

# Custom Coordinates

## Content Standards and Objectives

### Content Standard 2: Algebra (MA.S.2)

Students will:

- demonstrate understanding of patterns, relations, and functions;
- represent and analyze mathematical situations and structures using algebraic symbols;
- use mathematical models to represent and understand quantitative relationships; and
- analyze change in various contexts

through communication, representation, reasoning and proof, problem solving, and making connections within and beyond the field of mathematics.

#### Objectives:

**10.2.6 (AM2.1, A1.6)** Analyze a given set of data for the existence of a pattern numerically, algebraically, and graphically

### Content Standard 3: Geometry (MA.S.3).

Students will:

- analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships;
- specify locations and describe spatial relationships using coordinate geometry and other representational systems;
- apply transformations and use symmetry to analyze mathematical situations; and
- solve problems using visualization, spatial reasoning, and geometric modeling

through communication, representation, reasoning and proof, problem solving, and making connections within and beyond the field of mathematics

#### Objectives:

**10.3.1 (AGP.9)** Use appropriate tools to make geometric constructions.

**10.3.3 (AGP.15)** Investigate similar figures and apply proportions in problem solving situations.

## Best Practices for Instruction and Instructional Strategies

### Activity:

In this activity, students will practice plotting points, lines and figures by entering data into a list using the TI-83 calculator and the 'Custom Coordinates' [Tree – Activity 1](#)

The script of the lesson includes:

- Introduction of “Custom Coordinates” using a [Power Point Presentation](#).
- Detailed script instructions for completing the [Sidewalk Chalk Showcase](#) using the “[Graphiti](#)” activity worksheet. Showcase Picture [1](#), [2](#), [3](#), [4](#), [5](#)
- Detailed script instructions for completing the TI-83 Custom Coordinate [Activity 1](#) and [Activity 2](#)

### Prerequisite activities:

Students will:

- review mathematical definitions and phrases: Cartesian (rectangular) coordinate system, x- and y-coordinates, axes, origin, domain, range, relations, and functions;
- plot points and lines using graph paper and pencil and the “[Graphiti](#)” activity worksheet;
- plot points using a graphing calculator;
- make simple figures using the geoboard web site. (This can also be used as an extension, depending upon the level of the students or the assignment.)

### Extensions:

Students will:

- complete a more difficult figure ( [Bell – Activity 2](#) and TI-83 calculator);
- transfer the points and lines created with the “[Graphiti](#)” activity worksheet to the sidewalk;( [Showcase](#))
- change the original coordinates to create similar figures;
- create and graph their own designs

## Using Performance Descriptors to Measure Student Achievement

### Distinguished

The student demonstrates exceptional and exemplary performance with distinctive and sophisticated application of knowledge and skills that exceeds the standard in algebra. A student analyzes a given set of data for the existence of a pattern numerically, algebraically, and graphically.

The student demonstrates exceptional and exemplary performance with distinctive and sophisticated application of knowledge and skills that exceeds the standard in geometry. A student uses appropriate tool to make geometric constructions and justifies the results.

- Students will create and graph their own custom designs. (Complex closed curve)

### **Above Mastery**

The student demonstrates competent and proficient performance and shows a thorough and effective application of knowledge and skills that exceeds the standard in geometry. A student uses appropriate tools to make geometric constructions and solves practical application problems. The student investigates similar figures and applies proportions to solve practical application problems giving solutions in a clear manner.

- Students will complete a more difficult figure (bell)
- Custom Coordinate Sidewalk Chalk Showcase - Students will use proportions to make a sidewalk grid and plot points and lines to make a pumpkin (“Graphiti” activity worksheet)
- Students will change the original coordinates to create similar figures.
- Students will create and graph their own custom designs. (Simple closed curve)

### **Mastery**

The student demonstrates fundamental course or grade level knowledge and skills by showing consistent and accurate academic performance that meets the standard in algebra. Given a set of data, the student recognizes a numerical pattern.

The student demonstrates fundamental course of grade level knowledge and skills by showing consistent and accurate academic performance that meets the standard in geometry. A student uses appropriate tools to make simple geometric constructions. The student identifies and represents basic geometric figures such as points, lines, planes, and polygons and uses basic properties of each to solve problems.

