



MADDEN



FOOTBALL BY THE NUMBERS

ELEMENTARY LESSON PLAN



Scale Drawings in Art and Design

Overview

How do video games like EA Sports Madden NFL look so realistic? How do game designers and artists make sure players look the right size in comparison to each other, the football, and the field? In this lesson, students examine the connect between math and art as they explore and create scale drawings through the lens of video game design and artistry. Through questions and discussion prompts, students learn how grids can help us create scale drawings that maintain proper proportional sizes. They practice with a simple drawing and are challenged to create a more complex scale drawing in the form of a football jersey!

Lesson Duration

60 minutes

Essential Questions

- What is a “scale drawing?”
- How can I enlarge or reduce a picture while maintaining accurate proportions?
- What does scale drawing have to do with video game design and artistry?

Objectives

Students will:

- Describe a strategy for scaling an image
- Create an image that is a scaled version of another image

Standards

Common Core Math Standards

- CCSS.Math.Content.3.NF.A.3: Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.
- CCSS.Math.Content.5.NF.B.4: Interpret multiplication as scaling (resizing), by: Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.
- CCSS.Math.Content.6.RP.A Understand ratio concepts and use ratio reasoning to solve problems.
- CCSS.Math.Content.6.RP.A.1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.



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ELEMENTARY LESSON PLAN



Materials

- Computer or mobile device with internet access
- Overhead projector, document projector, or interactive white board
- One of each of the following for display on overhead/document projector or interactive white board:
 - Image #1: Football Field Examples from Football by the Numbers Interactive
 - Image #2: Football Player
 - Image #3: Football Player with Grid (one for display on overhead/document projector or
- One per student and one for display on overhead/document projector or interactive white board:
 - Give Me a Big Smile! handout
- Pencils, crayons, markers
- Index cards or notebook paper for the Exit Card activity
- Optional Extension #1: Copies of the Football by the Numbers Game Artist Challenge
- Optional Extension #2: Magazines (age-appropriate), newspapers, photocopied images

Procedure

1. Show students some images of the football field from the Football by the Numbers interactive. Ask them how the football field in the images are different from each other and how they are different from a real football field. (Note: The game images are scaled-down versions of a real football field. Within the game, the football field might appear bigger as the user zooms in or smaller as the user zooms out.)
2. Explain that, in order to represent realistic looking football fields and football players, video game designers and artists have to understand scale, or the relative sizes of things. A giant football player on a tiny football field would not look realistic or allow accurate game play (nor would a tiny football player on a giant field), so scale is important. To recreate a real world environment, such as a football field and stadium with players and fans, video game designers and artists have to know how to create images “to scale” using accurate relative sizes and proportions. Tell students that today, they are going to explore scale drawings in a fun activity.
3. Show students Image #2: Football Player, preferably using an overhead or document projector or interactive white board. Ask, “If you had to recreate this image and redraw it as a smaller picture, how might you try to do that?” Allow time for students to share their thinking.



MADDEN



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ELEMENTARY LESSON PLAN

4. Show students Image #3: Football Player with Grid Overlay and ask, "How might using a grid like this help?" Allow time for students to think and share their ideas.
5. Explain to students: "We can use a grid to create a "scale drawing" – an image that recreates the original picture and maintains the proper scale so the new picture looks exactly the same as the original picture, just smaller or larger."
6. Ask, "Can you think of anywhere else you have seen scale drawings – very large items reduced to a small scale or very small items expanded to a larger scale?" (Possible answers include maps, murals, diagrams in textbooks, or blueprints)
7. Distribute "Give Me a Big Smile!" to students and display a copy so that all students can see. Ask students to describe what they see in the first image. (Students should note that the smiley face is covered with a grid and that the grid shows numbers down the side and letters across the top.) Ask students to describe what they see in the second image. (Students should describe a blank grid with the same numbers and letters as the first image. Students should also note that the squares in the second grid are larger than the squares in the first grid.)
8. Some students may understand at this point how to use the grid to recreate the smiley face drawing. Allow them to explain/demonstrate in their own words how they think the grid should be used; correct any misunderstandings. Using questioning and discussion prompts, make sure students understand the following before starting their smiley face scale drawings:
 - Each square in the first grid corresponds to the same number/letter square in the second grid.
 - To create the larger drawing, they should copy what is in each small square to its corresponding square on the larger grid.
 - They have to try to create the same proportion in the new drawing. For example, if a line begins halfway up the small square, it should begin halfway up the large square.
 - Once they have recreated their scale drawing, the large smiley face should have the same proportions as the small smiley face.
 - For older students, introduce the term "ratio" and explain that it describes the relative relationship between the size and shape of the small smiley face to the large smiley face.
 - Tell students that each square on the small grid is .375 inches long and wide. Each square on the large grid is 1.5 inches long and wide – 4 times larger than the small grid. So, the ratio of the smaller grid to the larger grid is expressed as 1:4 (one to four).



MADDEN



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ELEMENTARY LESSON PLAN



9. Allow time for students to work on their scale drawings. If necessary, explain to students that the activity is just to explore how to use grids to create scale drawings. Their work will not be evaluated or graded and it does not matter if they don't consider themselves great artists.
 - For younger students, consider having them work in groups so they can share drawing responsibilities.
10. Have students share their final drawings (reminding them that the goal of the activity is to learn about scale drawings). Ask questions such as the following to close the lesson:
 - How do video game designers and artists make sure that backgrounds and characters look the way they're supposed to in the game?
 - Do you think they use grids to create their drawings?
 - What other tools might they use to help them create drawings with accurate scale?

