lesson 1

Different Views

Focus of learning (with Elements)

 Recognises the relationship between different modes of representing position and location (e.g. bird'seye view versus street view) (R)

Learning experiences

- Digital activity: The Zoo (1) MAM Routines: Notice & Wonder, with Think-Pair-Share; Reason & Respond
- Digital activity: Different Views MAM Routine: Reason & Repond
- C Concrete activity: Cube Constructions MAM Routine: Build it; Sketch it; Write it
- Pupil's Book page 61: Different Views

Equipment

- Lots of cubes and cuboids, both connecting (interlocking cubes, magnetic blocks, polydrons, megablocks, etc.) and not connecting (base ten, wooden building blocks and number rods)
- 3-D shapes

Maths language

bird's-eye/aerial view, street view

Warm-up

Digital activity: The Zoo (1) *MAM* Routines: Notice & Wonder, with Think-Pair-Share

Display the poster and, using Think-Pair-Share, ask:

What do you notice? What do you wonder?

Record the children's responses to both questions on the board. Allow the children the opportunity to respond to (agree/disagree with or query) others' responses, but do not confirm or reject any of the ideas.

Main event

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Digital activity: The Zoo (1) MAM Routine: Reason & Respond

Display the poster and ask or click to play the questions below. Whenever appropriate, ask the children to give reasons for their responses, e.g. to explain why or how they think this.



- What does this poster show?
- This is a zoo; what clues tell us this?
- Name some things you recognise.
- Where is this view from?
- Why do you think this is sometimes called an aerial view?
- Why do you think this is sometimes called a bird's-eye view?
- What is the opposite of an aerial or a bird's-eye view? (a street view)
- If we could see this as a street view, what would you expect to see?

- When might a bird's-eye or an aerial view be better?
- When might a street view be better?

Optional: Using Google Maps, locate the school using its Eircode. Look at the school from the different available viewpoints (aerial view, street-view front, street-view behind, etc.). The children could also do something similar with their own homes (when at home or in school, if there are sufficient devices available).

Digital activity: Different Views MAM Routine: Reason & Respond

Play the interactive game, in which the children match the aerial images with corresponding street-view images.

Concrete activity: Cube Constructions MAM Routine: Build it; Sketch it; Write it

Distribute the cubes and cuboids to the class. The children use these to construct small models of

various colours. They then sketch and colour both a bird's-eye/aerial view and a street view of their model. Optional:

- The children photograph their models from the two different viewpoints. The photos could then be used as a matching activity for others.
- Groups swap their sketches and build each other's models. Can they match the sketch to its 3-D model?
- Pupil's Book page 61: Different Views



Let's strengthen

The children may benefit from the additional support of the 3-D shapes to complete activity C.

Try this! For the bird's-eye view of the classroom, the children could use a squared copy page, PCM 26: 1 cm Square Grid, PCM 27: 2 cm Square Grid and/or PCM 28: Classroom Cut-outs.

Let's strengthen

The children may benefit from the additional support of the PCMs listed above.

Let's deepen

Challenge the children to draw the classroom map without any extra support.

Optional consolidation and extension possibilities

Home/School Links Book Page 23 can be completed any time after this lesson.

Integration Given that the overarching theme for this unit is The Zoo, there are lots of opportunities for cross-curricular integration, e.g. Language English: language and vocabulary development using the theme of the Zoo; Language Gaeilge: Ainmhí; STEM: animal life; Geography: animal conservation, animals/ habitats around the world; Music: listening and responding to *The Carnival of the Animals*. **Maths Journal** The children choose other objects in the classroom to sketch in aerial and street view.

Location and Transformation Display Set up a display in the classroom, to which the children can contribute labelled examples of their own work/ constructions from this unit.

Games Bank Play 'Directions Tic-Tac-Toe'.

Day 2, Lesson 2

Location

Focus of learning (with Elements)

- Identifies and describes the general location of an object using a grid system (U&C)
- Explores grid references in the context of barrier games, or other playful activities (A&PS)

Learning experiences

- Digital activity: Grids MAM Routines: Reason & Respond, with Write-Hide-Show
- Digital activity: The Zoo (2) MAM Routines: Notice & Wonder, with Think- Pair-Share; Reason & Respond, with Write-Hide-Show
- Digital activity: Where Am I? MAM Routines: Reason & Respond, with Write-Hide-Show
- C P Game: Capture the Counters!

