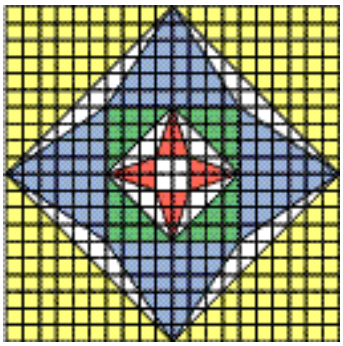
7.7 Communicating about Geometric Patterns

You will need
- coloured pencils
- centimetre grid paper

GOAL
Describe designs in terms of congruent, similar, and transformed images.

Communicate about the Math

Mohammed used computer software to draw this design, which he plans to stencil on homemade ceramic tiles. This is Mohammed's description of his design:



It has a white square in the middle, inside a red star. The red star is in a white square, which is in a green square. The green square is in a blue star. Then there is a white square around the blue star and, finally, a yellow square around everything. The whole design is 20 cm high and 20 cm wide.

This is what Samantha drew, based on Mohammed's description.

? How can Mohammed's description be improved?

Samantha looked at Mohammed's design and the Communication Checklist, and asked him these questions:

- Did you completely describe both the shape and the orientation of each part of your design?
- Did you describe all the transformations you used?
- Did you describe any equal sides and use appropriate measurements?

Communication Checklist

- ☑ Was your description clear?
- ☑ Was your description complete and thorough?
- ☑ Did you use necessary and appropriate math language?

A. Identify the parts of Mohammed's description that were accurate but not clear enough to allow Samantha to draw the design correctly.

B. What did Samantha think was missing from Mohammed's description?

C. What other questions would you have asked Mohammed to help him clarify his design for Samantha?

Reflecting

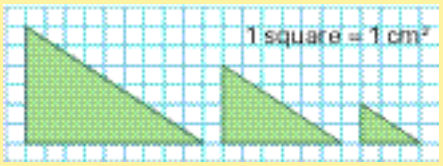
1. How could Mohammed have improved his description so that Samantha's design would have been closer to his design?

2. Which questions in the Communication Checklist were covered in Samantha's questions?

Work with the Math

Example: Describing a design

Improve Zach's description of this diagram.



Zach's description:

There are three similar right triangles.

The bases of the triangles are 1 cm apart, on the same line.

The triangle on the left has a 90° angle between a side of 6 cm and a base of 9 cm.

The triangle in the middle has a 90° angle between a side of 4 cm and a base of 6 cm.

The triangle on the right has a 90° angle between a side of 2 cm and a base of 3 cm.

Kwami's Solution

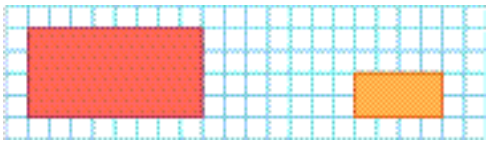
1. Draw a right triangle with a 9 cm base and a 6 cm height. The right angle should be at the bottom left vertex. The triangle should point up.
2. On the same base, draw a second triangle that is similar to the first, but has a 6 cm base and a 4 cm height. Make the second triangle oriented the same way as the first triangle.
3. Line up the base of the second triangle with the base of the first triangle.
4. Translate this triangle to the right until its right angle is 1 cm to the right of the bottom right vertex of the first triangle.
5. Draw a third similar triangle with a 3 cm base and a 2 cm height, oriented the same way as the other two triangles.
6. Translate the third triangle so that its base lines up with the other bases and is 1 cm to the right of the base of the second triangle.

I wrote step 1 because I couldn't tell where Zach wanted the right angle to go. From his description, it could have been on the left or the right. I also couldn't tell whether the triangle should point up or down.

I wrote the other steps to describe how the triangles line up. When Zach said "in the middle," I knew there would be a third triangle. He didn't say whether the smaller triangle should go to the right or the left of the original. Also Zach didn't say whether the triangles should point in the same direction, or how far apart to space them.

A Checking

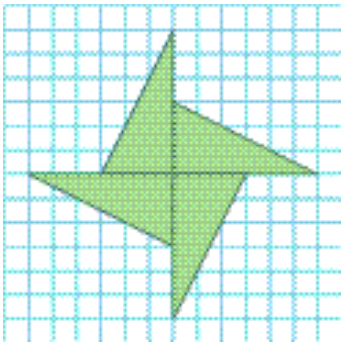
3. Consider the following design. Assume that each square in the grid is 1 cm by 1 cm.



a) Describe the design, keeping the Communication Checklist in mind.

b) Test your description by asking someone else to draw the design. Was the other person able to draw the design accurately? Could the description be used to draw a different design?

4. This design is made up of four triangles. Assume that each square in the grid is 1 cm by 1 cm.



a) Describe the design, keeping the Communication Checklist in mind.

b) Test your description by asking someone else to draw the design. Was the other person able to draw the design accurately? Could the description be used to draw a different design?

B Practising

5. The symbol for radioactive materials includes some simple shapes and some complex shapes. The following is Heidi's description of the symbol:

"There is a black triangle, and the inside of it is all yellow. In the middle of the triangle is a black dot, surrounded by three equally spaced shapes."

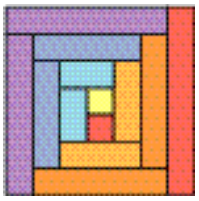
a) Carefully explain and correct any errors in Heidi's description.

b) Use the Communication Checklist to help you assess Heidi's description.

c) Use your answers to parts (a) and (b) to help you write an improved description.

d) Test your description by asking someone else to follow it. Was the other person able to draw the symbol accurately?

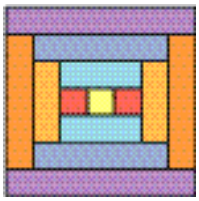
6. The log cabin square is a very popular quilt design.



a) Carefully describe the design.

b) Test your description by asking someone else to follow it. Was the other person able to draw the design accurately?

7. A design called "steps to the courthouse square" is often used with the log cabin square.



a) Carefully describe the design.

b) Test your description by asking someone else to follow it. Was the other person able to draw the design accurately?

8. Design your own quilt square using geometric shapes. Write a description of your design, keeping the Communication Checklist in mind. Can someone else recreate your design from your description? Review and revise your description until it is clear.