Exceptional Learners Differentiated Lesson Plan in a Core Subject Area

Curriculum Area: Mathematics - Space and Shape	Authors: Jessica Marks and Elizabeth Godfrey
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Prior Knowledge:
In previous lessons, students will have explored Cartesian planes in detail and will be comfortable plotting and identifying points on a Cartesian plane and performing simple transformations (such as rotations, reflections, and translations). This lesson will provide students with an opportunity to create a comprehensive review that will be shared with their classmates in the next activity to help them prepare for the upcoming unit test.

| **Time Required: 50 minutes**

→ **5 min explain class agenda**
→ **5 min to group**
→ **15 min to brainstorm and present vocabulary**
→ **5 min to choose activity and group**
→ **20 min to prepare choice activity** | Instructional Groupings:
→ First grouping: triads - one student will be given an X coordinate (ex. x=2), the second will be given a Y coordinate (ex. y=5), and the third will be given the corresponding ordered pair (ex. (2,5). The students whose x and y coordinates form an ordered pair will make a group
→ Second grouping: when choosing their activity from the Choice Board, the students will group themselves according to their interests (ie. the activity chosen) |

Curriculum Outcomes/Standards:
Identify and plot points in the four quadrants of a Cartesian plane using integral ordered pairs (SS4); Perform and describe transformations (translations, rotations or reflections) of a 2-D shape in all four quadrants of a Cartesian plane (limited to integral number vertices) (SS5)

Materials:
Choice Board - pre-assembled by teacher
First Grouping Strategy - cards for each student with the appropriate coordinate or ordered pair
Choice Activity - paper (lined and blank), graph paper, construction paper, masking tape, markers, pencil crayons, pens, pencils, musical instruments (bring own/ create/use objects in class), string, costumes (bring own/create)

Overview/Purpose:
To have the students create a review based on the identification and plotting of integral ordered pairs on the Cartesian plane.

What and how will I differentiate:
This lesson has been designed with multiple intelligences in mind. To try to incorporate all learning styles, the students will work in groups or alone, will present and have the choice to do an activity that pertains to their dominant sense of learning and interests.*

As a result of this lesson/unit students will:

Understand:
Have a better understanding of Cartesian planes, how to use them and the vocabulary associated with this topic

Know: How to recognize and plot points on a Cartesian plan, perform	**Do:** Will create a review activity for their classmates using their knowledge of Cartesian planes

transformations such as rotations, reflections, and translations, and be able to use the appropriate vocabulary when discussing Cartesian planes.	

Pre-Assessment:

As a review from the previous lessons on Cartesian planes, the students, once grouped in triads by their ordered pairs, will be given a vocabulary word that pertains to Cartesian planes (ex. ordered pair, origin, x-axis, y-axis, quadrant 1,2,3,4, scale, etc.). Each group will then be given 5 minutes to brainstorm an explanation. Next, each group will present to the class a brief description of the vocabulary word they were given and will place it in the appropriate location on a Cartesian plane located on the front board. Other students will take notes from each presentation to facilitate their revision. This activity will allow the teacher to check for understanding and to clarify any misunderstandings. This activity will appeal to interpersonal learners.

Steps in the lesson:

1. Choose an activity from the choice board
2. Group according to the activity chosen
3. Create and design the review activity; be prepared to share with the class next day

Wrap up/Post-Assessment:

This activity will be used as a means of assessment for the next class. The students will present their choice review activities to the class and have the class try them.
To sum up the review, we will have a discussion about this topic and synthesis questions will be given to the students.
→ Examples of synthesis questions:
1. Are Cartesian planes used in real world settings? How?
2. If you were to explain Cartesian planes to someone, how would you do so?

Evaluation:

For this class, collaboration and cooperation will be part of the participation mark. Also, with the presentation of the vocabulary word, and by observing and asking questions, this lesson allows for an informal formative assessment of the students' knowledge of Cartesian planes. For next class, there will be participation marks for the presentation of and participation in the activities. Also, each presentation will be marked according to a checklist (see below) that will be given to the students prior to the activity; this ensures that students have incorporated the necessary and appropriate vocabulary and knowledge of Cartesian planes.