- Students will enter data into a list using the TI-83 calculator.
- Students will construct a figure (tree) using the TI-83 calculator. (Without error)

### **Partial Mastery**

The student’s basic but inconsistent performance of fundamental knowledge and skills characterized by errors and/or omissions in geometry. Performance needs further development. The student identifies basic geometric figures such as points, lines, planes, triangles, and quadrilaterals and inconsistently uses basic properties of each to solve problems.

- Students will construct a figure (tree) using the TI-83 calculator. (With error - The student may need assistance locating or correcting the error.)
- Students will plot points and lines on graph paper to make a custom symbol (pumpkin - without error)

### **Novice**

The student demonstrates substantial need for the development of fundamental knowledge and skills, characterized by fragmented and incomplete performance in geometry. Performance needs considerable development. The student recognizes some of the basic geometric figures such as points, lines, planes, triangles, quadrilaterals, and basic angle pairs.

- Students will construct a figure (tree) using the TI-83 calculator. (With error - The

student will need assistance locating the error. The student may not be able to see the pattern in the numerical data.)

- Students will plot points and lines on graph paper to make a custom symbol (pumpkin - with error. The student will need assistance locating the error.)

## **Adaptations for Diverse Learner**

Check with the special educators for any modifications or considerations for students. Students will need to learn (or review) terms associated with the graphing calculators.

### **Multiple intelligences used in this lesson:**

- **Visual/Linguistic** - creating and graphing, students design custom coordinate activity with written step-by-step instructions
- **Visual/Spatial** - making a sidewalk chalk grid, plotting ordered pairs and lines and using proportions to make a picture symbol (pumpkin)
- **Logical/Mathematical** - using the technology of the TI-83 graphing calculator
- **Musical/Rhythmical** - playing Christmas carols, O' Christmas Tree and Silver Bells that correspond to the Custom Coordinate activities as the students work
- **Interpersonal/Social** - grouping students to do the Custom Coordinate Sidewalk Showcase
- **Intrapersonal/Individual** - student created custom coordinate activity and individual pumpkin graphing worksheet
- **Bodily/Kinesthetic** - enlarging scale drawing of coordinate grid on sidewalk
- **Naturalistic** - outdoor activity on sidewalk using chalk

### **Resources for adaptations:**

#### **Student Assistance Team Manual**

West Virginia Department of Education  
Division of Instructional and Student Services

#### **The Teacher's Resource Guide**

Hawthorne Educational Services, Inc.  
800 Gray Oak Drive  
Columbia, MO 65201  
Telephone: (573) 874-1710  
Fax: 1-800-442-9509

The Center for School and Community Integration  
Institute for the Study of Developmental Disabilities  
2853 East Tenth Street  
Bloomington, Indiana 47408-2601  
Telephone: (812) 855-6508

**Integrating Curricula with Multiple Intelligences (training manual)**  
p153  
IRI/Skylight Publishing, Inc.

**Web sites:**

**LDOOnline**  
**Classroom Accommodation List**  
**Appropriate School-Based Accommodations and Interventions**

## **Integration of Technology**

### **Content Standard 3: Technology Productivity Tools**

Students will:

- Use technology tool to enhance learning, increase productivity, and promote creativity; and
- Use productivity tools to collaborate in constructing technology-enhanced models, preparing publications, and producing other creative works.

**Objectives:**

**TEC.9-12.3.2** Select and use appropriate technology tool to efficiently collect, analyze and display data that is relevant to class assignments.

For directions in using the TI-83 graphing calculator to enter data into a list and to graph data, refer to the TI-83 worksheets.

## **Instructional Materials**

Each student needs:

- “Custom Coordinate” activity worksheets
- TI-83 graphing calculator
- “Graphiti” activity worksheets  
Activity Resources Company Inc.  
PO Box 4875  
Hayward CA 94545
- Sidewalk chalk

## Web-Based Resources

### Useful web sites:

#### [Mathforum.org](http://mathforum.org)

Tools and lesson plans for prerequisite and/or similar activities such as investigating the Cartesian coordinate system using a simple plot.

#### [NCTM.org](http://nctm.org)

The National Council of Teachers of Mathematics web site has dozens of resources. Look under chapter seven of the standards for lessons in specifying locations and describing spatial relationships.

#### [Matti.usu.edu](http://matti.usu.edu)

A web site devoted to virtual manipulatives, the virtual geoboard is a fun way for students to construct lines and figures.

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