Reflections & Transformations

Teachers Teaching with Technology™
Professional Development from Texas Instruments

Teacher Notes   **ACMMG181**

7 8 9 10 11 12

TI-Nspire   Assessment   Teacher   Not Applicable

ACMMG181:   Describe translations, reflections in an axis, and rotations of multiples of 90° on the Cartesian plane using coordinates. Identify line and rotational symmetries

Introduction

The purpose of this document is to provide information about the activity and assessment files included in this bundle. The activity file is not intended to cover the entire curriculum statement. There are four additional files associated with this activity:

- Reflections and Transformations Demonstration (TI-Nspire file)
- ACMMG181 (TI-Nspire file)
- ACMMG181 Assessment (PDF)
- ACMMG181 Assessment – Answers (PDF)

Reflections and Transformations Demonstration

This TI-Nspire document is designed for **teacher demonstrations** and used in conjunction with a data-projector. The TI-nspire file is an interactive document that can be used to develop concepts and introduce mathematical skills associated with curriculum standard ACMMG181.

Figure 1

Open the document with the TI-nspire software and ensure the document preview is set as "Computer" (Figure 1). To navigate pages use the page sorter option in the "Documents Toolbox" (Figure 2).

Figure 2

Page 1: Reflections (x axis)

Point P can be moved around the screen. The coordinates of point P are displayed, so too the coordinates of the reflection in the x axis. Students observe the coordinates of both points, develop conjectures and reason through the location of the reflection. The toggle (slider) provides the option to show/hide the reflection so teachers can ask students for the coordinates of the reflected point. (Figure 3)
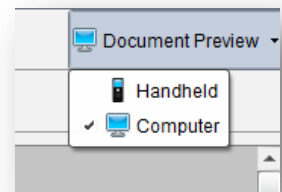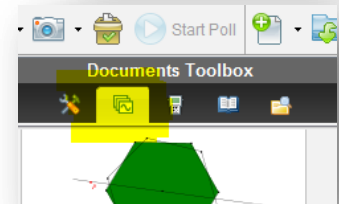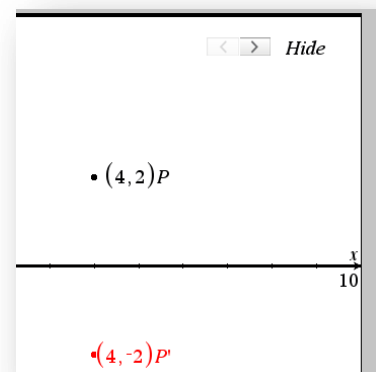

Figure 3

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Teachers using the TI-Navigator system can generate a 'quick poll' (Figure 4). Set the question type to numerical input, this question type defaults to coordinate points. With the reflected point hidden ask students to send the location of the reflected point P'. Student results can be saved to the portfolio to track learning. Repeating this process provides evidence of student progression.
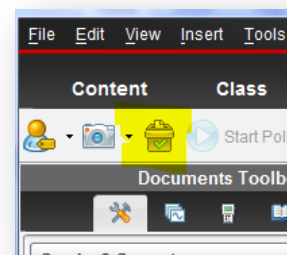
Page 2: Reflections (y axis)

This page is essentially the same as the previous with reflections occurring in the y axis.

Page 3: Reflections (x & y axes)

This page provides a *double* reflection via the x and y axes. The curriculum statement does not necessitate a double reflection, "reflection in an axis", however it is a worthwhile inclusion as students can compare a double reflection with a rotation of 180°. This type of comparison can lead to a range of extension questions:

- Is a double reflection the same as a 180° rotation for single points / shapes? (Refer Page 5 for rotation)
- Is a single reflection the same as a 90° rotation?
- Identify a set of points where a single reflection in the y axis would be the same as a rotation of 90° (clockwise)?
  Teachers using the TI-Navigator system can use the Quick Poll feature to ask this question as drop points; have each students submit a single point with the collective result from the class forming the 'family' of points.
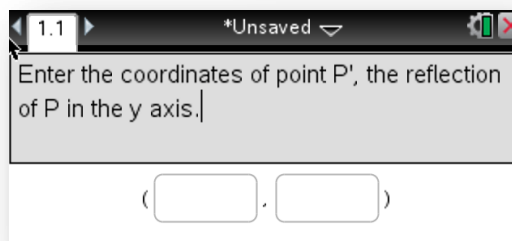
Page 4: Rotations (90° Clockwise)

This page helps deliver in a very visual manner, the rotation of a point. It does not endeavour to prove or explain how the coordinates are determined. The aim of this page is for students to develop conjectures.

