2-3 The Shape Investigator

Activity Page

By reading and editing code students will investigate the properties of shapes and start to understand the idea of a variable.

Subjects	Age	Roamer Expertise	Student Grouping	Lesson Time	Availability
▸ Computing ▸ Mathematics	Year 4 Year 3				

Description

This activity builds on the efforts of Computing 2-2 Getting Into Shape. In that activity students identified shapes and wrote programs to draw them. In this activity they systematically develop those skills with wider range of shapes.

1. They read code and match it to a shape
2. They find patterns in the shape
3. They learn about the repeat command
4. They use the repeat to simplify the shape code
5. They program Roamer to draw similar shapes

Objectives

Students will have the opportunity to:

1. Consolidate their understanding of similarity of shapes
2. Get some practical understanding of a variable
3. Investigate what happens when you change parameters in programs
4. Consolidate their ability to reason and predict what a program will do

Secondary Objectives

They will have the opportunity to develop their:

1. Analytical skills
2. Confidence
3. Skill as an independent learner

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Lesson Plan and Assessment

Preparation

1. Print Out Work Sheets

1. Print out one for each student
2. Print out another for each group

2. Prepare Roamer

1. Set up drawing area for each group
2. Fit pen tube holders and pens to Roamer
3. If necessary calibrate the accuracy of Roamer

Activity

1. Summarise work from Previous Activity

1. Draw a square on the blackboard
2. Working with the whole class:
   a. Get the students to write a program that would make Roamer draw the square
   b. Ask different students for each line of the code
   c. Write the program on the blackboard/whiteboard
3. Get a student to program the square into Roamer
4. Test the program in front of the whole class

2. Walk through the task

1. Hand out the worksheets to each student
2. Can a student find the program for the square (it is A)
   a. They should write A next to the Square in the worksheet

3. Match the programs to the shapes

1. Each student should individually match the programs to the shapes
2. Each group should:
   a. Review the answers of all the group members
   b. Discuss and decide a set of group answers
   c. Test their answers with Roamer

Suggested learning intentions and success criteria

Use effective questioning to get the students to verbalise the learning intentions:

We are learning how to read code and work out what it does.

Use effective questioning to get students to explain how they know when they have been successful.

We have done it when we feel these are easy questions.

4. Look for patterns in the code

1. With the whole class explore the square program and look for patterns
2. Demonstrate ways of finding a pattern
   a. Look at the shape to find similarities
   b. Look at the code for repetition
   c. Play Turtle – walk around the shape – get a feeling for a repeating movement
   d. Watch the Roamer drawing the shape – look for repeat actions
3. Establish the learning intention:
4. The students should then form their groups:
   a. Review the answers of all the group members
   b. Discuss and decide a set of Group answers

Suggested learning intentions and success criteria

Use effective questioning to get the students to verbalise the learning intentions:

We are learning to recognise patterns in code.

Use effective questioning to get students to explain how they know when they have been successful.

We know we are successful when we can work out an answer by:

Seeing a pattern in the shape

Seeing the same commands in the code

Playing Turtle

Seeing Roamer do the same things

5. Introducing the Repeat command

1. Go back to square on the blackboard/whiteboard
2. Show students how to write a repeat command
   a. The R key starts the command
   b. The brackets are like a box
   c. What you put in the box gets repeated
   d. The number is the number of times it is repeated
3. Let them experiment with the command

6. Use the Repeat command to simplify the shape code

1. Ask the children to work in their groups and re-write the shape code
2. Use Roamer to test the new code

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Suggested learning intentions and success criteria

Use effective questioning to get the students to verbalise the learning intentions:

We are learning how Repeat can make code simpler.

Use effective questioning to get students to explain how they know when they have been successful.

We are successful when we can explain how to simplify the shape code.

7. Investigating similarity

1. Go back to square on the blackboard
2. Draw a square with side length approximately 2
3. Draw another square side length approximately 3
4. Discuss with the class the what the shapes have in common
5. Test the student's ideas with the Roamer
6. Get the pupil's to draw bigger versions of the other shapes

Suggested learning intentions and success criteria

Use effective questioning to get the students to verbalise the learning intentions:

We are finding out what makes a shape similar.

Use effective questioning to get students to explain how they know when they have been successful.

We've done it when we can make Roamer draw a bigger or smaller shape.

Assessment

1. Plenary session

1. Ask each group amongst thto discuss what they learnt
2. A representative of each group should make a 1 minute presentation of their findings
3. Use effective questioning to guide students to a deeper understanding

2. Review student worksheets

1. Were the group answers consistent with the whole group answers?
2. Were students able to answer the more dificult questions?