Extension:

Distribute the Football by the Numbers Game Artist Challenge and have students create a jersey for the team of their choice. Students may work as individuals or in pairs or groups. For their first rendering, students should only use a sheet of 8 x 11 paper (standard copy paper). Once their jerseys are finished, distribute chart paper to each student/pair/group and challenge them to use a grid system to recreate a large version of their jerseys on the chart paper. Display students' work with their Exit Cards (if accurate).

Optional Extension:

Distribute magazines, newspapers, and/or photocopied images and challenge students to select an image and create a scale drawing of it, making it either larger or smaller. Support students who need help figuring out the ratio between the two grids. Students may work as individuals or in pairs or groups.





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ELEMENTARY LESSON PLAN



EXIT CARD

NAME: _____ CLASS: _____

TEACHER: _____

Answer the questions.

Explain in one paragraph how to create a scale drawing. Include in your explanation at least two of the following terms:

- Scale
- Grid
- Recreate
- Accurate
- Proportion
- Ratio



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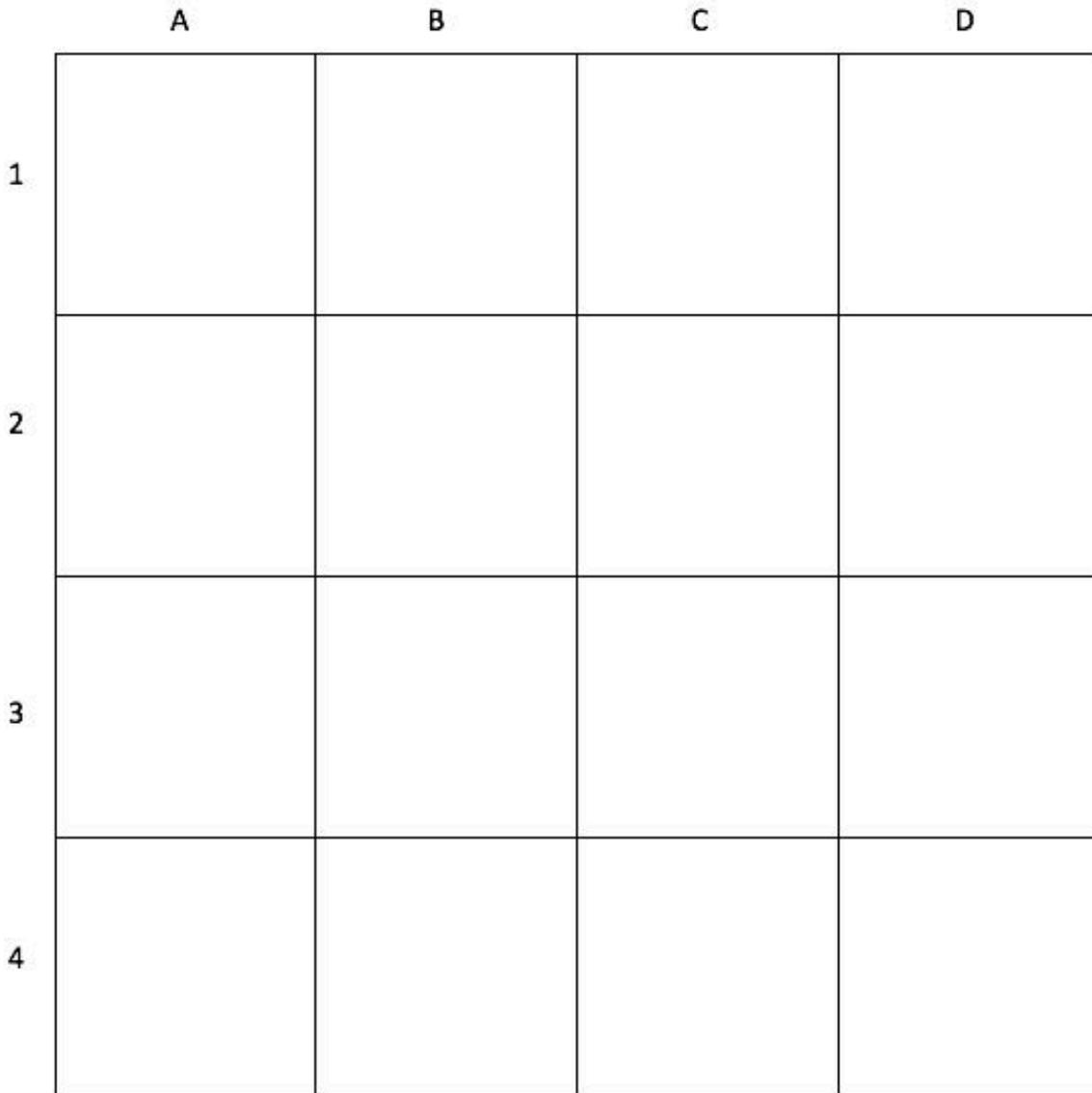
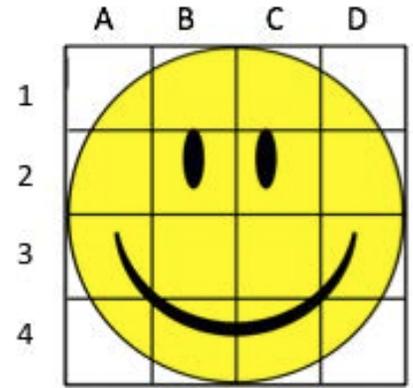


GIVE ME A BIG SMILE

NAME: _____

TEACHER: _____

Use the grids to help you recreate the small smiley face as a large smiley face.





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Image #1





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Image #2





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Image #3

