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| Video Title | **The path walking Snail** | | |
| Topic | Geometry | | |
| Aim(s) | Understand how to model a difficult mathematical problem. Learn how to solve a puzzle by means of a coloring of the plane. | | |
| Length | 45min | | |
| Camp Location |  | | |
| Facilitators |  | | |
| N. of students |  | | |
| Date |  | | |
| Resources  needed | Blank paper (5 per group of students), pen (2 or 3 per group), colored pencils (4 or 5 different colors per group) | | |
| Preparations | In case the session takes place in person, the facilitator can draw some lines on the floor with tape so that some student volunteer can try and walk along them after the introduction to the problem. | | |
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| **Video time** | **What facilitator does** | | **What learners do** |
| 00:00 - 00:25 | General VMC Video Introduction |  | |
| 00:25 - 01:51 | Statement of the problem |  | |
| VIDEO PAUSE How to start thinking about the problem? | * Assist the process, guide them towards trying the problem with a few lines, and make sure they understand the rules. | | * Draw a few lines and try and move the snail along them by drawing its path. * Discuss your ideas. * Do you think the answer is yes or no? |
| 01:56 - 2:24 | Trying on three lines |  | |
| VIDEO PAUSE The problem on three lines | * Explain that often in mathematics one can attack a complicated problem by starting with a simplified version. | | * Draw three lines and try. * Discuss if the answer is yes or no. |
| 2:30 - 3:20 | Solution on three lines |  | |
| 3:20 - 3:57 | The problem on four lines: three configurations |  | |
| VIDEO PAUSE The problem on four lines | * We increase the difficulty by adding a line: emphasize this as a natural process in mathematical thinking. * Encourage them to try all configurations and check that they are following the rules. | | * Draw the three configurations and move the snail along them. * Discuss your ideas for each configuration: do you think the answer is yes or no? |
| 4:02 - 4:52 | Solution on four lines: first two configurations |  | |
| 4:52 - 5:23 | Fake solution in the third configuration! Finding the mistake |  | |
| 5:23 - 6:26 | Coloring the regions of the plane: explanation of the rules |  | |
| VIDEO PAUSE  Coloring a configuration | * Encourage the students to try and color the regions of a configuration following the rules. | | * Draw a configuration. * Try and color the regions of the plane with your pencils, following the rules: can you do it? |
| 6:32 - 6:41 | Showing a possible coloring with three colors |  | |
| 6:41 - 7:11 | Can we use fewer colors? What if we change the configuration? |  | |
| VIDEO PAUSE Looking for the minimum number of colors needed | * Make sure the students understand the question. * Once they have a coloring, ask them if they can find one with fewer colors. | | * Can you find a coloring of your previous configuration with fewer colors? * Try with different configurations. * Discuss what you think is the minimum number of colors needed. |
| 7:12 - 7:31 | Coloring with two colors |  | |
| VIDEO PAUSE Why are two colors always enough? | * Initiate a discussion on how one can be sure that two colors are always enough. | | * Try to color various configurations with only two colors. * Discuss why, or how, you can do this with every possible configuration. |
| 7:31 - 8:20 | Explanation of a reason why two colors are enough |  | |
| 8:20 - 8:40 | An example of configuration colored step by step |  | |
| VIDEO PAUSE Using the two-color coloring method | * Make sure the students understood the method. * If the students are very advanced, you can explain how to prove that the method always works. | | * Try to color various configurations using the method. Does it work? * Discuss if the method always works, and why. |
| 8:40 - 8:59 | Towards a solution using the coloring |  | |
| VIDEO PAUSE Looking for a solution using the coloring | * Encourage the students to think and share their ideas. | | * Discuss how the coloring could help solve the snail puzzle. |
| 8:04 - 9:24 | A possible path and a possible coloring: how are they related? |  | |
| VIDEO PAUSE Relating the color with the path followed by the snail | * Make sure you had a look at the solution in order to know how the coloring is related to it. Try to guide the students towards finding this relation. * Let them think for a few minutes, then you can suggest that they think on which color the snail sees on the right and left during his walk. * If the students have good ideas, guide them towards understanding that the color to the right is invariant **if the snail follows the rules of the problem**. Let them think of what happens if the snail breaks the rules at a crossing. | | * On your configuration with two colors, draw a possible path of the snail. Think of the relation between this path and the coloring. * Follow the facilitator's suggestions: what color does it see on its right along the path? If the snail follows the rules, does this color change? |
| 9:34 - 10:12 | Explanation of the relation between the coloring and the path |  | |
| 10:12 - 10:55 | Explanation of the solution |  | |
| 10:55 - 11:01 | Thanks for playing! |  | |