Activity Extensions

1. Program a shape using the Repeat instruction

1. Let students experiment and draw closed shapes of their choice

Subject Comments

All these programs have lines of code that can be repeated. The main focus of the activity is giving students the opportunity to look at code and recognise repetitive patterns. The next part of the activity is the introduction of the repeat function. On average a programmer will make between 15 and 50 errors per 1,000 lines of code. Anything that reduces the amount of code increases the efficiency of the programming task. The repeat command is one way to reduce the amount of code. You will also observe that the repeat command makes the code easier to understand.

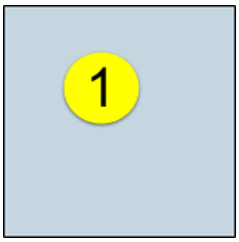
Like many Roamer challenges this activity shows the power of LOGO based materials to engage students in mathematical experiences. .This task involves students experimenting with changing numbers. They get instant feedback if they make a mistake. With LOGO debugging is not just a process of fixing something; it is a positive learning experience. The obvious mathematical connection in this activity is the idea of similar shapes. To create a similar shape all the lengths have to change and all the angles stay the same. Deviate from these two rules and the resulting shape will not be similar. This activity allows students to investigate this idea. Effectively Roamer provides a maths laboratory enabling students to explore ideas and prove concepts.

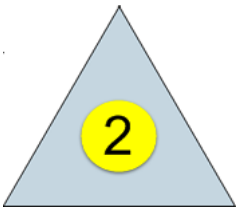
However there are other things going on in this activity. By changing the lengths of the sides students are effectively discovering the idea of a variable and consequently beginning to understand in a practical way the central idea of algebra. This is not something you would normally make explicit. But it is building experiential basis for their future maths education.

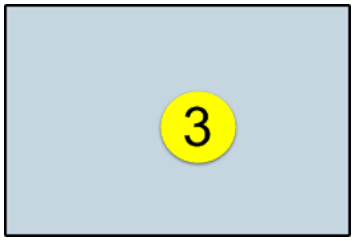
Prior Knowledge

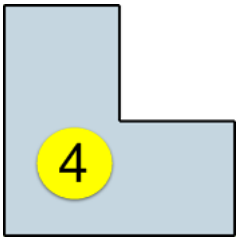
1. Students should be familiar with basic 2D Shapes: square, triangle, rectangle, etc.
2. Students should have done activity Computing 2-2 Getting into Shape

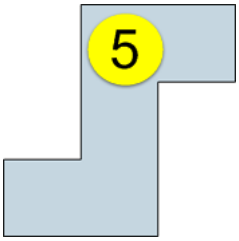
Find a program that will draw the shapes below.

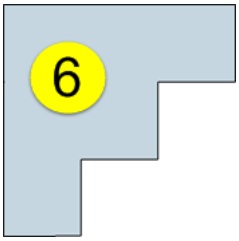












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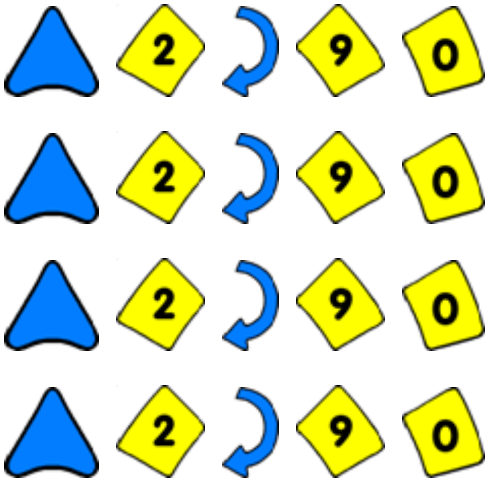
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2 9 0
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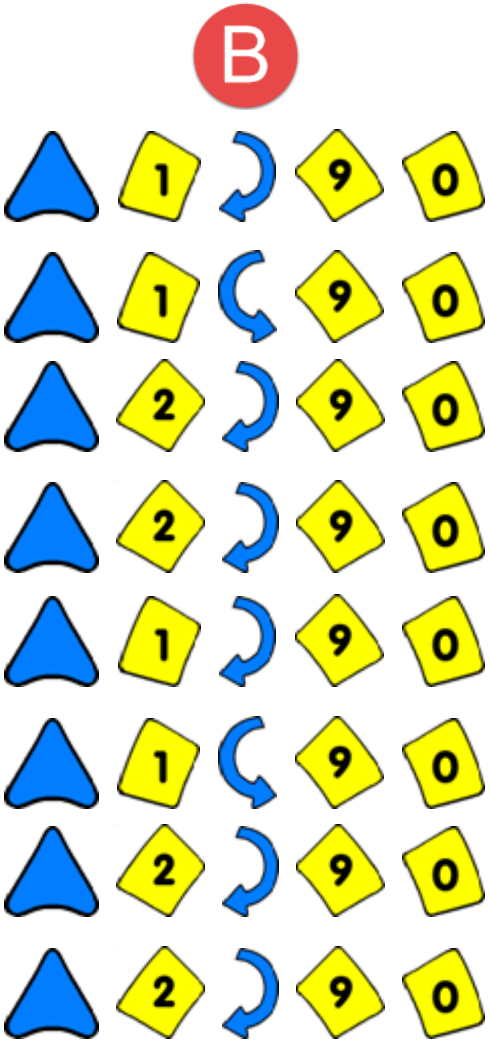
2 9 0

