

RACING PAPER HORSES

SUPPLIES NEEDED:

- Two pieces of construction paper
- A pencil
- A ruler with centimeter and millimeter marks
- Scissors
- A way to make a ramp - A few books and a board often work well.
- The template below

SETTING UP:

Making the horse will take you a bit of experiment in and of itself, but if you follow these guidelines, the horse should walk right out of the gate with very few tweaks.

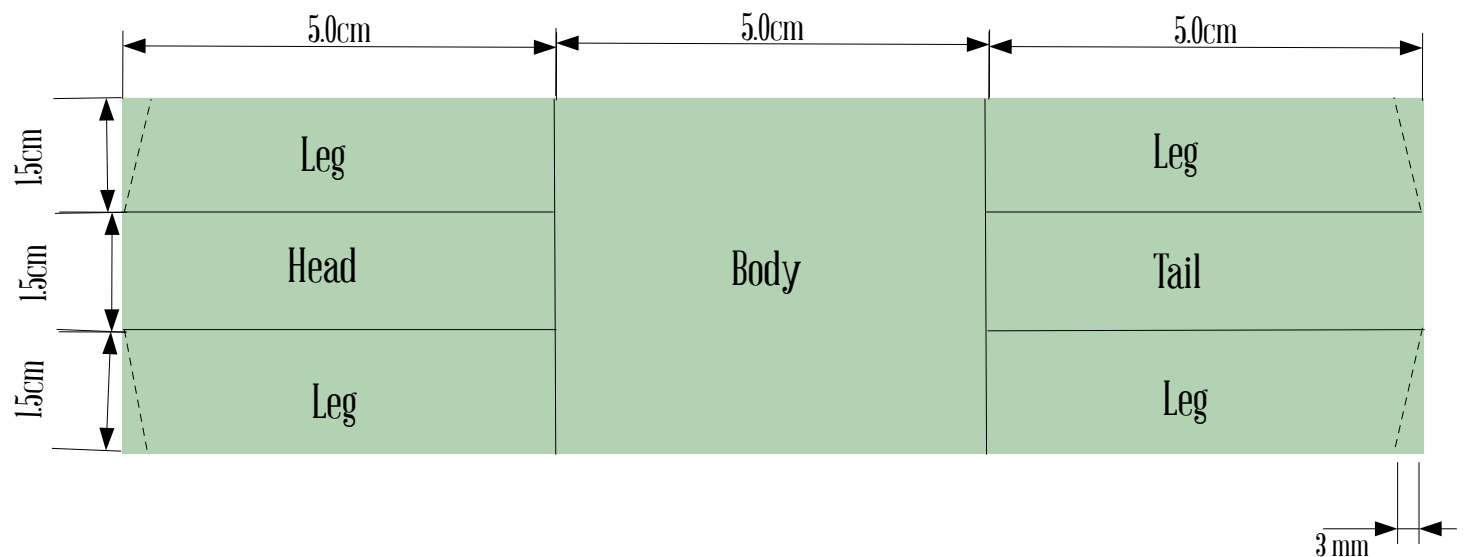
Using the not-to-scale template below, use your ruler and pencil to create a rectangle that is 15 cm by 4.5cm. Split the long direction into three 5.0cm, and the short direction into three 1.5 cm on each of the ends.

Cut along the leg and lines so that you have three “tassels” on the ends. The legs, head, and tail should be free from each other, but still attached to the body.

Curl the tail up. We do this so the horse balances.

Fold the head - several different methods can be used here, and this is an area of experimentation. But, aim to have it held high so it counter balances the tail. I pinched it near the middle, and bent it down from that point.

Finally, gently shape the feet by cutting off the slanted triangle at a curve. We found that the sharp corners don't work as well, so make them just slightly curved. (See second page for picture.)



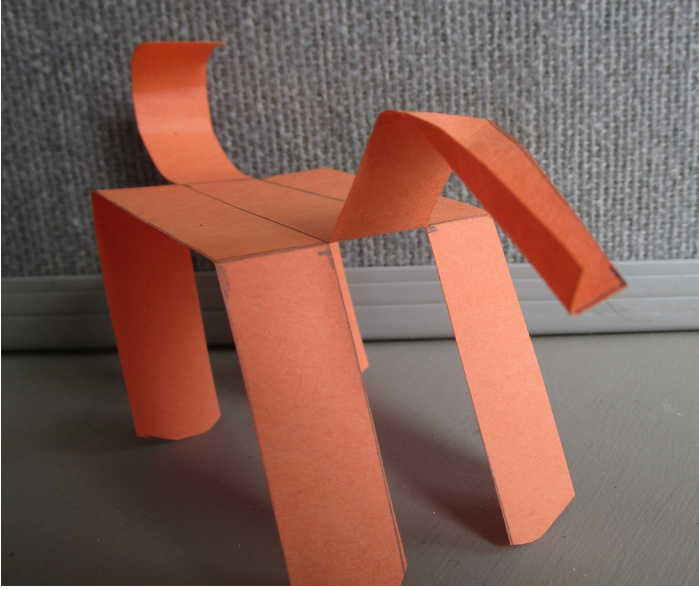
SET UP THE RACE TRACK:

Use a few books and a board to create a ramp. Add your other piece of construction paper to the top of it.

There is a lot of room for experimentation here with friction. It would be a great time to explore what surfaces are too slick and too sticky to work.



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THE SCIENCE:

There are several things going on here. We mentioned before balance. On top of balance there is friction, geometry, and momentum. Let's look at each one briefly.

BALANCE:

The head and tail balance each other to keep the horse standing upright instead of tipping forward or back. This is important on an incline just as much as on a flat surface.

GEOMETRY:

The feet are slightly curved to help the horse move down the ramp. It rocks back and forth on those gentle curved "hooves" as it walks down the ramp. Different shapes may cause them to not move, slide, or even gallop. Geometry of the ramp could impact the speed and gait of the horse as well.

FRICTION:

The surface your horse walks down is important. Too smooth and there is no grip for the horse feet to catch onto. Too rough and it won't move. Testing different surfaces will give your horse a different gait, too.

MOMENTUM:

Momentum is the physics behind making all this possible. As the horse moves from one side to the other, momentum is created. If the surface you have it optimal for the foot shape and material you made the horse out of, it could walk down the entire length of the ramp.

EXPERIMENT IDEAS:

- ★ Change the angle of the head
- ★ Curl the tail differently
- ★ Change the curve of the hooves
- ★ Use different surfaces for the ramps
- ★ Change the angle and height of the ramp
- ★ Use different paper for the horse
- ★ Shorten the tail or head to see if it balances
- ★ Try different sizes of horses - how big you can make it and it will still work? How small?

GAME IDEAS:

- ★ Speed builds
- ★ Ramp races
- ★ Design and round robin competitions (great for co-ops and birthday parties)

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