Equipment

- Counters
- PCM 30

Maths language

top, bottom, middle, left, right, centre, between, map, location, grid, column, row, grid reference

Warm-up

D Digital activity: Grids MAM Routines: **Reason & Respond, with Write-Hide-Show**

Look at the images, which show grids of 2-D and 3-D shapes. Ask:

What shape can you see at/in the top/bottom/ middle/left/right/centre?

Main event

Teaching tip

While the children have previously explored simple maps and grids, this is the first time they are introduced to using a grid system and grid references as a way to represent location, e.g. F2, A3.

Digital activity: The Zoo (2)

MAM Routine: Notice & Wonder, with Think-Pair-Share; Reason & Respond, with Write-**Hide-Show**

Display the poster and, using Think-Pair-Share, ask:

What do you notice? What do you wonder? Record the children's responses to both questions on the board. Allow the children the opportunity to respond to (agree/disagree with or query) others' responses, but do not confirm or reject any of the ideas. Then ask or click to play the questions below. Whenever appropriate, ask the children to give

reasons for their response, e.g. to explain why or how

What is this called? (A map)

they think this.

- Where is the entrance? Can you describe its location another way?
- Where is the giraffe? Can you describe its location another way?
- Pick an animal. Tell your partner where it is. (Swap and repeat.)
- Why does the map have grid lines on it?
- How could you use this grid to describe the location of the entrance?
- In which column is the entrance? (Column C)

The children record their responses on their MWBs.

- In which row is the entrance? (Row 1)
- How might we use this letter and this number to describe the entrance? (grid reference C1)
- Does the grid make it easier or more difficult to explain the location?

Let's strengthen

The children may benefit from using a mnemonic to help them remember that in grid references the letter comes first, e.g. L comes before N in the alphabet, so letter before number; C comes before R in the alphabet, so column before row.

For extra practice using grids, see the Unit 9 Let's Strengthen PCM.

Digital activity: Where Am I? MAM Routines: Reason & Respond, with Write-Hide-Show

Display the image. Choose an animal or feature on the grid. The children write the grid reference for this on their MWBs to record the location.

Let's strengthen

The children may benefit from the additional support of PCM 29: Map of the Zoo, on which they can 'draw' their index ('pointing') finger along the columns and rows to identify the grid reference.

🜔 [Game: Capture the Counters! Play 'Capture the Counters!' from the Games Bank. Distribute copies of PCM 30: Location Grid and Spinners and counters to the class.

Optional consolidation and extension possibilities

Location and Transformation Display What new examples could be added?

Maths Journal The children record what they did in the main part of this lesson.

Story Read *Treasure Map* by Stuart J. Murphy. A story about a group of children trying to find hidden treasure.

Integration Geography: map work and mapping skills; PE: orienteering.

Games Bank Play a different grid game, e.g. 'Line 'em Up!'

Day 3, Lesson 3

Turns

Focus of learning (with Elements)

- Gives and follows directions involving half and quarter turns (C)
- Discusses, models, visualises and predicts how an object will look when rotated through a half or quarter turn (R)
- Reasons about alternative ways to perform the same transformation (R)

Learning experiencesEquipmentDigital activity: Grid References MAM Routines:
Reason & Respond, with Write-Hide-Show• ScissorsDigital activity: Turtle Turns
MAM Routine: Reason & Respond• Programmable bot toys (e.g. Bee-
Bots) and bot matsConcrete activity: Predicting Turns
MAM Routine: Write-Hide-Show• PCM 29Pupil's Book page 62: Turns• PCM 31

Maths language

full turn, half turn, quarter turn, three quarter turns, clockwise, anti-clockwise, opposite

Warm-up

Digital activity: Grid References MAM Routines: Reason & Respond, with Write-Hide-Show

Look at the images, which show grids of 2-D and 3-D shapes with grid references. Ask/say:

• What shape is located in A1? B3?, etc.

Digital activity: Turtle Turns MAM Routine: Reason & Respond

Use the interactive tool to turn the turtle and ask the questions below. Whenever appropriate, ask the children to give reasons for their response, e.g. to explain why or how they think this.

