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Hide the Pixels
Grade 6-8

Introduction

This activity allows students to try their hand at optimization by exploring a relationship between two values. In this visual problem students can be creative in finding different solutions and comparing them to each other, as well as in creating their own designs as game boards for other students to play with.

Agenda

Activity	Time	Description/Prompt	Materials
Mindset Message	10 min	Play the mindset video.	Mindset Video
Explore Pixel Aliens	15 min	• Introduce the problem. • Let students explore one or both of the Pixel Aliens. What is the lowest score they can get for each?	• Pixel Aliens Handouts • Math journal • Colored pencils (optional) • Calculator (optional)
Discussion of Pixel Aliens	10 min	• Encourage students to share what they found. What is the lowest score they found for each alien? What strategies did they use? Did they notice any useful patterns?	• Document camera
Make and Share Boards	15 min	• Invite students to create their own pixel designs in the Blank Handout and exchange designs for their peers to find the lowest scores they can on these new boards.	• Hide the Pixels Blank Handout
Debrief Mindset Message	5 min	Debrief the mindset messages for this activity.	

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Activity

Introduce the problem to students by sharing information about pixel art with them. For example, you might tell them about how before computers were as powerful as they are today, the only way to make images was to create them pixel by pixel. Each pixel is a little square that is individually colored. Entire video games were created this way. We don't do it this way anymore, but it has become a style artists use and call Pixel Art. You can project the examples below for them to see. For more background, here is an in-depth article on pixel art: https://design.tutsplus.com/articles/what-is-pixel-art--cms-21759

Give students one or both of the Pixel Alien Handouts and have them work in groups to find the lowest scores they can earn. As students work, notice what strategies they are using to optimize their score and how they are thinking about the growth of the two parts that make up the score.

Once students have had some time to explore these cases, invite students to share with the rest of the class their findings: not only the lowest score they found for each alien but also the strategies they used to optimize the score and if they notice any useful patterns. In this case the "best" score is the lowest score. This is a good time to introduce the idea of "optimizing" as a mathematical concept used in mathematical modeling. When you optimize something, you are "making it the best". Optimization problems are common in areas like engineering and economics where you want to design to get the best performance possible.

Following this discussion give students some time to make their own pixel art on the Hide the Pixel Blank Handout. Encourage them to be creative and try out some different ideas. It is helpful to have extra blank sheets so students can make mistakes (and share them proudly!) and share their art with their peers. Then they can sit in small groups and try to optimize the scores for each of their pieces of pixel art together. Notice different ways groups are approaching the problem and any 'Aha!' moments they might have as they work together.

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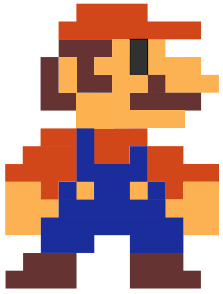

