YOUR CHALLENGE

Can your train stay on track?

STEP 1 Gather Your Materials

4 plastic or poly cups

Tape

2x
Or a ruler

Scissors

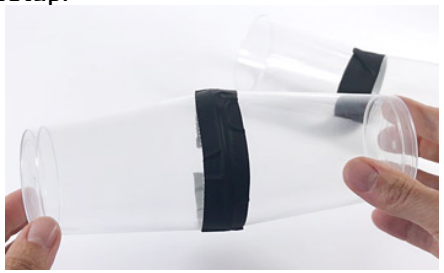
Shoe box or a book

STEP 2 Prep work

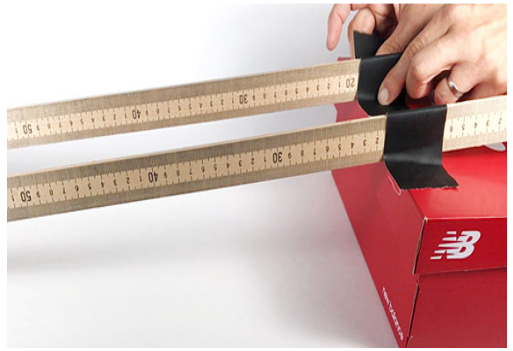
Can you describe the differences between the shapes of the first and second cup setup? Which one looks more stable to you?

1. Take two cups and tape them together with their bases facing each other. This is your first cup setup.

2. Take the other two cups and tape them together with their tops facing each other. This is your second cup setup.



3. Set up a model railway track with the two rulers or yardsticks and your book or box. Place the rulers in parallel with one side on the book and the other on the work surface, creating an incline. Stand the rulers up on their sides so that the long narrow sides are pointing up and that you will be able to fit each of the cup setups across the track. Tape the rulers securely in place.



STEP 3 Test your train wheels on the tracks

1. Carefully place the first cup setup across the track at the top of the slope. Try to place it as close to the centre as possible. Let go of the cup setup, and let it roll down the track

What do you notice? How does this cup setup work on the track?

2. Place the second cup setup onto the tracks. Again, try to place it in the very centre of the track. Let this cup setup roll down the track.

3. Now take the first cup setup again and place it on the tracks. **This time place it off-centre. Shift it either slightly to the left or the right.**

Do you think this changes your results?

4. Take the second cup setup and place it on the track. Again, place it slightly off-centre either to the left or right.

What happens? Can you explain your observations?

STEP 4 Take a video

Why not take a video of your train tracks and
show us your wheels staying on track ☺

Have you any ideas on improving your experiment?
Can you make you make a curve on your tracks?
What shape of wheels suit a train?

STEP 5 What happened?

The different cup setups represent different train wheel shape possibilities. Both cup setups represent a set of slanted train wheels, but the direction in which the wheels are slanted was exactly the opposite.

It was probably difficult to keep the first cup assembly on the track. It should have derailed almost every time before it reached the end of the track. No matter how you placed the cups they probably usually fell off the track. This assembly only stays on the track if it is perfectly centre. But this is almost impossible to accomplish.

The second setup, however, should have stayed on the track—even if you put it off-centre. Whenever this wheel setup became off-centre it automatically corrected its course toward the centre, which makes it a very stable system.

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