- What animal is this? (turtle)
- What view of the turtle is this? (aerial or bird's-eye view)
- Watch carefully. Describe what happens next.

• Write the location of ... (specify one of the shapes) on your MWB.

Assess whether the children can correctly use and interpret grid references.

Main event

Use the control panel to make the turtle do a half turn, clockwise/to the right. Ask:

- The turtle is now facing the opposite direction. He did a half turn to his right. Another way to say this is that he did a half turn clockwise. What does clockwise mean?
- Can you sketch how he moved on your MWB?
- Watch carefully again. Describe what happens this time.

Use the control panel to make the turtle do a half turn, anti-clockwise/to the left. Ask:

- The turtle is back where he started. He did a half turn to his left. Another way to say this is that he did a half turn, anti-clockwise. What does 'anti-clockwise' mean?
- Can you sketch how he moved on your MWB?
- Watch carefully again. Describe what happens this time.

Use the control panel to make the turtle do a quarter turn, anti-clockwise/to the left. Ask:

- The turtle did a quarter turn to his left. Another way to say this is that he did a quarter turn, anti-clockwise.
- Can you sketch how he moved on your MWB?
- If the turtle wants to return to where he started, how must he move? Can you sketch it on your MWB?
- What other turns could the turtle do?

Concrete activity: Predicting Turns MAM Routine: Write-Hide-Show

Teaching tip

The purpose of the following activities is for the children to visualise and predict the end points of turns, and to then make the turn to check their



predictions. It is not necessary to do all of the listed activities, so choose one or more that best suit the needs of your class, depending on the resources available.

Predicting Turns 1

Place an MWB on each of the four sides of the classroom, each with a different shape drawn on it, e.g. oval, parallelogram, hexagon and rectangle. Say/ask:

- Make a prediction: If you stand facing the hexagon and then make a quarter turn, clockwise, what shape will you be looking at then? Write it on your MWB.
- Show me.
- Now do it: Stand up. Hold both hands straight out in front of you, pointing towards the hexagon. Make a quarter turn, clockwise. What shape are you looking at?

Repeat with other directions, including half turns and three quarter turns, both clockwise and anticlockwise. Ask:

• If I start facing the hexagon and I finish facing the oval, how might I have turned?

 Is there more than one way to do this? Explain why.

For variety, this activity could also be done in another space (e.g. the yard or the PE hall). Identify four main features. The children could write the initial letter of these features to indicate where they predict they will face after turning.

Predicting Turns 2

Create enough copies of PCM 31: Aerial View of Zoo Animals (the turtles and bots) so that each group has a representation of a turtle or a bot toy which they then place on PCM 29: Map of the Zoo. You can give the instructions or nominate children to do so. For example:

- Place the turtle so that it is in the elephant enclosure, facing the penguins. Make a prediction: If you turn the turtle a half turn, anti-clockwise, what will it be facing? Write it on your MWB.
- Show me.
- Now do it: Turn the turtle a half turn, anticlockwise. What is it facing?

Repeat with other starting locations and other instructions.

Let's deepen

Challenge the children to make and/or visualise three quarter turns.

Describing Turns

The children work in pairs. Child A describes to Child B how to turn an animal. Together, they check the result. Then they swap roles.

Programming a Bot

If a programmable bot toy is available, ask:

- How do we program the bot to do a quarter turn, clockwise/anti-clockwise? Write the instructions on your MWB. Check to see if you were correct.
- How do we program the bot to do a half turn, clockwise/anti-clockwise? Write the instructions on your MWB. Check to see if you were correct.
- How do we program the bot to do a full turn, clockwise/anti-clockwise? Write the instructions on your MWB. Check to see if you were correct.

Place the bot in a particular position on the bot mat. Ask:

 How do we programme the bot to turn to face ... (name a feature on the mat)? Write the instructions on your MWB. Check to see if you were correct.

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Write some turn inputs on the board. Ask:

• What will the bot be facing if we input these instructions? Write the answer on your MWB. Check to see if you were correct.

Repeat with other features.

