

Giant Grid Project: Guide

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The first section of this document is a full overview and Teacher Guide. The Student Guide is in the second section of this document.

Project Overview:

The Giant Grid Project is a Group Initiative that engages Math 7 students in the creation of a 20m x 20m grid to be used in the Culminating Activity (Giant Grid Plot) and beyond.

As the Connection cycle proceeds, students transition from one-dimensional lines to the two-dimensional Cartesian grid, practice plotting points, and learn to create and use coordinate grids. This extends and applies their learning in the area of integer operations.

The lessons will employ a variety of applications of grids in abstract form, such as artistic grid overlays, longitude/latitude, and graph paper.

Small groups of students will work to create prototypes, then a series of discussions will incorporate the best ideas and design elements from the small group into the plan for the full-scale grid.

The grid build requires a combination of careful steps and simple hand work. There is an experimental component, in which students create small prototypes before embarking on the full-scale grid.

Project Lessons: Points and Grids

Background knowledge:

Students will have worked with integer number lines.

Lesson 1: Lines, Points and Axes:

First Period:

Equipment/Materials: Projection or whiteboard images of number lines and grids

Teacher script:

Number Lines Crossed to form a Grid:

This is a number line. These are integers from -20 to 20. This line is oriented horizontally. This is the horizontal axis. This line is oriented vertically. This is the vertical axis. The plural of axis is axes. One axis crossing another axis is a grid. The grid is measured using axes. Because the axes go from zero to

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infinity, there are arrowheads at the ends of the axes showing that the numbers continue. Our axes are only labeled from -10 to 10, because that is enough for what we are doing now.

Points and Coordinates:

Any intersection of horizontal and vertical lines is called a point. Where the values of the axes are both zero, there is a point called the Origin. It has the label (0, 0). The numbers of this label (0, 0) are the coordinates of the point. We mark a point with a dot and a label. Placing a point on a grid is called plotting a point.

Let's look at another point. This point has a line connecting it to the 3 on the horizontal axis. It also has a line connecting it to the 4 on the vertical axis. This point is called (3, 4). The numbers (3, 4) are the coordinates of the point. This point is (-5, 7). This point is (-6, -8). This point is (5, -2).

Grids and points are useful in the world. Here are some examples: such as graph paper artistic grid overlays, longitude/latitude.

Second Period

Student Materials:

Each student has a grid and a whiteboard marker.

Please label your horizontal axis from -14 to 14.

Please label your vertical axis from -18 to 18.

Please label the origin (0, 0). Please draw arrowheads on the ends of the axes, pointing away from the origin.

Find (3, 4). Please label (3, 4)

Please label (-5, 7), (-6, -8), and (5, -2)

Please ask questions if you would like to check your work.

Choose one of the Shapes from the following lists of points, and plot each point one at a time. Each point should have a dot and a label.

Third Period:

Convert Picture to Points: Draw a Shape, Convert to a Points List

1. Sketch a simple shape using straight lines and points, such as a triangle or a rectangle.
2. Next, draw with more detail it on graph paper, placing the corners on points.
3. If you choose, you can design a more complex shape, such as a flower or an animal, but keep in mind we haven't yet learned how to plot curves, so straight lines are a good choice for now.

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4. Label the points needed to define all corners.
5. Next try tracing the drawing with your finger to see how a person could draw it using only the coordinates.
6. List the points needed to draw the shape in the best order for a person to use only the list and graph paper to draw the shape.

Convert Points to Picture

Receive a list of points and use a new sheet of graph paper to plot the points and draw the shape formed by those points.

Enrichment work:

Art Copy

Place a graph paper transparency on a picture, and mark axes on the transparency. Next, copy the picture onto graph paper. Use the graph paper to look at the details and positioning of important parts and know where to transfer them to points on your graph paper copy.

Lesson 2: Making a Grid.

First period:

Teacher Script:

What are the characteristics of a grid?