Resources: NB Curriculum Documents

* This lesson has been differentiated in order to meet the needs of diverse learners. Although differentiation was not made according to one specific exceptionality, the level of interest-based choice in this lesson will appeal to all learners. A student with ADHD, for example, will choose an activity based on their interests which will help them to maintain focus during the activity. Similarly, a student with a learning disability in reading/writing may choose a bodily-kinesthetic/spatial activity to best represent his/her understanding. Finally, students with physical disabilities have a variety of options that allow them to actively participate in this lesson.

Teacher Resources and Materials:

Presentation Checklist

Criteria	Did they present these concepts, show this knowledge?	Points Value
Demonstrate proper use of the vocabulary corresponding to Cartesian planes.		/10
Demonstrate an understanding of key concepts surrounding Cartesian planes.		/10
Make connections between the activity and the material being reviewed.		/5
Provide insight into the practical use of Cartesian planes.		/5
Demonstrate unique and creative activities to synthesize information.		/5
Total (General Comments)		/35

Cartesian Planes Review - Choice Board

Choose one activity from each level below to help you make sense of the information we are studying.

Topic/Concept: _____

Create a Handout

Design an assessment for your classmates on Cartesian planes. Be sure to accommodate multiple learning styles and provide an answer key.

Logical Mathematical

Create a Game

Design a game that could be used to assess your classmates understanding of Cartesian planes. You may consider incorporating aspects of games such as battleship, hopscotch, snakes and ladders, mazes, etc.

Spatial/Bodily Kinesthetic

Create a Song/Rap

Write the lyrics to a catchy song or rap that could be used to facilitate your classmates' revision. Be sure to include the essential vocabulary from the unit and remember that repetition is key.

Musical/Verbal linguistic

Create a Drawing

Create a drawing by plotting points in each of the four quadrants of a Cartesian plane. Record the sequence of ordered pairs and have other students find the hidden image!
(Similar to Connect the Dots)

Spatial

Write a Story/Poem

Write a story or poem that describes a journey across a Cartesian plane that could be traced/ plotted by your classmates. Be sure to include details such as direction and distance travelled (North, South, East, West; 1 block, 2 blocks, 3 blocks) and location with respect to key points such as the origin, and the x and y axis.

Verbal linguistic/Intrapersonal

Create a Dance!

Choreograph a dance for your classmates to perform on a giant Cartesian plane. Be sure to incorporate transformations such as reflections, translations, and rotations. The dance can be done in pairs or individually. Record the necessary steps on a Cartesian plane.
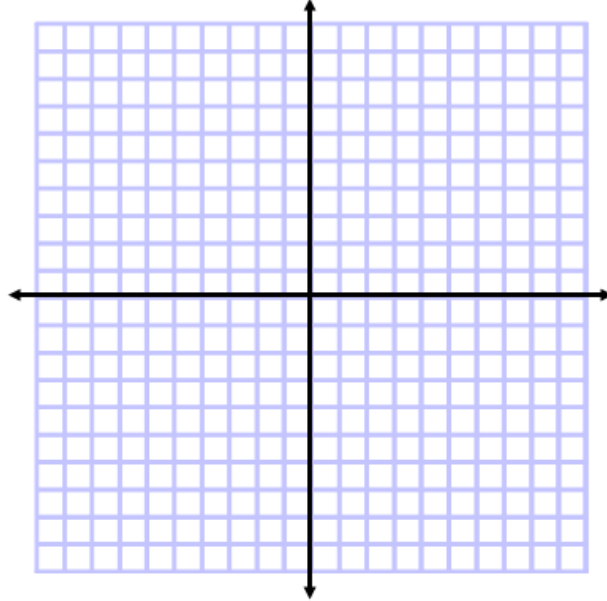
Interpersonal/Bodily-Kinesthetic
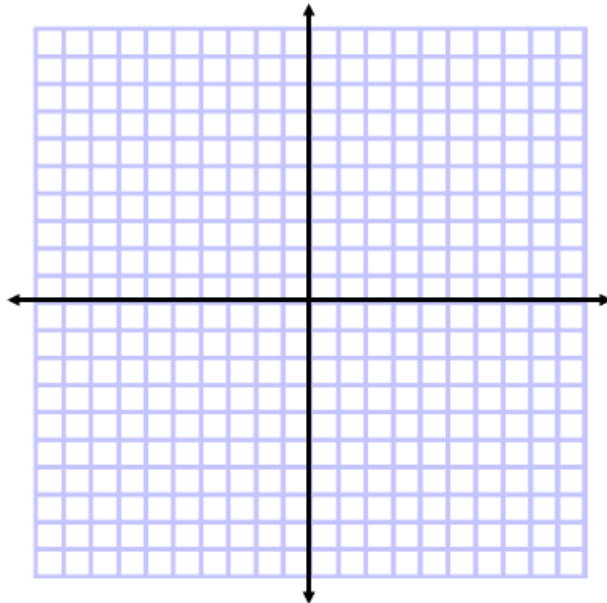
1. Label the Cartesian plane below by identifying the x and y axes, the origin, and each of the 4 quadrants.