Let's deepen

Challenge the children to suggest alternative ways to perform the same turns, e.g. three quarter turns clockwise is the same as a quarter turn anticlockwise; two half turns clockwise is the same as a full turn anti-clockwise, etc. Pupil's Book page 62: Turns



Further consolidation and extension possibilities

Integration STEM: computational thinking, coding and programming; energy and forces, turning gears and cog wheels.

Location and Transformation Display What new examples could be added?

Games Bank Play a different grid game, e.g. 'Tower of 3'.

Day 4, Lesson 4 Directions

Focus of learning (with Elements)

- Gives and follows directions involving turns and simple distances or landmarks in the context of simple plans/grid maps/aerial photos of familiar environments (C)
- Records directions as a series of simple steps (C)
- Analyses and evaluates representation and directions for movement and refines for clarity and accuracy (R)
- Devises and analyses routes on maps, plans or grids that satisfy certain constraints (A&PS)

Learning experiences

- Digital activities: Same But Different Turns; Turning Shapes MAM Routine: Reason & Respond
- DG Digital activity: Zoo Routes MAM Routine: Reason & Respond
- Pupil's Book page 63: Directions

Maths language

journey, route

Warm-up



Digital activities: Same But Different – Turns; Turning Shapes MAM Routine: Reason & Respond Play the two slideshows and ask the children to propose reasons for why the images are the same and why they are different.

Equipment

Bots) and bot mats

Programmable bot toys (e.g. Bee-

Main event

D C Digital activity: Zoo Routes MAM Routine: Reason & Respond

Display the image and say:

- Imagine Mia is at the entrance and wants to visit the lions first. Use your MWB to show the directions.
- Imagine Jay is at the entrance and wants to visit the penguins, but he also wants to go to the café on the way to the penguins. Use your MWB to show the directions.
- Imagine Lexi is at the entrance and wants to visit the elephants, but she also wants to go to the toilet on the way to the elephants. Use your MWB to show the directions.
- Choose an animal but don't say it aloud. Use your MWB to show the directions to get to your chosen animal from the entrance. Ask your



partner to follow your directions – did they get to the correct animal?

Let's strengthen

The children may benefit from additional supports such as programmable bot toys and/or PCM 29: Map of the Zoo.

Let's deepen

Challenge the children to compare routes and to identify the most efficient route around the zoo to see as many animals as possible.

Pupil's Book page 63: Directions

Please note that a bot toy is not required to complete the page. The goal is for the children to interpret the directions to identify where the bot will end up.

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Let's strengthen

The children may benefit from additional supports, such as using their finger to move along the grid as directed, using a small item (e.g. a sharpener or rubber) to physically move along the grid or using the bot cut-out from PCM 31.

Let's deepen

Challenge the children to use instructions that include three quarter turns.

Teaching tip

Bot toys work on the premise that the directions/ commands are input first and then a 'go/play' button is pressed to execute the directions as input. If available, the children could explore a programmable bot toy (e.g. Bee-Bot) in advance, but this is not required. Alternatively, online interactive tools enable the children to virtually explore how bot toys work. For example, this online Bee-Bot Emulator lets you program a virtual Bee-Bot and could be displayed on the IWB: edco.ie/55ma

There is also a Bee-Bot app, available to download free from the Apple App Store or Google Play Store, with several options and levels of difficulty.

Another option is to create 'kid-bots'! A child in the group assumes the role of a bot and therefore can only move as directed by their group. The other children in the group have to 'program' the kid-bot by providing a list of directions (e.g. forwards, forwards, turn right, forwards, and so on) to get them safely from where they are to their seat. This works really well on a tiled floor.

Optional consolidation and extension possibilities

Bot Play If a programmable bot toy is available:

- The children use the bot to devise and solve their own problems.
- Design your own class bot mat (see PCM 32: 14 cm × 14 cm Square Grid, showing one 14 × 14 cm square that the children can use as a

guide to make a larger grid). Using a large sheet of paper, draw horizontal and vertical lines to create a grid with 14×14 cm spaces. Using PCM 32, the children can create their own 14×14 cm scene that can be glued or attached with sticky tape to a square on the class grid. Working individually or in

groups, the children choose a theme (e.g. zoo, pet farm, farm, treasure island) and design a hunt with obstacles to be avoided. Other children/groups work out possible routes.

