



COMPASSES ZOO

THE COMPASS PANDA

TEACHER FILE

by Fabrice Eudes



Objective:

To teach students how to use relative numbers to localize points on a plane, while using the appropriate terminology.

Skills taught:

How to place a point on an orthogonal plane by using Cartesian coordinates.
Learn the meaning of the terms abscissa, ordinate, and coordinates.

Prerequisites:

To place a point on a line marked in unit lengths
To determine the symmetric of a point in relation to a line
To create a simple figure with the help of interactive geometry software (if computers are used)
To understand the concept of opposites

Materials used:

A computer
A video projector
Approximate length of exercise: 2 hours
Name of geometry software: GeoGebra

Files to download:

Construction program for students
Construction grid for students (size A4 or A3)
Construction grid for teachers (size A4 or A3)
GeoGebra file for students
GeoGebra file for teachers

How to carry out the exercise

Preparation

Have the students bring a compass, a pencil, and an eraser: Before the students arrive, have the computer, the video projector and the GeoGebra files ready.
The construction requires care and precision on the part of the students: it helps to enlarge the grid to an A3 size.

A preview of the final figure

After explaining the aim of the exercise, i.e. to create the head of a panda with the sole help of a compass, begin with a general introduction of the construction process by using the slideshow feature of GeoGebra.

The navigation bar at the bottom of the window marks the various steps in the process. If not visible, activate the function "Navigation bar for construction steps" from the "View" menu. The meter indicates how many of the total steps have been completed in the construction process. Click on "Play" to begin constructing.

When the slideshow ends, the teacher ticks all the boxes at the top left of the image to hide

the points and some circles. He/she also hides the grid and the reference axes by using the "Axes" and "Grid" functions from the "View" menu.

The end result is aesthetically pleasing and should motivate the students to work hard.

Construction by the students

Distribute the construction program and the grid.

The instructor rewinds the construction process, cancels the ticked boxes, and makes the axes and grid visible.

The students begin working from step no. 10 on. The first 9 steps only define the checkboxes.

From now on, each student works on his/her own. The different stages of construction are grouped by theme. For instance, one can proceed as follows:

- with the help of GeoGebra, show students the cluster of points in a construction phase
- give the students a reasonable amount of time to carry out the construction
- move on to the next stage

Using GeoGebra:

The permanent circles are drawn without a name in one continuous stroke, the others are drawn as dashed lines, with their names. While the students are drawing on paper, the boxes should be ticked as follows:

Column 1: the number corresponding to the GeoGebra step

Column 2: the number corresponding to the step on the student's card

Column 3: the circles to be hidden.

45 20 mark "hide C₁₀" and "hide C₆ and C₇"

48 23 mark "hide C₁"

54 25 mark "hide C₂ and C₃"

76 36 mark "hide C₁₁, C₁₂, C₁₃, and C₁₄"

87 42 mark "hide C₅"

93 46 mark "hide C₁₉"

107 54 mark "hide C₂₀, C₂₁, and C₂₂"

Finish by hiding the points, the grid, and the axes, as done previously.

Identifying errors

Student errors can be quickly identified by printing the instructor's "construction grid" on tracing paper, giving the teacher more time to assist students in need. When working with A3, print an A3 transparent version by printing it in two sections on two pieces of A4 tracing paper.

Variations / Further developments / References

This exercise can take place in a computer classroom with the assistance of remote monitoring and control software, such as Net Support School. A GeoGebra student file is provided with: axes divided into unit lengths, a magnetic grid to help position the points, and a customized toolbar.

A test, if any, can be oral at the end of the construction, or assigned as homework.

The figure can be simplified, for instance, by using only one circle to outline the muzzle. I've tried to follow Daniele Nannini's original drawing by as closely as possible in this exercise.

References

- « Animaux Compassés » by Daniele Nannini, éd. Dessain et Tolra, 1991. ISBN 2-249-27862-8
- « Animali Compassati » by Daniele Nannini, éd Fatatrac, 1987. ISBN 88-85657-87-7
- <http://www.compasses-zoo.net/>
- <http://www.danielenannini.it/>

Christophe Poulain has created animations of several compass animals with Metapost software. Motivated students can visit <http://melusine.eu.org/syracuse/metapost/animations/poulain/> or you can get inspiration for more exercises like this one.