Reasoning in the classroom

Ambulance

Support materials for teachers

Year 6

Llywodraeth Cymru
Welsh Government

Year 6 Reasoning in the classroom – Ambulance

These Year 6 activities bring together different aspects of shape, space and number.

Activity 1

Ambulance

Learners use their understanding of reflection to explain why an ambulance has text that is written the 'wrong' way.

Includes:
- Ambulance question
- Markscheme

Activity 2

Kaleidoscope

They continue with the theme of reflection, as well as using angle and simple constructions, to create kaleidoscope patterns.

Includes:
- Explain and question – instructions for teachers
- Whiteboard – Kaleidoscope 1
- Whiteboard – Kaleidoscope 2
- Whiteboard – Kaleidoscope 3

Activity 3

999 and counting

They explore and create 'magic squares'.

Includes:
- Explain and question – instructions for teachers
- Whiteboard – Magic square

Reasoning skills required

Identify

Learners transfer their mathematical skills to a variety of contexts, making their own decisions about what to do and how to do it.

Communicate

They explain their methods and their findings.

Review

They use checking strategies and peer-mark one another's work.

Procedural skills

- **Reflection, symmetry**
- **Angle facts**
- **Angle measurement**
- **Simple construction**
- **Four rules of number**

Numerical language

- **Reflection**
- **Symmetry (line of symmetry), mirror image**
- **Angle, right angle**
- **Horizontal, vertical**
- **Sum to**

Ambulance

Activity 1 – Ambulance

Outline

This short Year 6 activity focuses on a key element of numeracy – the ability to communicate effectively.

You will need

Q

Ambulance question
One page for each learner

M

Markscheme

Ambulances have **AMBULANCE** not **AMBULANCE** on the front.

Why?

1m
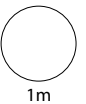
Activity 1 – Ambulance – Markscheme and exemplars

Marks	Answer
1m	Gives an explanation, or implies, both driver(s) and mirror(s), e.g. • So drivers can see the word ambulance in their mirror • So that when you are in your car you see it the right way when the ambulance is behind (mirror implied)

◄ **Do not accept partial explanations, e.g.**
- **So drivers can see it**
- **Because of the mirror**

Correct; **1 mark**

- This learner shows understanding, even though ambulance is spelt incorrectly!

The person in the car sees the reflection in the mirror and knows what it is because it is important

Correct; **1 mark**

- The 'person in the car' implies the driver.

If my mum was driving and an ambullence roared up behind her she needs to now it is an ambullence because she plays musick very loud.

Correct; **1 mark**

- The inclusion of 'behind her' implies the use of a mirror.

Because it reflects

Incomplete; **0 marks**

- Although this learner may understand the situation, they have not communicated why reflection is needed.

It is like POLICE so my dad can see it because he drives too fast.

Incomplete; **0 marks**

- This learner makes no reference, explicit or implicit, to the mirror.

Kaleidoscope

Activity 2 – Kaleidoscope

Outline

This activity continues the theme of reflection introduced within **Activity 1 – Ambulance**. Learners create their own kaleidoscope patterns, using their knowledge of angles and symmetry.

You will need

WB   **Whiteboard – Kaleidoscope 1**

WB   **Whiteboard – Kaleidoscope 2**
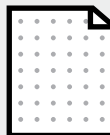
WB   **Whiteboard – Kaleidoscope 3**

Each pair will need:

A protractor/angle measurer

Drawing equipment, including coloured pens

Square-dotty paper

Triangular-dotty paper

Templates for both types of paper are freely available on the web, e.g. www.mathsphere.co.uk/resources/MathSphereFreeGraphPaper.htm

Activity 2 – Kaleidoscope

Explain

Show **Kaleidoscope 1** on the whiteboard and ask learners to talk about what they see. If necessary, prompt them to think about symmetry and ask how many lines of symmetry there are. *(Two – one horizontal and one vertical)*

Ask how many of them have seen a kaleidoscope. How do they work? Talk about the use of mirrors and that what we see are reflections. Show **Kaleidoscope 2** and explain that this kaleidoscope has two mirrors. Discuss how the other parts of the kaleidoscope are reflections.

Give each pair a piece of square-dotty paper. Ask them to create their own kaleidoscope patterns. Tell them that they must be accurate so they will need to take care. *(This activity could be completed at home.)*

Finally show **Kaleidoscope 3** and explain that this time the two mirrors are not at right angles. Their task is to decide in their groups the angle between the mirrors, then they are going to construct a kaleidoscope pattern of their own that shows this 'six-pattern'. This time, learners need triangular-dotty paper (isometric paper) rather than square-dotty paper and they will need a protractor/angle measurer.

Question

- Are you confident in reflecting your pattern both vertically and horizontally? Which way do you find easier? Why?

- Why is it better to work with a pencil than pen? And why should your pencil be sharp?

- Have you checked your kaleidoscope pattern is correct? How can you tell when you have made a mistake?

- For the six-pattern, what is the angle between the mirrors? *(60°)* How did you work it out? *(There are 360° in a complete circle, and 360 ÷ 6 = 60°.)* What would the angle be for an eight-pattern? *(45°)* Or . . . ?

- When you are using a protractor/angle measurer, how do you know which scale to use – the inside or the outside?

- Now that you have completed your kaleidoscope patterns, is there anything you would change? Why?

Ambulance

999 and counting

Activity 3 – 999 and counting

3	1	2
1	2	3
2	3	1

Outline

This activity connects (loosely) with the theme introduced in **Activity 1 – Ambulance** by focusing on the number 999.

Learners find a magic square that sums to 999, then create their own magic squares for other pairs/groups to solve.

You will need

WB   **Whiteboard – Magic square**

Activity 3 – 999 and counting

Explain

Ask what telephone number is used for the emergency services in the UK *(the likely response is 999, but 112 is also used)*. Tell learners that 999 was first used in 1937 and every year the Welsh Ambulance Service takes over 285 000 emergency calls for ambulances *(source www.ambulance.wales.nhs.uk)*. Tell them you are going to use the number 999 in a different way – to make a magic square.

Show **Magic square** on the whiteboard. Ask learners to add each row, column and diagonal. Agree that they all sum to 6 and write 'magic number 6' next to the grid.

Next, in the blank grid below, write this magic square:

Ask them to check the square is 'magic' then write its magic number *(the sum, 15)* next to the grid.

5	4	6
6	5	4
4	6	5

Circle the centre number in both grids and ask learners to compare each centre number to the magic number for that square *(the sum)*. What do they notice? *(3 × the centre number = the magic number)*

Now ask them in their pairs/groups to make their own magic square. It must have 9 as its magic number. Share results – there should be different solutions. *(Encourage learners to think flexibly and also to consider rotations/reflections. Are these the same or different?)*

Now ask them to create a magic square that has a magic number of 999. *(The easiest way to do this is to multiply each entry within the 9 magic square by 111 – but let them work that out for themselves!)*

Finally, tell learners that they are going to create their own magic squares, deciding for themselves what the magic number should be. Pairs/groups can swap work and check solutions.

Question

- Which is your favourite magic square? Why?

- Was finding the magic square with 999 as its magic number more difficult than the earlier magic squares? Why/why not?

- Why is it important to check your work?

- When you made your own magic square(s), how did you decide what the magic number should be? Could it be 16? Or 11? Or . . . ? *(Using whole numbers, the sum must be a multiple of 3, to allow for a whole number in the centre.)*

Extension

- Learners create magic squares with 0 as its magic number *(This forces the use of negative numbers.)*

3	1	2
1	2	3
2	3	1