2. Plot the points (-5,7), (1,4), (-3,-2), (4, -1) on the Cartesian plane above. Be sure to write the ordered pair next to each point.

3. Coordinates A (-3, 4), B (3,4), and C (-3,-7) correspond to three of the four vertices of a rectangle. Plots these points on the Cartesian plane below and record the coordinates of point D that will complete the rectangle.

4. Explain the following transformations. Use examples to illustrate what you are saying.
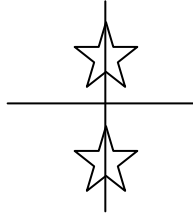
     a) horizontal translation

     b) vertical translation

     c) reflection across the x-axis

     d) reflection across the y-axis

     e) rotation about the origin

     f) rotation about a vertex.

5. Identify the following transformations as either a translation, rotation, or reflection. Be sure to note the point/axis about which these transformations have occurred.

a)   b)   c)

1. Label the Cartesian plane below by identifying the x and y axes, the origin, and each of the 4 quadrants.

y-axis

Quadrant 2

Quadrant 1

origin (0,0)

(-5,6)

(1,4)

x-axis

(4,-1)

(-3,-2)

Quadrant 3

Quadrant 4
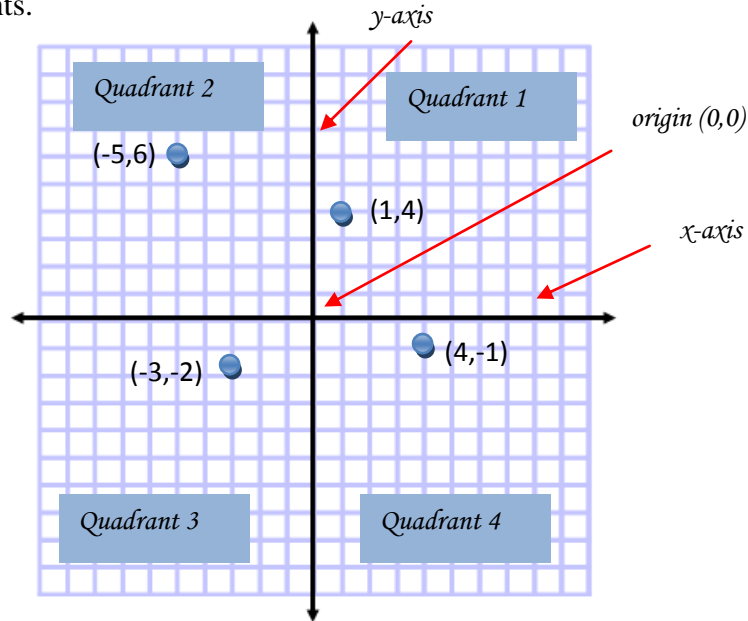
2. Plot the points (-5,6), (1,4), (-3,-2), (4, -1) on the Cartesian plane above. Be sure to write the ordered pair next to each point.

