Gravity - Spinning Magnet (Speed Calculation)

A wonderful toy, where a magnet spins down a spoke creating vibrations that rotate a spinner

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INTRODUCTION

Ring magnets behave fascinatingly when inserted into any metal rod that is magnetic. Here, we use a cycle spoke as the rod and notice the wonderful behaviour of the magnets as they spin down the spoke! This causes vibrations at the bottom of the spoke, where a cardboard spinner spins rapidly as the magnets descend!

TOOLS:

- Stopwatch (1)
  (or the stopwatch app on mobile phone)
- Plain Paper (1)
  (or Notebook)
- Pen (1)

PARTS:

- Cycle Spoke (1)
- Ring Magnets (2)
— Precautions

⚠ Be mindful of sharp edges of the spoke

— Step 1 - Case of One magnet

- Pass the magnet through the screw end of the spoke and leave it near that end.
- With the screw end at the top, hold the spoke vertically and give the magnet enough of a twirl so that it can start moving down the spoke.
— Step 2 - Measuring the time taken

- Measure the time taken by the magnet to reach the bottom of the spoke using a stopwatch.

- You can use the Stopwatch on your watch or app on your mobile phone.

- Seek assistance for measuring time, if necessary.

- Conduct 3 separate trials and write down their respective time periods on a piece of paper.
— Step 3 - Case of Two Magnets

- Place two magnets over each other.
- Pass the magnets through the screw end of the spoke and leave them near that end.
- With the screw end at the top, hold the spoke vertically and give the magnets enough of a twirl so that they can start moving down the spoke.

— Step 4 - Calculating the Speed of Magnets

- Measure the length of the spoke from base to the screw grooves.
- This is the distance travelled by the magnets on the spoke.
- The formula for calculating speed is Distance travelled/Time taken.
- Calculate the mean of three trials for both cases separately by formula (Trial 1 + Trial 2 + Trial 3) / 3.
- Now calculate the speed of magnets for both cases using mean values.
— Troubleshooting

- If magnets stopped in the middle of a trial, go for a fresh trial.
- Do not tilt the spoke in the middle of a trial.
- If time measurement readings are erratic, feel free to go for more trials until your timings are more consistent.

— Observations

- Does adding more magnets slow it down or speed it up?
- Can you make out which metal is the spoke made of? Try this activity using similar shape and sizes of other metals and check whether the same phenomenon happens or not.
- Invert the spoke and give enough twirl to let magnet as well as circular card sheet fall freely. Do you notice anything peculiar while card sheet is coming down.

— Optional Variation

- Try the experiment with three or four magnets.