• The designs and/or routes could be recorded in their Maths Journals.

Location and Transformation Display What new examples could be added?

Games Bank Choose a grid game to play (e.g. 'Capture the Counters!', 'Line 'em Up!' and 'Tower of 3').

Day 5, Lesson 5 Right Angles

Focus of learning (with Elements)

 Recognises square and non-square corners in the environment, identifying square corners as right angles (U&C)

Learning experiences

Digital activity: Same But Different – Corners
 (1) MAM Routine: Reason & Respond

Video: Square Corners MAM Routine:Reason & Respond

- Concrete activity: Making Right Angles
- Pupil's Book page 64: Right Angles

Equipment

- Teaching clocks
- Geoboards and elastic bands
- Programmable bot toys (e.g. Bee-Bots)
- Sticky tape
- Markers

Maths language

square corner, right angle

Warm-up

Digital activity: Same But Different – Corners (1) MAM Routine: Reason & Respond

Play the slideshow and ask the children to propose reasons why the images are the same and why they

are different. If not suggested, prompt the children to refer to the number and type of corners (i.e. square corners or not) on each shape.

Main event

Video: Square Corners MAM Routine: Reason & Respond

Play the video. Whenever appropriate, allow the children to answer the questions and to give reasons for their responses, e.g. explain why or how they think this. The children make their own square corner/right angle along with the video and use this to find right angles in the classroom, on shapes, etc.

Concrete activity: Making Right Angles The purpose of the following activities is for the children to explore and create

right angles using the available resources.



It is not necessary to do all of the listed activities, so choose one or more that best suit the needs of your class, depending on the resources available. You will need teaching clocks, geoboards and elastic bands, a bot toy, sticky tape and a marker.

Teaching Clocks: Challenge the children to use a teaching clock to make right angles. Relate these dynamic angles (changing/moving, as opposed to the static angles of 2-D shapes) to making quarter, half and full turns.

Teaching tip

Other than 3 o'clock and 9 o'clock, the times that make right angles on the clock may not be ones the children can easily identify. Therefore, the focus should be on creating what looks like a right angle and then checking it with their ruler.

Let's deepen

Challenge the children to explain the relationship between making three right angles on the clock and the fraction of a turn that this makes.

Geoboards: Use a geoboard and elastic bands or a geoboard app to make shapes with right angles. Is it possible to make a shape with one/two/three/four/ five or more right angles?

Bot Toy: If a programmable bot toy is available, attach a marker to it with sticky tape. Ask:

- How can you program the bot to draw a right angle? (e.g. enter the commands: forward, turn right, forward, go.)
- What about two right angles?
- What about a shape with four right angles?

Allow the children time to explore and investigate the shapes they can program the bot toy to draw.

Pupil's Book page 64: Right Angles



Optional consolidation and extension possibilities

Location and Transformation Display What new examples could be added?

Play Search online to play interactive games, such as Tetris.

Maths Eyes Identify examples of right angles in the classroom or local environment. Record the examples found in the Maths Journals.

Games Bank Choose a grid game to play (e.g. 'Capture the Counters!', 'Line 'em Up!' and 'Tower of 3').

Days 6 and 7, Lesson 6 Reflections

Focus of learning (with Elements)

- Discusses, models and visualises reflection of shapes (U&C)
- Completes missing reflections of shapes or images (C)

Learning experiences

Digital activity: Same But Different – Corners (2) MAM Routine: Reason & Respond

Digital activity: Reflections MAM Routines: Notice & Wonder, with Think-Pair-Share; Reason & Respond

Concrete activity: Symmetry Stations

Pupil's Book page 65: Reflections

Equipment

- Tangrams (one set per pair)
- Plastic mirrors (one per pair)
- Pentominoes, pattern blocks, and any other available
 2-D shapes (both symmetrical and non-symmetrical)
- Pegboards and pegs
- Geoboards and elastic bands
- Scissors and ruler
- Paint and paintbrushes
- Cubes (e.g. interlocking cubes)
- PCM 34

Maths language

reflection, mirror symmetry, lines of symmetry, flip

Warm-up

Digital activity: Same But Different – Corners (2) MAM Routine: Reason & Respond

This is the same resource as used in the previous lesson. Play the slideshow and ask the children to

Digital activity: Reflections MAM Routines: Notice & Wonder, with Think-Pair-Share; Reason & Respond

Display the poster. Using Think-Pair-Share, ask:

- What do you notice?
- What do you wonder?