3. Coordinates A (-3, 4), B (3,4), and C (-3,-7) correspond to three of the four vertices of a rectangle. Plots these points on the Cartesian plane below and record the coordinates of point D that will complete the rectangle.

A (-3,4)   B (3,4)

C (-3,-7)   D (3,-7)
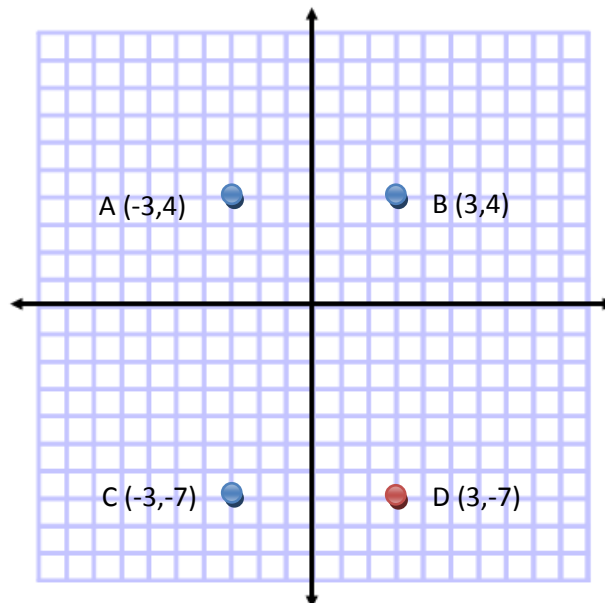
4. Explain the following transformations. Use examples to illustrate what you are saying.

    a) horizontal translation

    A horizontal translation consists of moving a 2 dimensional figure in the positive or negative x direction as shown below:
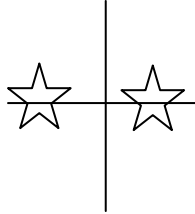
    b) vertical translation

    A vertical translation is similar to a horizontal translation but it occurs in the positive or negative y-direction:
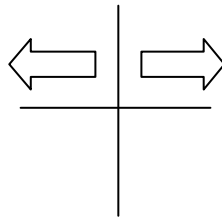

    c) reflection across the x-axis

    A reflection across the x-axis is a mirror image of a 2-dimensional figure where the mirror is located on the x-axis.
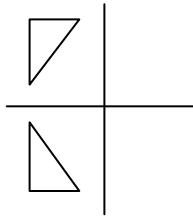
    d) reflection across the y-axis

    A reflection across the y-axis is a mirror image of a 2-dimensional figure where the mirror is located on the y-axis.
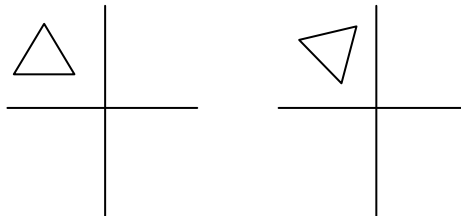

