

GEOBOARD ACTIVITIES

Objective: Explore congruent figures, similar figures, and symmetry using geoboards.

Materials: Geoboard Record Sheet
Geoboard Record Sheet Transparency
One geoboard and rubber bands for each participant
One transparent geoboard and rubber bands for the trainer

Procedure:

A. Lines of symmetry of a square

1. Pass out a geoboard, some rubber bands, and an activity sheet to each participant.
2. Tell them that they should always give students fair warning that during this activity if rubber bands fly, they will do the activities on a recording paper instead of using the geoboards. Also, students should be given time to experiment with their own designs before beginning the first activity. So, you will also give the participants a few minutes to experiment with the geoboards.
3. Next, instruct them to take four rubber bands and make a square using the outermost pegs of the board. Demonstrate this on the overhead with your geoboard.
4. Challenge them to take only one other rubber band and divide the square into two congruent parts. Tell them when they have done this, to place their geoboard face down. When everyone is finished, ask them to hold up their geoboards.
5. Discuss the four different ways this could have been accomplished without "bending" the rubber band. (The rubber band could have been placed vertically, horizontally, or either way diagonally.) Demonstrate each of the four ways on the overhead. Point out that each one of these dissecting lines is a line of symmetry because if we folded the geoboard along one of the lines the resulting two halves of the square would fit exactly on top of each other.
6. Ask the participants how many lines of symmetry a square has. (four)

7. Have them draw the square and the four lines of symmetry on the first grid of the "Geoboard Record Sheet", and above it write "Lines of Symmetry".
8. Discuss the fact that by recording it on the record sheet they not only get more practice, but by labeling their drawings they will have a quick reference to look back at as a reminder of what symmetry is, and as the other activities are completed what congruence and similarity are.

B. Lines of Symmetry of a Right Triangle

1. Instruct the participants to remove the rubber bands, and then to form a large right triangle by placing rubber bands along two of the outer rows of pegs, then placing another rubber band diagonally across the geoboard to finish the triangle.
2. Demonstrate this on the overhead with your geoboard. Ask them to use rubber bands to draw as many lines of symmetry as possible, then to place their geoboards face down on the table. When everyone is finished, ask them how many lines of symmetry this right triangle has. (one) Have them hold up their geoboards. Demonstrate the line of symmetry on the transparent geoboard.
3. Have participants record the right triangle and its line of symmetry on the second grid on the "Geoboard Record Sheet", and above it write "Line of Symmetry".
4. Ask if all right triangles have a line of symmetry. (No, only isosceles right triangles.)

C. Congruence

1. Advise the participants that for the following activities with the geoboard, if the students are younger, the teacher would probably discuss the fact that congruent means exactly the same shape and size, and similar means "the same shape but can be a different size". However, if their students are older and this is a review for them, the activities should be done with no discussion before the activities, but more as a discovery lesson, or an exercise to see how much the students recall from years past, with little prompting.
2. Instruct the participants to remove their rubber bands from the last activity, and make a small right triangle on their geoboards. Model one on the overhead, whose legs are each just one unit.

3. Next, instruct participants to construct a triangle congruent to the first one somewhere else on their geoboard, and then to place their geoboard face down on the table.
4. After the participants have had time to do this, ask them to hold up their geoboards, and congratulate them on knowing that congruent means exactly same shape and size.
5. Demonstrate a second, congruent triangle to the small one you had made on the transparent geoboard.
6. Have them draw two small congruent triangles on their third grid on the "Geoboard Record Sheet", and label it "Congruence".

D. Similarity

1. Instruct the participants to take one of the congruent triangles off of their geoboard, leaving the other one intact.
2. Next, ask them to construct a similar triangle to the small triangle they already have on their geoboard and then to turn their geoboards face down on the table.
3. After they have had time to do this, ask them to hold their geoboards up.
4. Discuss that similar means "same shape, but possibly different size". Therefore, the second triangle must still be a right triangle in order to be the same shape, but it might have larger dimensions (Smaller dimensions will not be possible because of the size of the original triangle). Also note, that if one side of the triangle was multiplied by two then all of the other sides had to be multiplied by two as well, because similar figures are proportional.
5. Demonstrate an example of similar triangles on the transparent geoboard.
6. Have the participants record both triangles on the fourth grid, and label it "Similarity".