B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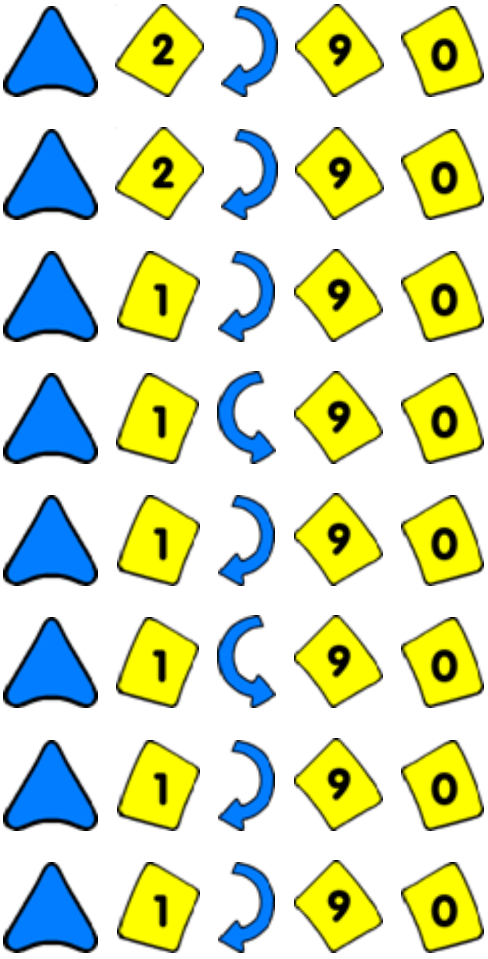
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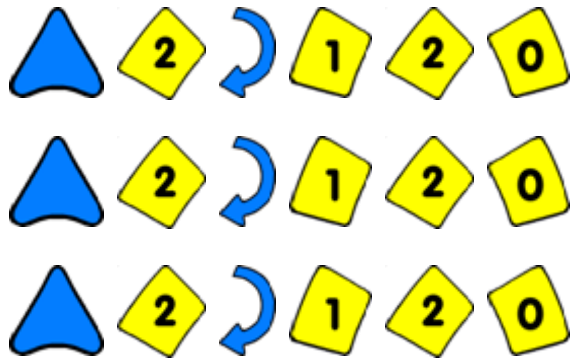

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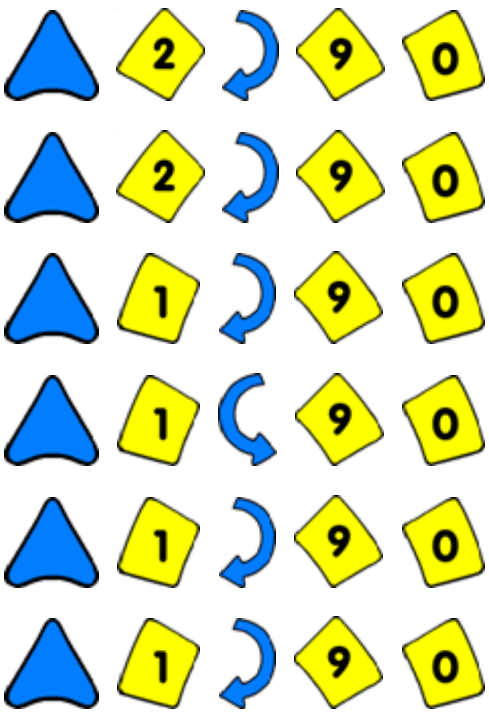

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