e) rotation about the origin

A rotation about the origin is a circular movement beginning at the origin. Rotations can be done clockwise (-) and counter-clockwise (+)
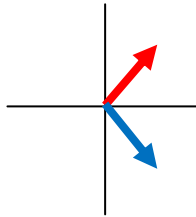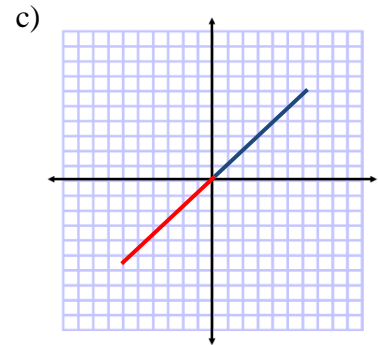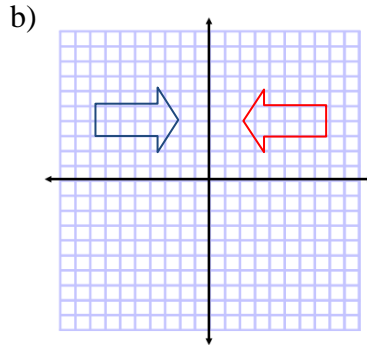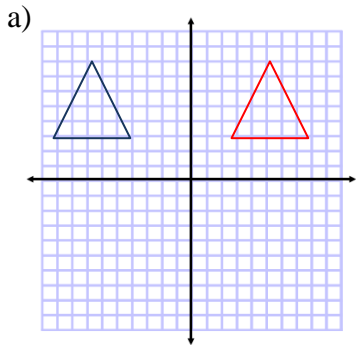
f) rotation about a vertex.

A rotation about a vertex is a circular motion of a 2 dimensional object where the object is fixed by one of its vertices.

5. Identify the following transformations as either a translation, rotation, or reflection. Be sure to note the point/axis about which these transformations have occurred.

a)

b)

c)

a) *This is a horizontal translation in which the figure has been shifted 12 units in the positive x (right) direction.*
b) *This is a reflection about the y-axis.*
c) *This is a 180° rotation about the origin or a reflection about the line y = -x.*

Sample Story:
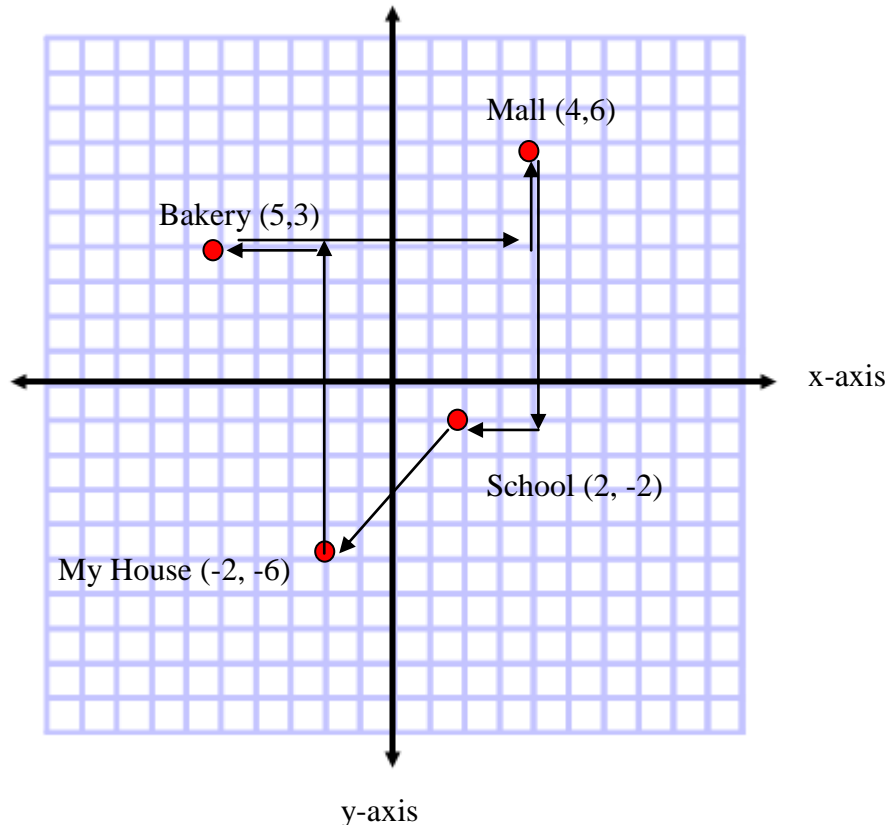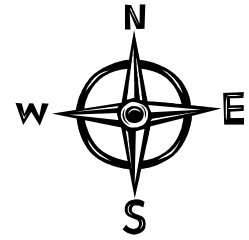
One day, I decided to leave the **quadrant 3** neighborhood and visit the bakery. I travelled 9 blocks North, through the **x-axis**, and one block west, and I finally arrived at the bakery, whose address was **(5,3)**. Next I headed for the mall, located in the village of **quadrant 1**, 9 blocks east and 3 blocks North of the Bakery, (four blocks East of the y-axis) at **(4,6)**. After doing some shopping, I thought I would visit my friends at the **fourth quadrant** school, located 8 blocks South and 2 blocks West of the mall (2 blocks South of the x-axis). After visiting the school at **(2, -2)** I returned home, travelling 4 blocks South-West, again crossing the **y-axis** until I reached **(-2,-6)**.

