

## Art and Mathematics with Geogebra

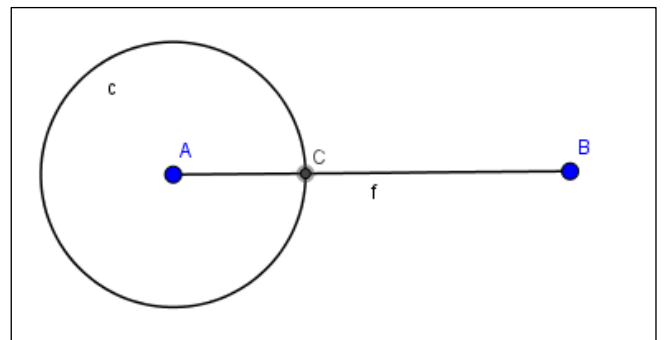
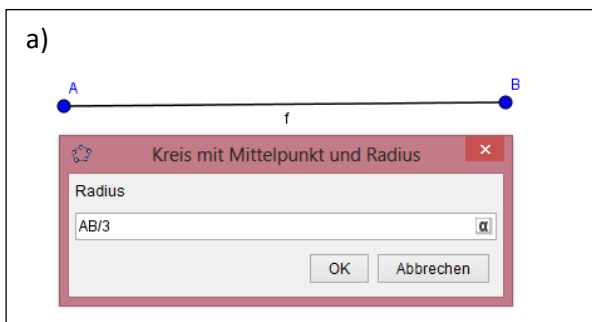
Each student in the classroom receives a different picture with a piece of art from Max Bill, a Swiss artist (1908 – 94), who created colorful graphics and compositions based on triangles and squares or rectangles. He belongs to an art movement called „concrete art“. For him his paintings showed the concrete use of mathematics, especially geometry, for his planing as well as his creations. His pieces of art would not have become so wonderful and famous without using midpoints of segments and areas in different forms but of the same size. You can use some of his graphic paintings also to teach fractions, too.

1. **Task:** Construct the graphic you have got with Geogebra. You may choose the colors as you like. Here are some useful hints.

- Work without any coordinate system.
- Use regular polygons i.e. squares. Look precisely at your template. Sometimes it is easier to build up the whole picture by using small squares. You start with a small square and add a new one by using points of the first square and so on... . So you can guarantee that all squares have the same size.
- Use the item „midpoint“ belonging to *points* in the main menu to divide a segment in two equal parts.
- Drag(move) the basic points of your construction to see if it is dynamic and does not collapse.
- Now you get to know how to divide a segment if a square e.g. in 3 equal parts:

a) if you want to divide segment AB into 3 equal parts, choose circle with center and radius, click on A and fill in  $AB/3$ .

b) A circle is visible. Choose now from the *point* menu -> *intersect circle and line* and go on like in a).



Don't forget to save your construction when it is finished.

### 2. Task:

Make annotations on a sheet with the picture that you have constructed. Describe all mathematical and geometric properties of the picture that you see when watching the picture for a while. How big are areas in relation to the biggest area? Use fractions. Which forms have the same area? Are forms reflected (by which line?) or a point (which one?) or rotated? Do you see special angles? Can you identify different forms of triangles, polygons? ... Write down as many properties as possible.

3. **Task:** explain your neighbour what you have found in your picture. Ask him to add more properties. Then change the roles. Look at your neighbour's picture and listen to his/her explanation and add things if you can!