Record the children's responses to both questions on the board. Allow the children the opportunity to respond to (agree/disagree with or query) others' responses, but do not confirm or reject any of the ideas. Note any 'wonderings' that could become the basis for a subsequent maths investigation.

Distribute a tangram set and a mirror to each pair. Ask or click to play the questions below. Whenever appropriate, ask the children to give reasons for their responses, e.g. to explain why or how they think this.

- What is the same about all of these images?
- What is different?
- What do we call the image of the shape seen in the mirror? (reflection)
- What tangram pieces look similar to this one when reflected in a mirror?
- What pieces would look different?
- If the side of the square was touching the mirror, what shape might be visible? (rectangle)
- Try it. Were you correct? Explain why.
- If the parallelogram was touching the mirror, what shape might be visible? (irregular hexagon)
- Try it. Were you correct? Explain why.
- What other shape pieces could you explore with a mirror? Try them.

Distribute pentominoes, pattern blocks or any other available 2-D shapes available (both symmetrical and non-symmetrical) to each pair/group. Ask/say:

- Using only one shape and the mirror, can you make two shapes appear? How?
- Can you make them appear a different way?

propose reasons for why the images are the same and why they are different. On this occasion, if not suggested, prompt the children to use the language of 'right angles', or 'not right angles'.

Main event

- Can you make only one shape appear? How?
- Is it a different shape? If yes, what shape has now appeared?
- Can you place the mirror on the shape so that the reflection matches the other half of the shape?
- If you can do this, we can say that this shape has a line of symmetry. Which shapes have lines of symmetry?
- Are there any shapes that have more than one line of symmetry? Which ones? Where are the lines of symmetry?

Concrete activity: Symmetry Stations

Organise the class into four or five groups, depending on numbers. Choose four or five of the activities below, depending on the children's needs and the available resources, and allocate an activity to each group. After an appropriate amount of time (e.g. 10–20 minutes), the groups rotate to a new station. These stations could be used on just one day or over both days. The full instructions for each activity are available on PCM 34: Symmetry Stations. The PCM can also be printed and cut up so that the instructions for each activity are available at the appropriate station. (If setting up stations is not feasible, do one or more activities with the whole class at the same time.)

- Station 1 Cutting and Folding 2-D Shapes.
 Equipment needed: 2-D shapes, paper, scissors and ruler for each child.
- Station 2 Pentomino Pieces. Equipment needed: pentomino pieces, paper/copy and ruler for each child.
- Station 3 Pegboard Symmetry. Equipment needed: mirror, pegboard and pegs for each pair.
- Station 4 Pattern Blocks Symmetry. Equipment needed: mirror, pattern blocks and MWB per pair.
- Station 5 Geoboard Symmetry. Equipment needed: mirror, geoboard and elastic bands per pair.
- Station 6 Symmetrical Art. Equipment needed: paper, paint and paintbrush for each child.

Unit 9: Location and Transformation



Pupil's Book page 65: Reflections



Let's strengthen

The children may benefit from the ongoing support of mirrors for all of these activities.

Let's deepen

Challenge the children to justify how they know their mirror image is accurate without using a mirror.

Optional consolidation and extension possibilities

Location and Transformation Display What new examples could be added?

Story *Let's Fly a Kite* by Stuart J. Murphy, which is about two squabbling siblings learning about symmetry when their babysitter helps them build and fly a kite.

Play Use some online interactive resources, including pattern block or geoboard apps, to create a symmetrical pattern:

edco.ie/33xy

edco.ie/9a6p

Integration Art: construction, print, painting, drawing various symmetrical shapes, completing reflection images; History: feasts and festivals, looking for lines of symmetry in art, images and patterns associated with various cultural feasts, e.g. Hanukkah and the menorah, Diwali and rangoli patterns.

Games Bank Play 'Mirror Patterns', using the ten frames.

Equipment

Pentominoes, tangrams, pattern blocks, and any other available 2-D shapes

Day 8, Lesson 7

What Move?

