POINTZERO: TRAPPED

These activities are designed for 60-minute lessons. You may need to adapt the materials for use in longer or shorter lessons.

INTRODUCTION

In this activity, pupils are presented with a tiling pattern to copy.

This activity is mainly ICT based. It has been designed for use with pupils in an ICT suite although it could be adapted for use in a maths classroom equipped with a data projector and whiteboard. It is suggested that pupils work together in pairs or small groups to encourage appropriate levels of participation and discussion.

The activity contains 3 options offering varying degrees of challenge. Different pupil pairs or groups within a class can work at different options. Alternatively, you may prefer to ensure each group has a mix of pupils. This will help to create appropriate conditions for peer support.

Completing an option unlocks a code which can be used when the user enters the PointZero building to reflect their progress. **Please note that these codes are not automatically saved if the user logs out**. Remind users to make a note of any codes they receive as they progress.

Each option is represented within the activity by different named floors:

- **Option 1 (Modern Floor):** A simple two-coloured tile is used to create the design. Reflection is used. This option is for pupils working at **level 4 of the National Curriculum**.
- **Option 2 (Renaissance Floor)**: A more complicated, three-coloured tile is used to create the design. Vertical and horizontal reflection are used. This option is for pupils working at **levels 4 and 5 of the National Curriculum**.
- **Option 3 (Medieval Floor)**: A three-coloured tile is used to create the design. Reflection and rotation are used. This option is for pupils working at **level 5 and above of the National Curriculum**.

LEARNING OBJECTIVES

Modern Floor

By the end of the lesson pupils will:

- recognise where a shape will be after reflection where the shape is parallel to the mirror line.

Renaissance Floor

By the end of the lesson pupils will:

- recognise where a shape will be after reflection where the shape is parallel to the mirror line.

Medieval Floor

By the end of the lesson pupils will:

- recognise and visualise the transformation of a 2d shape in cases such that:
    - the shape is parallel to the mirror line;
    - rotation is about the centre of the shape and is by 90º either clockwise or anticlockwise or is 180º.

LEARNING OUTCOMES

Modern Floor

Most pupils will:

- copy a tiling design created by a two-coloured, square tile that has been reflected in a single mirror line parallel to one of the tile edges.

Renaissance Floor

Most pupils will:

- copy a tiling design created by a three-coloured square tile that has been reflected in a choice of 2 mirror lines, parallel to the edges of the tile.

Medieval Floor

Most pupils will:

- copy a tiling design created by a three-coloured square tile that has been transformed by:
    - reflection in a choice of 2 mirror lines, parallel to the edges of the tile;
    - rotation about the centre of the tile of 90º either clockwise or anticlockwise or 180º.

NATIONAL CURRICULUM OBJECTIVES

Ma3 Shape, Space and Measure

Using and applying shape, space and measure

1) Pupils should be taught to:
   b) select and combine known facts and problem-solving strategies to solve complex problems
   d) interpret, discuss and synthesise geometrical information presented in a variety of forms.

Transformations and coordinates

3) Pupils should be taught to:
   b) recognise and visualise rotations, reflections and translations, including reflection symmetry of 2-D and 3-D shapes, and rotation symmetry of 2-D shapes; transform 2-D shapes by translation, rotation and reflection, recognising that these transformations preserve length and angle, so that any figure is congruent to its image under any of these transformations.

Links to the revised Programme of Study for introduction in 2008 include:

1 Key Concepts

Creativity

b) Using existing mathematical knowledge to create solutions to unfamiliar problems.

2 Key Processes

Representing

Pupils should be able to:

a) identify the mathematical aspects of a situation or problem
b) choose between representations.

Analysing
Pupils should be able to:
c) visualise and work with dynamic images
d) identify and classify patterns.
k) make accurate mathematical diagrams, graphs and constructions on paper and on screen.

3 Range and content

Geometry and measures
The study of mathematics should include:
d) transformations.

4 Curriculum opportunities

The curriculum should provide opportunities for pupils to:
f) work collaboratively as well as independently in a range of contexts
g) become familiar with a range of resources, including ICT, so that they can select appropriately.

LESSON PREPARATION

- If this is the first time you have accessed the case study, familiarise yourself with the story of PointZero.
- Go through the 3 options in order to ascertain the correct level for your pupils.
- If you are using response cards rather than mini-whiteboards for the starter activity, create a set of ABCD response cards for each pupil. It can be helpful for each letter to be on a different coloured card to enable you to see more easily which pupils have the correct response. Some response cards have been done for you, which can be downloaded from the Teacher 'Support Materials' area in the PointZero case study.
- Arrange for the starter and plenary activities to be displayed to the whole class, either using a data projector or an overhead projector. To successfully display coloured images using an overhead projector, print the images onto the transparency paper recommended for your colour printer.
- Arrange for pupil access to computer facilities for the main part of the activity. Ensure the PointZero case study is available on each computer.
- Print out sufficient copies of the homework sheet.
- You may wish to create a certificate of achievement to award to pupils that perform well in the activity.

Vocabulary

Reflection, mirror line, rotation, 90º, 180 º, 270 º, clockwise, anti-clockwise, vertical, horizontal, symmetry, transformation.

