

**Meet an Engineer:
Mari Gravlee**



*Advanced Programs
Engineer for United
Launch Alliance*



On any given day, Mari could be reviewing test results from a rocket engine thruster or traveling to NASA to discuss the development of a test setup for cryogenic propellants. Her days can be hectic, but they are never dull. Although she has a Bachelor's Degree in Mechanical Engineering, Mari says that communication – often-times an Engineer's weakest point – is one of the most important skills for her job. Being able to explain things to others and gain their support is very important. Although she enjoys her day to day duties, nothing is as exciting as launch day. Mari says it's incredible to see all the rocket systems working together to deliver a satellite into space.

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Article on Mari Gravlee: Metro Denver WIRED
All Photos: United Launch Alliance
<http://www.ulalaunch.com/>

4-H Projects with spatial design:

- Model Rocketry
- Leathercraft
- Scrapbooking
- Wood Working
- Quilting
- Ceramics
- Sewing

STEM Connections



Extension



Dr. Barbara J. Shaw

Connecting Science, Technology, Engineering, and Math concepts to our everyday lives.

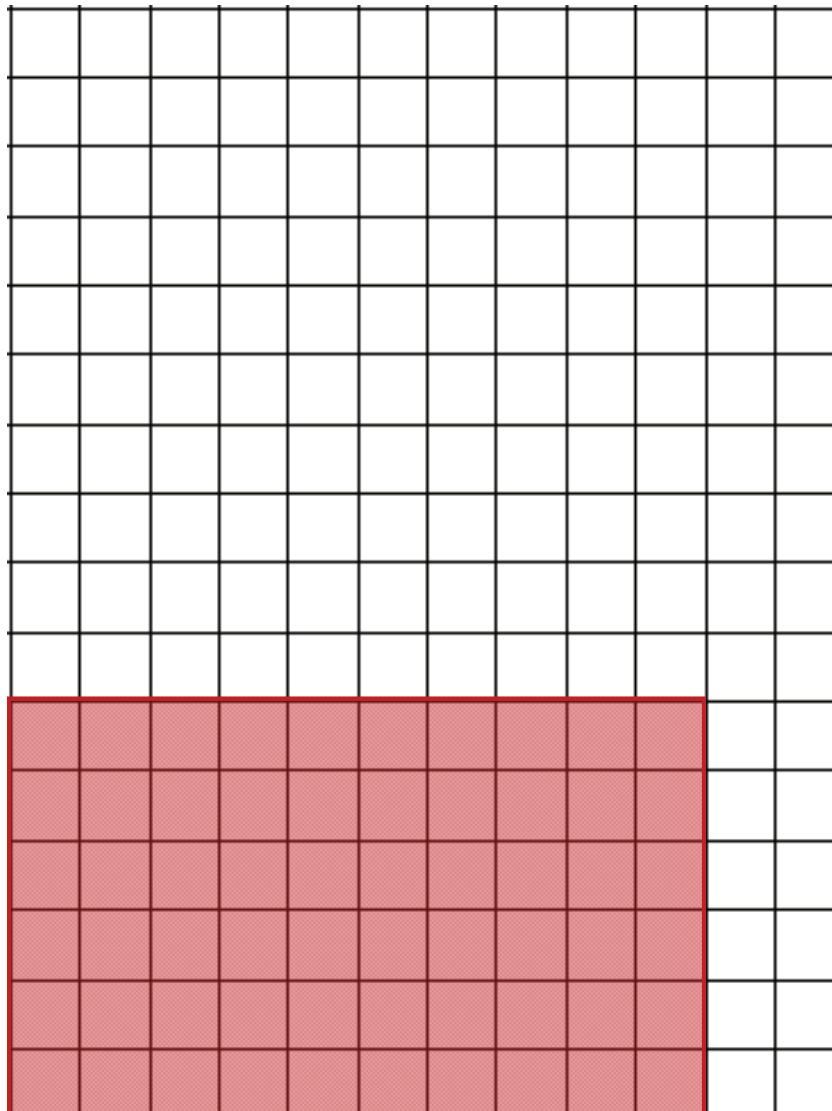
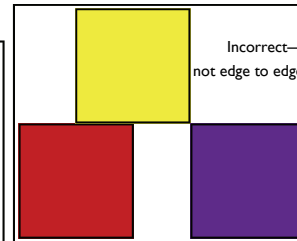
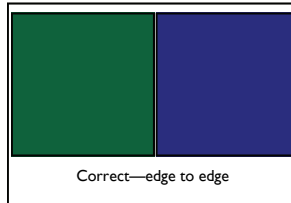
Pentominoes



EXPLORE IT - DESIGN IT - DO IT

For our summer activities, we are going to explore aerodynamic designs for rockets and airplanes. We are starting with shapes in 2 dimensions (length and height) to introduce how to find geometric spatial solutions. Next month, we will look at 3 dimensional shapes, and then begin to experiment with designs that are aerodynamically efficient.

Below is the graph paper you need to record the pentomino shapes. The red shaded box is for the puzzle after you have found all 12 shapes. The answers will be found throughout this newsletter, so you can check to see if you found all 12 pentomino shapes. There is also one of the 2,339 possible solutions to the puzzle.



Materials:

- 5 identical squares (example, tiles, starburst candies, coasters, etc.)
- Graph paper (below)
- 12 color pencils
- Scissors

Directions:

- A pentomino is a geometric figure formed by joining five equal squares, edge to edge.
- You can form 12 different unique pentomino shapes, NONE symmetrical.
 - Symmetry is a precise and well-defined concept of balance or patterned self-similarity.
 - Reflection symmetry—the mirror image



• Rotational symmetry—the image flipped over



• Translational symmetry—the images are offset



- Use your squares to help find all 12 of the unique pentomino shapes.
- Each time you find a new shape, record it on your graph paper, using a different color pencil to shade in the 5 squares.
- Check that it is unique, and not symmetrical to another pentomino you have already found.
- After you have discovered all 12 shapes, cut each out with the scissors.
- The red box on the graph papers is a grid that is 10 by 6 squares.
- Can you fill your grid with all 12 pentominoes without overlap and gaps? Believe it or not, there are 2,339 different solutions!
 - You may have to turn over some of your pentominoes to fit all 12 on your grid.

Agents and 4-H Assistants:

Please insert the answers (each of the individual graphic below) by copying and pasting each of the pentominos and the answer to the puzzle throughout your newsletter, and not all bunched together in one spot. Thanks.