E. Symmetric Figures

1. Instruct the participants to, once again, remove the rubber bands from the geoboard. This time ask them to use one rubber band to divide the geoboard in half vertically.

2. On the transparent geoboard build a simple design on one side of the vertical line.
3. Instruct the participants to make the design symmetrical by constructing a mirror image on the other side of the rubber band, then to turn their geoboards face down on the table.
4. Ask participants to hold up their geoboards.
5. Construct the reflection on the transparent geoboard.
6. Have them record the design on the fifth grid on "The Geoboard Record Sheet", and label it "Symmetry".

F. More Symmetry

1. Have the participants remove the rubber bands from their geoboards.
2. Instruct them to, once again, make a vertical line with one rubber band. Ask them to make any design they want on one side of the rubber band. Advise them to keep the design simple.
3. Have participants exchange geoboards with a partner and make their partner's design symmetrical.
4. Have participants record their completed figure on the sixth grid on the "Geoboard Record Sheet", labeling it "Symmetry", and then return their partner's geoboard.

G. Yet More Symmetry

1. Repeat Activity F, only this time place the initial rubber band horizontally.
2. Have the participants record their design on the seventh grid on the "Geoboard Record Sheet", and label it "Symmetry".

H. The Last of Symmetry

1. Repeat the above activity starting with a diagonal line of symmetry.
2. Have the participants record their resulting symmetric design on the eighth grid on the "Geoboard Record Sheet", and label it "Symmetry".

Notes:

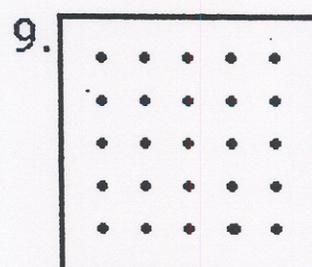
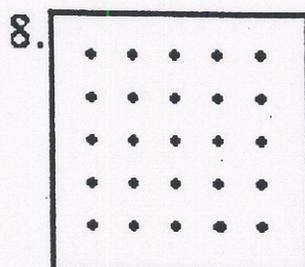
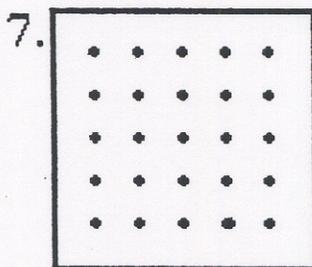
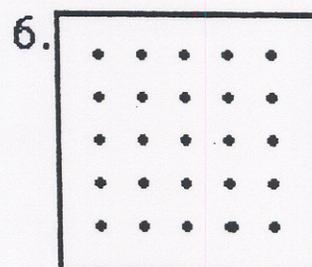
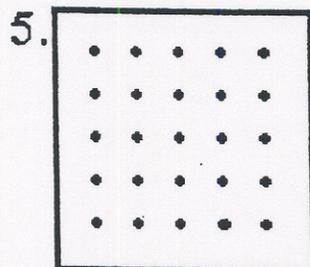
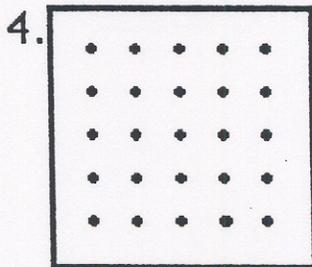
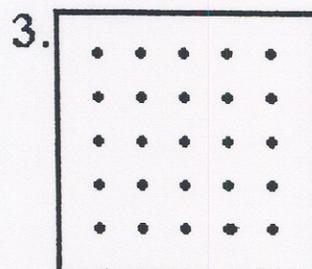
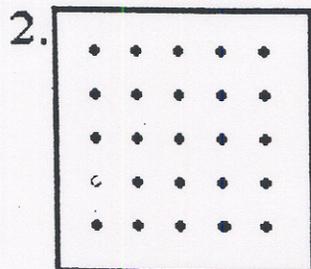
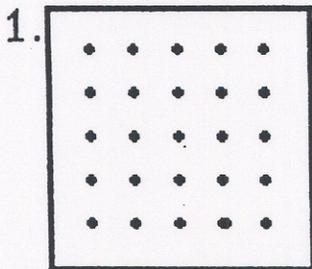
1. If time does not permit doing all of the activities, do Activities A through F, then explain that with their students participants could extend the geoboard work to similar activities such as described in Activities G and H.
2. Symmetry with a diagonal line is difficult for students. Many do not think to turn the geoboard to make lines either vertical or horizontal.
3. Clear geoboards, allow students to work at seats and then immediately share with class on overhead. Students can compare work easily by placing geoboards on top of each other.