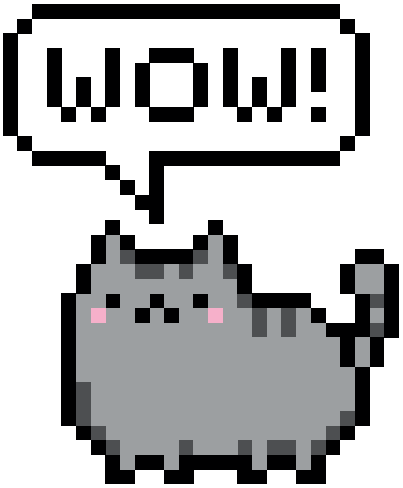

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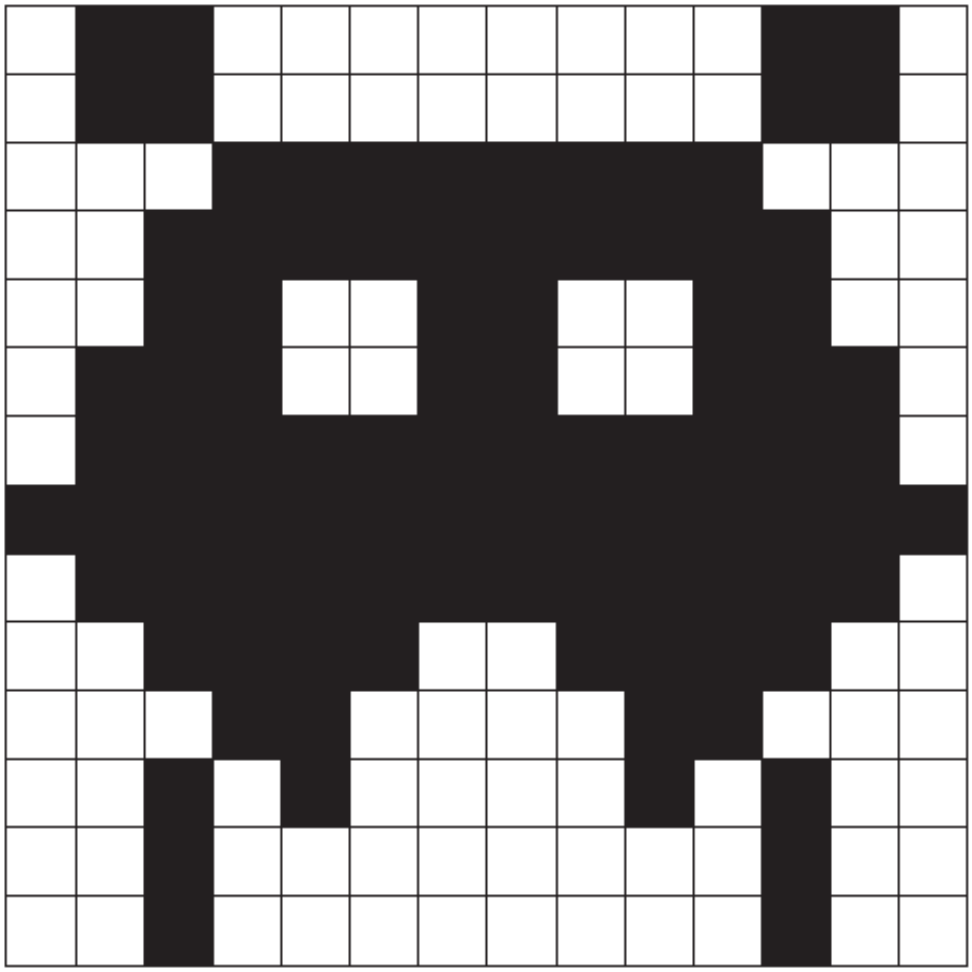
Your challenge is to cover all of the colored pixels using rectangles. Your score will be the area of all the rectangles used plus the square of the number of rectangles. Try to get the lowest score possible!



Inspired by NRich.maths.org

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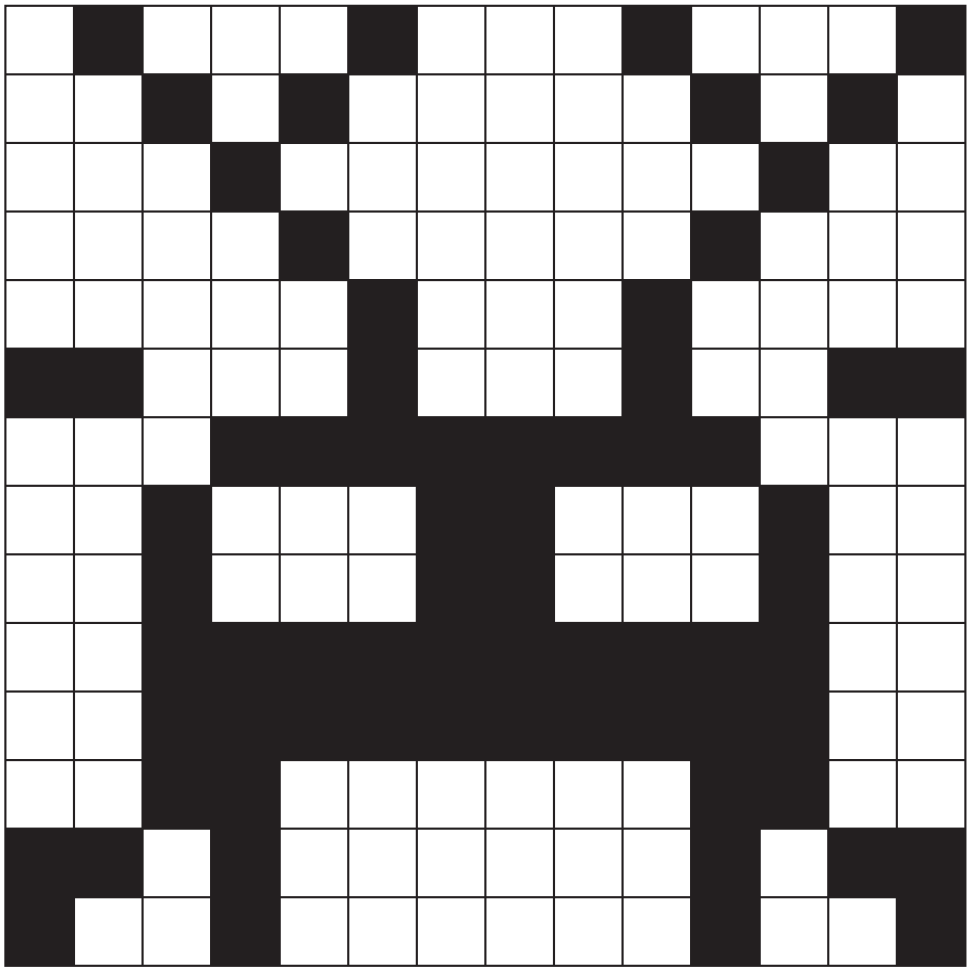