It is possible to show/hide the angle or point independently so that students can see the 90° rotation with or without the angle displayed.

Page 5 & 6: Rotations (180°)
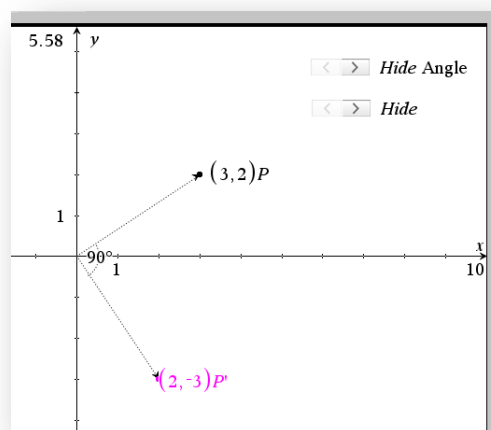
These pages are similar to Page 4.

Figure 6

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Page 7: Translations

This page translates a shape rather than a single point. It is possible to hide the shape and display only the point; however a shape has been included for several reasons.

- Students may confuse reflection and translation when a single point is used. The shape helps illustrate the differences.
- The introduction of shapes adds to teacher questioning options such as:
  - Write down the coordinates of a square with vertices (3,1), (4,1), (4,2) & (3,2) after being translated 6 units in the negative x direction?
  - Write down the coordinates of a square with vertices (3,1), (4,1), (4,2) & (3,2) after reflection in the y axis?

Page 8: Dilations

This page starts with a shape with one vertex on the origin. This helps associate dilations with enlarging or reducing images using computer software. When an object is selected on most computer software packages, dragging one of the 'handles' on a corner provides a dilation. The vertically opposite corner is anchored, in some cases the shift or control key must be held down to ensure dilation in x and y direction is uniform. (ie: Aspect ratio is maintained)

This page can be used to introduce more advanced concepts such as:

- ACMNA173:   Recognise and solve problems involving simple ratios (Year 7)
- ACMGM220:   Use the enlargement transformation to explain similarity and develop the conditions for triangles to be similar. (Year 9)
- ACMGM221:   Solve problems using ratio and scale factors in similar figures. (Year 9)

Page 9: Dilations

This is an extension of the previous page using triangles that are not 'pinned' to the origin. A useful strategy is to have students imagine the shape as a quadrilateral with one corner located at the origin.

Page 10 & 11: Axes of symmetry – Regular polygons with an even number of sides.

The shapes on these pages consist of a regular quadrilateral and hexagon. Students develop conjectures about the number of axes of symmetry and the number of sides on the shape.

Page 12 & 13: Axes of symmetry – Regular polygons with an odd number of sides.

The shapes on these pages consist of a regular triangle and pentagon. Students develop conjectures about the number of axes of symmetry and the number of sides on the shape.

Page 14: Reflections of shapes / Axes of symmetry

The triangle on this page is 'freeform' making it much harder to locate the axis of symmetry. Students can develop conjectures about what types of triangles have an axis of symmetry.

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ACMMG181 – TI-Nspire file

This TI-Nspire file assesses a selection of the content for this curriculum statement. It can be used as formative or summative assessment. The answers are currently set as "Exam" so corrections will automatically be completed when the document is collected using the TI-Navigator system.

The questions can be changed to Self-Check and distributed to students. In this case students can see if there answer is correct as soon as they complete the question.
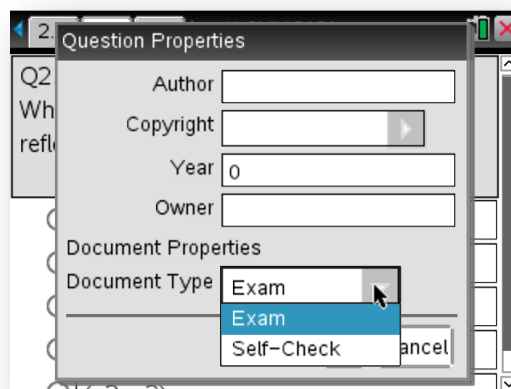
ACMMG181 – Assessment

This is a PDF containing a printable duplicate of the TI-Nspire file for use in schools where TI-Nspire software, TI-nspire calculators or TI-Nspire iPad App is not available. The test can be photocopied for non-commercial educational purposes.

ACMMG181 – Assessment Answers

This is a PDF containing a printable duplicate of the TI-Nspire file and includes answers to all the questions.

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