Projections using a Toy Train

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1 Goals

The goals of this activity are:

1. To give students one intuitive way of understanding what a projection is.

2 Materials

For this activity you will need:

1. A toy train track.
2. A toy train with a string attached that can move on the track.

3 Instructions

This activity will take approximately 20 minutes.

1. Explain that one intuitive way of understanding the projection of a vector v onto a vector w is to think of it as the 'portion' of v that 'belongs' to w.
2. To demonstrate what this means, place the toy train on the track and the track on a table. Pull the string parallel to the table, but in various directions. Note that this always results in the train moving on the track, and hypothesize that a portion of the force you apply on the string is 'secretly' along the same direction as of the track. This explains why the train moves along the track. This part of the force that 'belongs' to the direction of the track is called the projection.
3. As the explanation proceeds, pass the train to students to experiment with.

4 Tips

1. It is easy to make a simple toy train and track with cardboard.
2. It is possible to use other words instead of 'portion' and 'belongs.'