Focus of learning (with Elements)

- Discusses, models, visualises and predicts reflection, rotation and translation of objects, images and shapes (U&C)
- Reasons about alternative ways to perform the same transformation (R)

Learning experiences

- Digital activity: How Was It Moved? MAM Routines: Concept Cartoon, with Think-Pair-Share
- Video: Transformation MAM Routine: Reason & Respond
- C Concrete activity: Moving Shapes
- Pupil's Book page 66: What Move?

Maths language

slide/translation, turn/rotation, flip/reflection

Warm-up

Digital activity: How Was It Moved? **MAM Routines: Concept Cartoon,** with Think-Pair-Share

Display the Concept Cartoon and, using Think-Pair-Share, ask the children the following questions, and to give reasons for their answers where appropriate:

- What do you notice?
- What do you wonder?

Click to hear the characters propose their ideas and, using Think-Pair-Share, ask:

What do you think?

as appropriate.

D Video: Transformation

MAM Routine: Reason & Respond

Concrete activity: Moving Shapes

Play the video, pausing when suitable to allow

children to respond, giving reasons for their answers

- (Point to a specific character.) Do you agree with their idea? Explain why?
- Do you think something different? What do you think? Why do you think this?

If appropriate, record the children's responses to these questions on the class board. Allow the children the opportunity to respond to (agree/ disagree with or guery) others' responses, but do not confirm or reject any of the ideas.

Main event

Afterwards, ask the children:

- Was it easy to work out how the shapes were moved?
- Were there any shapes that made it easier or more difficult to work out how the shapes were moved? Which ones?
- What is it about these shapes that made them easier/difficult?

Teaching tip

It can be more difficult to identify how a regular shape (e.g. circle, equilateral triangle, square, regular hexagon) was moved than an irregular shape.

🕑 Pupil's Book page 66: What Move?



Optional consolidation and extension possibilities

Location and Transformation Display What new examples could be added?

Play Use any of these online interactive resources to experiment with creating, rotating, flipping and sliding digital shapes:



edco.ie/9a6p

Games Bank Play 'Mirror Patterns'.





Distribute the available shapes to the children, including pentominoes, tangrams, pattern blocks, if available. Instruct the children to each trace around a shape (e.g. in their

Maths Journals), to move it (i.e. flip, turn or slide it, in their own chosen direction/amount), and then trace around the shape again, filling in the shape in its 'after position'. Ask the children to describe and/or write underneath how the shape was moved.

Let's deepen

The children could also work in pairs. Child A moves a shape and records how it was moved but then covers up (e.g. with a sticky note) how the shape was moved. Child B tries to work out how the shape was moved before removing the sticky note to reveal the answer.

Day 9, Lesson 8 Tessellations

Focus of learning (with Elements)

- Explores and creates simple tessellations (U&C)
- Explores tessellations where a single shape is repeated (A&PS)
- Examines tessellations and identifies if shapes have been reflected, rotated and/or translated (U&C)

Learning experiences

- Digital activity: Same But Different Moving Shapes MAM Routines: Reason & Respond, with Think-Pair-Share
- Concrete activity: Exploring and Creating Tessellations
 - Concrete activity: Solving Tessellating Puzzles
- Pupil's Book page 67: Tessellations

Equipment

- Pentominoes, tangrams, pattern blocks, and any other available 2-D shapes (both tessellating and non-tessellating)
- PCM 33

Maths language

• tessellate, tessellations, cover, without gaps, repeat

Warm-up

Digital activity: Same But Different – Moving Shapes MAM Routines: Reason & Respond, with Think-Pair-Share Play the slideshow and ask the children to propose reasons for why the images are the same and why they are different.

Main event

Concrete activity: Exploring and Creating Tessellations



The purpose of the following activities is for the children to explore and create

tessellations using the available resources. Distribute pentominoes, tangrams, pattern blocks and/or assorted 2-D shapes to the class.

Shapes that Do/Do Not Tessellate: Tell the children to use pattern blocks, pentominoes, tangrams or 2-D shapes to cover the surface of a copy or book. Ask:

- (Use several shapes of the same type and size.) Which of these shapes tessellate? Explain why.
- What shapes do not tessellate? Explain why.
- Is there any shape that does not tessellate with itself but does tessellate with a different shape?
- Put some identical shapes in a row all facing the same direction. Do they tessellate if you slide them together? (For example: In pattern blocks the squares, hexagons, parallelograms can all be slid together to tessellate.)