This grid has two axes and grid lines. All the parts have square corners. The horizontal lines are all parallel to each other. The vertical lines are all parallel to each other. The difference between vertical and horizontal lines is a right angle. This means all horizontal lines are perpendicular to all vertical lines. Note that when a grid is laying flat on a table or on the ground, we still call the axes horizontal and vertical.

Second period

Student materials: pencils, rulers, triangles, protractors, string, pins/nails, boards, paper grid templates.

Work:

Find a way to reproduce the grid, except tracing. Control of Error: All lines should either be parallel or perpendicular to other lines.

Third Period:

In groups (assigned) use the materials given to create
a -20cm x 20cm paper grid and
either
-10cm x 10cm physical grid
or
a -10dm x 10dm physical grid.

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As you make your grid, take notes and think of how your grid could be made at a much larger scale, like 20m x 20m

Group Presentation instructions and Criteria:

Prepare a 3-5 minute group presentation explaining how best to make a full scale - 10m x 10m grid that would meet the following criteria:

- It is accurate.
- It could be labeled
- It could be used multiple times preferably both outdoors or indoors.
- It would not be expensive.
- If your proposal requires equipment or supplies, ask your teacher before committing to that plan.

Group project presentations:

- Student groups present their proposals, and answer questions.
- Presentations should include some demonstration, a display and explanation of their model, and a proposal for how to proceed with a large version.
- Roles in presentation groups include one or two note-takers to record questions and problem-solving suggestions.

Completion Guide / Checklist

<i>Work:</i>	<i>Due date: (*flexible)</i>
Attend a lesson on Points and Grids	October 8
Attend a lesson on Making Grid	October 10
Shelf work: Picture to Points List	October 11*
Shelf work: Points List to Picture	October 12*
Shelf work: Making a Grid	October 13
Group work -20cm x 20cm paper grid and -10cm x 10cm physical grid or a -10dm x 10dm physical grid.	October 18
Group Presentation	October 21

Presentation prep checklist

<i>Item for presentation</i>	<i>Who is doing it?</i>	<i>Ready?</i>
Demonstration		<input type="checkbox"/>
A display		<input type="checkbox"/>
Explanation of model		<input type="checkbox"/>

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Proposal for how to proceed with a large version.		<input type="checkbox"/>
All group members have defined roles in presentation groups		<input type="checkbox"/>

Giant Grid Project:

Process:

- Student-led process. Check-in dates are determined by students to ensure meeting deadline of readiness for Culminating Activity.
- Tasks and roles are to be defined by students.
- Materials lists, sources, and budget are to be determined by students. Budget top limit will be provided by teacher in consultation with administration. (est \$150)
- Key milestones are to be identified and tracked by students in consultation with teachers.

Assessment:

Student Self-Assessment:

Please rate your understanding, communication, and participation on a scale of 1-4 where 4 means fully understood and fully participated and 1 means really not getting it did not/barely participated.

Rate my:	4 Fully did it/got it	3 Pretty good	2 Just enough	1 not meeting requirements
Understanding				
Communication				
Participation				
Comments				

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Student Guide

Group Project Overview:

The Giant Grid Project is a Group Project to ultimately make a 20m x 20m grid to be used in the Culminating Activity (Giant Grid Plot) and beyond.

You will start with some lessons on using number lines and grids. then practice plotting points, and learn to create and use coordinate grids.

Then you'll work in groups to make small grids, and then groups will present proposals for the best way to make a Giant 20m x 20m Grid. Finally, the whole class will make a Giant Grid by bringing the best ideas and methods together.

Why make a grid?

Grids are useful, and they're everywhere. A grid is a layer of vertical and horizontal lines that are marked with numbers. Any location on a surface can be named using its grid location. The giant Grid we'll make as a class in this project will be used in our Culminating Activity at the end of the Cycle.