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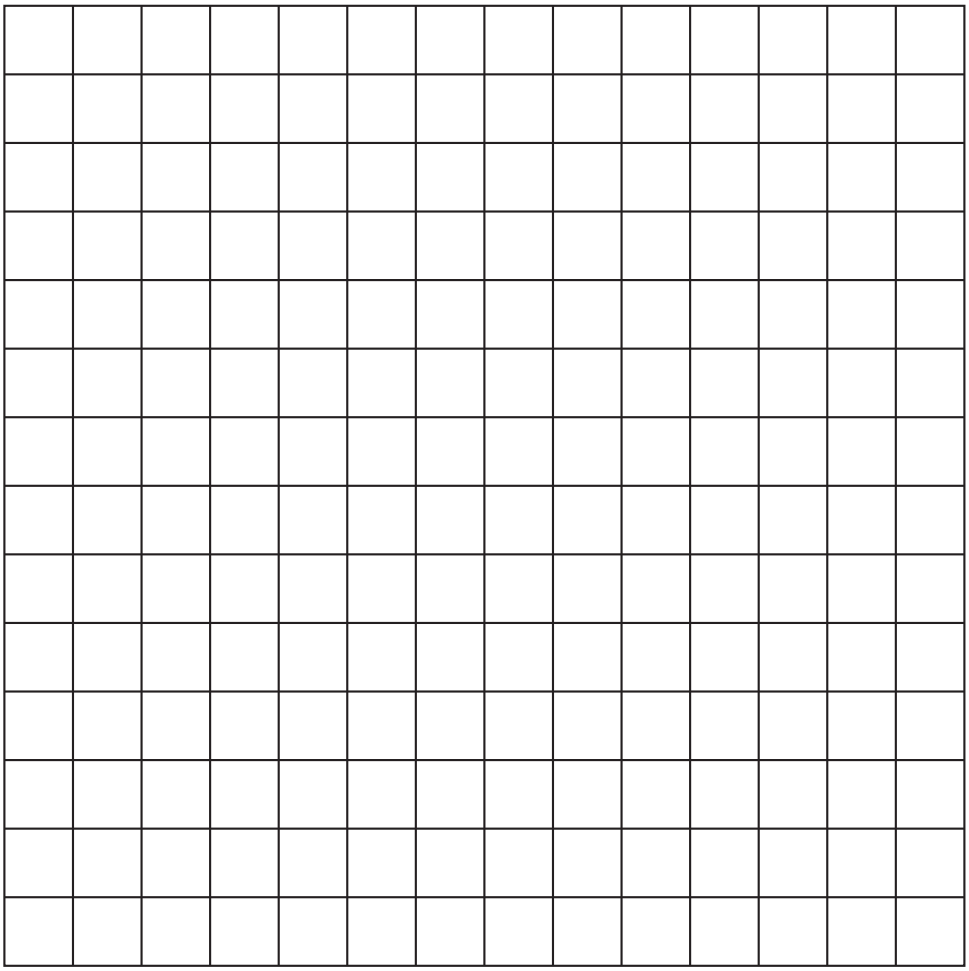

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