 If not, can they be turned/rotated or flipped to tessellate? (For example: In pattern blocks the half hexagons/trapezoids and triangles must be moved through a half turn or flipped up/down to tessellate.)

The children could also create drawn tessellations in their Maths Journals by tracing around shapes, moving them and re-tracing them. Ask the children to identify which drawn shapes are examples of a slide, flip or turn.

Concrete activity: Solving Tessellating Puzzles It is not necessary to do all of the listed activities, so choose one or more that best suit the needs of your class, depending on the resources available.

Zoo Animals: The children use the tangrams, pentominoes and/or pattern blocks to complete puzzles of zoo animal representations and/or to create their own representations of zoo animals. PCM 33: Shape Animals contain various puzzles that can be completed.

Let's deepen

Challenge the children to create their own puzzles, i.e. to make a picture, trace the outline only and challenge another child to complete their puzzle.

Digital Zoo Animals: There are many free online games and puzzles that can also be used.

For tangrams, go to the links below and choose to complete any one of the given puzzles, some of which include zoo animals:

- (Choose animal options at the bottom of the screen.) edco.ie/fyha
- For pentominoes, go to: edco.ie/fr2r

For pattern blocks, go to the links below and choose to complete any one of the given templates, some of which include zoo animals:

- edco.ie/y8hb
- edco.ie/498h
 edco.ie/w5tk
- Pupil's Book page 67: Tessellations



Optional consolidation and extension possibilities

Location and Transformation Display What new examples could be added?

Integration Art: creating tessellations and tessellating images; looking and responding to the art of M.C. Escher.

Play Use some online interactive resources, such as Tetris.

Games Bank Choose a game to play.

Home/School Links Book Page 24 can be completed any time after this lesson.

Day 10, Lesson 9

Review and Reflect

Focus of learning (with Elements)

Reviews and reflects on learning (U&C)

Warm-up

Carry out a warm-up activity of your choice from one of the lessons in this unit.

Main event

Use this menu of activity ideas to choose how best to structure this last lesson of the unit to suit your needs and the needs of your class.

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Let's talk!	Let's play!	
Classroom poster: Review and Reflect Use Think-Pair-Share alongside the prompt questions to review the unit. Individual children could present examples of their own drawings/work/constructions to the class, and talk about what they have learned.	 Play or use some of the online digital resources referenced in the unit, including Tetris. Play Capture (a grid game); see Home/School Links book page 27. 	
Maths language	Let's create!	
Ask the children to explain the following terms, perhaps using examples or drawings on their MWB: bird's-eye (aerial) view, street view, journey, route, full turn, half turn, quarter turn, clockwise, anti- clockwise, rotation, rotate, square corner, right angle, tessellate, reflection/flip, mirror symmetry, lines of symmetry, flip, slide/translation. Use the Unit 9 Maths Language Cards to revise key terms. For example: if the image and text are cut apart, can the children match them? Complete the My Maths Fact File on pages 126 and 127 of the Pupil's Book.	 STEAM activities combining maths and art: There are lots of visual arts activities that explore these concepts, for example: Symmetrical art: Provide each child with half a picture of their own face (or a celebrity's face) and ask them to draw the other half. Tessellations: Create a tessellating picture, using geometric shapes. Search online for other activities that would suit your class. 	
Progress Assessment Booklet	Maths eyes	
Complete Questions 37–40 on pages 18–19. Alternatively, these can be left to do as part of a bigger review during the next review week.	 Go for a walk around the school. Where can you see examples of right angles, tessellations, reflections/mirror symmetry? Take photos to record them. Make a map of the yard/playground or school. You could use Google Maps and street view to help you. 	
Let's strengthen	Let's deepen	
Identify children who might benefit from extra practice with some of the key concepts or skills in this unit. Use the Unit 9 Let's Strengthen PCM. Consult the Unit 9 Let's Strengthen Suggestions for Teachers.	Use the Unit 9 Let's Deepen PCM.	