Three Main stages of the Project:

1. Lessons and Shelf work
2. Group project and presentations on small-size grids and How to Make a Grid
3. Full Class project: Making a Giant Grid

Work for Grids Lesson:

Student Materials:

Each student needs:

- A grid
- A whiteboard marker.
- A list of Shapes defined by points.
- Graph Paper

Instructions:

1. Please label your horizontal axis from -14 to 14.
2. Please label your vertical axis from -18 to 18.
3. Please label the origin (0, 0). Please draw arrowheads on the ends of the axes, pointing away from the origin.
4. Find (3, 4). Please label (3, 4)
5. Please label (-5, 7), (-6, -8), and (5, -2)
6. Please ask questions if you would like to check your work.
7. Choose one of the Shapes from the following lists of points, and plot each point one at a time. Each point should have a dot and a label.

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Student Guide

Convert Picture to Points: Draw a Shape, Convert to a Points List

1. Sketch a simple shape using straight lines and points, such as a triangle or a rectangle.
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5. Next try tracing the drawing with your finger to see how a person could draw it using only the coordinates.
6. List the points needed to draw the shape in the best order for a person to use only the list and graph paper to draw the shape.

Convert Points to Picture

1. Receive a list of Shapes defined by points
2. Select one of the Shapes to plot
3. Use a new sheet of graph paper to plot the points and draw the shape formed by those points.

Small Group Project:

Materials: pencils, rulers, triangles, protractors, string, pins/nails, boards, paper grid templates.

Group Work:

Find a way to reproduce the grid, except tracing. Control of Error: All lines should either be parallel or perpendicular to other lines.

Instructions

1. In groups (assigned) use the materials given to create
2. a -20cm x 20cm paper grid and
3. either
 - 10cm x 10cm physical grid
 - or
 - a -10dm x 10dm physical grid.
4. As you make your grid, take notes and think of how your grid could be made at a much larger scale, like 20m x 20m
5. Prepare a 3-5 minute presentation explaining what you learned about making a grid and how your group would suggest making a giant 20m x 20m grid.

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Student Guide

Group Presentation instructions and Criteria:

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- It is accurate.
- It could be labeled
- It could be used multiple times ,preferably both outdoors or indoors.
- It would not be expensive. Check with teacher.

Group project presentations:

- Student groups present their proposals, and answer questions.
- Presentations should include some demonstration, a display and explanation of their model, and a proposal for how to proceed with a large version.
- Roles in presentation groups include one or two note-takers to record questions and problem-solving suggestions.

Small Group Project Completion Guide / Checklist

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Attend a lesson on Making Grid	October 10	<input type="checkbox"/>
Shelf work: Picture to Points List	October 11*	<input type="checkbox"/>
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Shelf work: Making a Grid	October 13	<input type="checkbox"/>
Group work -20cm x 20cm paper grid and -10cm x 10cm physical grid or a -10dm x 10dm physical grid.	October 18	<input type="checkbox"/> <input type="checkbox"/>
Group Presentation (see Presentation Checklist)	October 21	<input type="checkbox"/>
Full Class Creation of Giant Grid	November 5	<input type="checkbox"/>

Presentation Prep Checklist

Item for presentation	Who is doing it?	Ready?
Demonstration		<input type="checkbox"/>
A display		<input type="checkbox"/>
Explanation of model		<input type="checkbox"/>
Proposal for how to proceed with a large version.		<input type="checkbox"/>
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Giant Grid: Full Class Project:

The whole class will select a strategy and make a plan to create a 20m x 20m grid meeting the following criteria:

Giant Grid Criteria

<i>Criterion</i>	<i>Met</i>
The grid is accurate (dimensions 20m x 20m)	<input type="checkbox"/>
It is uniform in grid spacing	<input type="checkbox"/>
It is labeled with obvious axes, origin and -10m to 10m interval markings	<input type="checkbox"/>
It is portable and durable	<input type="checkbox"/>
It could be used indoors or outdoors, provided there is enough space	<input type="checkbox"/>

Process:

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- Materials lists, sources, and budget are to be determined by students. Budget top limit will be provided by teacher in consultation with administration. (est \$150)
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