Materials required:

Starter
- Mini-whiteboards, pens and erasers OR individual cards with A, B, C & D on them.
- Teacher access to a computer and projector or overhead projector and transparencies.
- Microsoft PowerPoint

Main
- Access to computers and the PointZero case study – either in pairs or small groups.

Plenary

- Mini-whiteboards (optional), pens and erasers.
- Access to computer and projector or overhead projector and transparencies.
- Microsoft PowerPoint

Classroom set-up

- Pupils should work individually for the starter activity and either with a partner of similar ability or individually once they begin the main activity on computers.
- If the computers are in a separate room to the normal classroom, then either the starter and plenary activity can be carried out in the usual classroom and the pupils taken to the computer room for the main activity, or the entire lesson can be conducted in the computer room, with pupils working away from the computers for the starter and plenary sessions.

Prior knowledge and skills

Modern Floor tasks:
- Pupils should recognise a shape that has been reflected in a single mirror line.

Renaissance Floor tasks:
- Pupils should recognise shapes that have been reflected in mirror lines parallel to the sides of the shape.

Medieval Floor tasks:
- Pupils should recognise and distinguish between shapes that have been reflected in any mirror line and shapes that have been rotated by 90º, 180º and 270º.

LESSON DETAILS

Starter

The same task for each option.

Pupils attempting the Modern Floor and Renaissance Floor options can use the 'Tiling Reflections' presentation. Use the 'Tiling Transformations' presentation for pupils working on the Medieval Floor activity.

Aims
Modern Floor: to remind pupils about simple reflection
Renaissance Floor: to remind pupils about reflection
Medieval Floor: to remind pupils about reflection and rotation

- Pupils should have a mini-whiteboard each OR a set of ABCD cards.
- Using either the presentation provided or the content displayed to the whole class using an overhead projector, show the first problem.
- Ask pupils to think carefully about which image is the reflection of the shape on the left but not to call out or show their response until they are told to.
- Pupils should either write their response on a mini-whiteboard OR select response A, B, C or D from their set of response cards.
- Give pupils a few moments to think about their answer and then ask them to hold up their response.
- For subsequent problems, pupils could be asked initially to show the letter of an answer that it definitely can't be. The teacher can then select individuals to explain their reasoning, which will help any pupils who are struggling to understand the content.

Main

Before moving to the computers and opening up the activity in PointZero:

- If this is the first time pupils have seen PointZero go through the story on the first screen and ask pupils what they think may happen. On the next screen, ask pupils to select the activity **'Trapped'**.
- It may be useful to show the pupils the screens they can expect to see and showing them how to choose the option appropriate for them.

Each task requires pupils to copy a 4 by 6 tiling pattern which is created using a specific tile and certain transformations.

Whilst pupils are working on the computer tasks:

- Some pupils may need support to identify whether a rotation or reflection is needed. A single tile and a mirror can be used to help.
- Pupils should be discouraged from using trial and error to complete the activity. You should remind them that they are penalised for having a high number of attempts. This penalty is specified in the code that is awarded to them at the end of the activity.

It is recommended that pupils begin on either Modern Floor or Renaissance Floor to familiarise themselves with the task and then move on to Medieval Floor to challenge their mathematics and problem-solving skills.

At the end of the task pupils are automatically given a code which reflects how well they completed the task. This code will be entered in the 'PointZero' area of the game. It is recommended completing the other two activities (Lost and Confined) before entering PointZero.

Plenary

*The same task for each option using the 'Tiling Patterns' presentation**.** It is suggested that 3 designs are used but more could be used if required.*

Show the pupils the tiling designs and ask which of them could be created with the given tile and the appropriate transformations.

There are three sections which correspond to the three options in the PointZero activity – Option 1 (Modern), Option 2 (Renaissance) and Option 3 (Medieval). An extension is to ask how many of the tiles are wrong.

Homework

- A homework sheet is provided for pupils to create their own tiling pattern using the tile provided.
- Pupils should be encouraged to use the transformations they have used during the lesson to create their patterns

TECHNICAL SUPPORT

Throughout all the activities and support notes you will be asked to open various files in Flash or in Adobe PDF. To use these, you will need to have the minimum specification installed. This recommendations list can be found below.

The latest **Adobe Flash Player** (previously know as the Macromedia Flash Player) can be downloaded free from the Adobe website. Support and Help can also be found on this site.

http://www.adobe.com/shockwave/download/download.cgi?P1_Prod_Version=ShockwaveFlash

You will be using a version of **Adobe Reader** or Distiller to view these Teacher Notes. If you would like help or to download a newer version, you can find information at Adobe's website:

http://www.adobe.com/products/reader/

Minimum Machine and Software Specifications

PC

P3 800MHz; 128MB RAM; Windows 2000
Screen resolution 1024x768
Browser: Microsoft Internet Explorer 5.5; Firefox 1; Netscape 7; or Opera 7
Macromedia Flash Player 7
Adobe Reader 7

Mac

G3 500MHz; 128MB RAM; OS X 10.2
Browser: Safari 1; Firefox 1; Netscape 7; or Opera 6.2
Screen resolution 1024x768
Macromedia Flash Player 7
Adobe Reader 7