Extension:

1. The beginning design made for reflecting to form symmetry does not have to be all on one side of the reflecting line (line of symmetry).

GEOBOARD RECORD SHEET

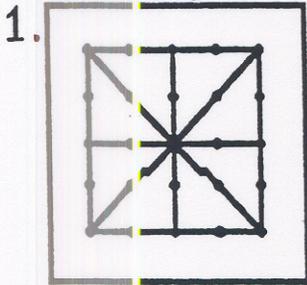
Record results of geoboard activities on this sheet. Label each grid for future reference.



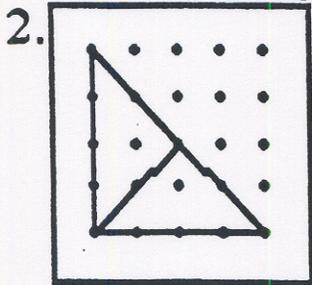
GEOBOARD GRIDS – MASTER

Record results of geoboard activities on this sheet, and label for future reference.
(Sample Answers)

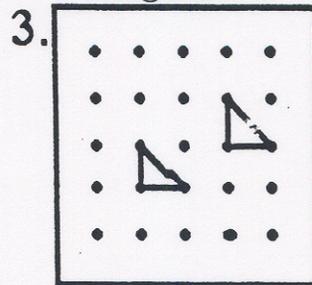
1. Lines of Symmetry



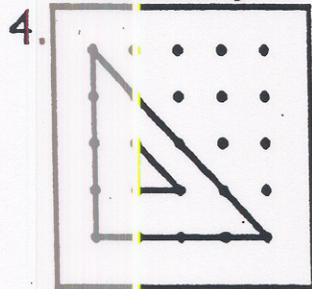
2. Line of Symmetry



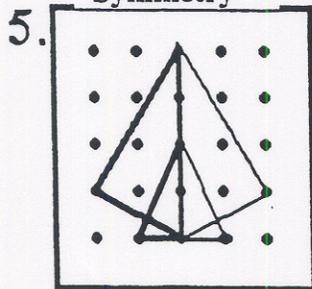
3. Congruence



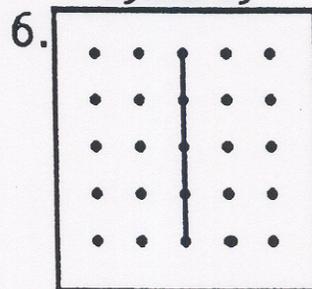
4. Similarity



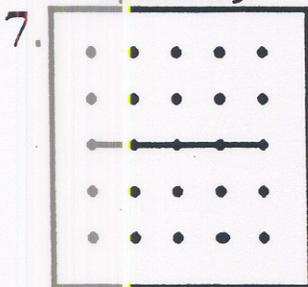
5. Symmetry



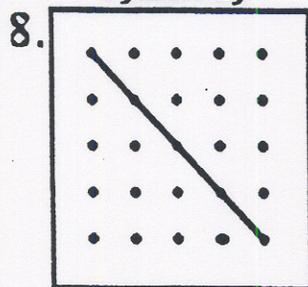
6. Symmetry



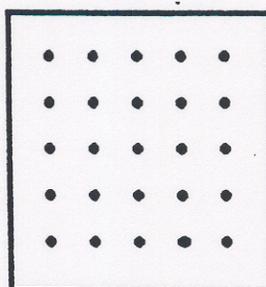
7. Symmetry



8. Symmetry



9.



#6, 7, 8 their own designs