Sample Game: Cartesian Battleship

Much like the traditional game of battleship, in Cartesian Battleship, the object of the game is to sink the enemy boat(s) by guessing their coordinates. Each student will be given two Cartesian planes as shown below. On the first, he/she will plot 2 ships, consisting of three and four points in a straight line, respectively. On the second Cartesian plane, the student will record the coordinates of the enemy ship. For every "hit", the student will mark a dot and for every miss, he/she will mark an x.
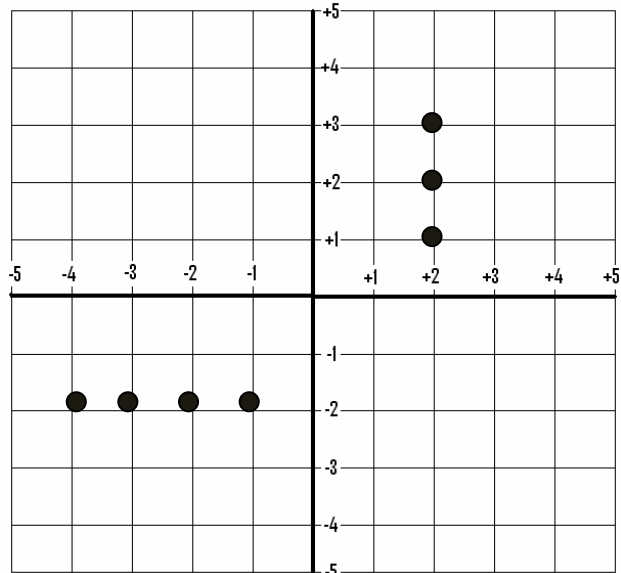
Place 2 boats consisting of three and four consecutive points on this grid.
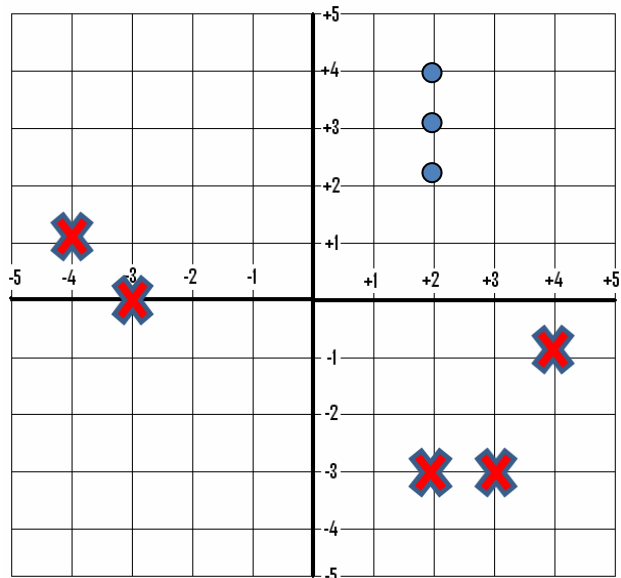
Record the location of your partner's boats on the grid above. Mark all "hits" with a dot, and all "misses" with an x.