Patterns in Perpendicular Vectors

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SSEA 2022

1 Goals

The goals of this activity are:

1. To emphasize the difficulty of visualization, to motivate the definition of the dot product, and to perhaps let students discover the definition themselves.

2 Materials

For this activity you will need:

1. Handouts

3 Instructions

This activity will take approximately 35 minutes.

1. Form groups of 3 to 4 students, give students handouts, and explain the goals of the activity.
2. As students work on the 2D vectors, ask them if they can come up with a general formula for when 2 vectors are perpendicular to each other.
3. When students work on the 3D vectors, ask them to actively think about whether there is a way to generalize what they observed for 2D vectors.
4. As students work on the handout, visit each group to answer any questions they may have.
5. At the end of the activity, discuss how definitions come from generalizations of what we observe, and how visualization is not always sufficient. Propose a definition of dot product based on student ideas, and conjecture that it is 0 for orthogonal vectors.

4 Tips

1. Encourage students to visualize the 3D vectors using software.