## **Project 22 Control Towers**

Objective: Child will design a marble run for multiple marbles at various stages to see how force impacts the movement of the marbles.

Essential Question(s): How might the speed of an object relate to the energy transferred to another object?

**Special Materials:** toilet paper tubes and marbles, Newton's cradle (if possible; video would do) Bricks Required: 8x8 plates, 4x4 plates, 2x4 plates, 2x4 tiles, 2x2 tiles, 2x2 plates, 1x4 bricks, 2x4 bricks





## **Project Structure:**

## Engage:

- hanging from a rod).
  - a. Ask what happens with the metal balls. Child will probably point out that the center balls stay still while the outer balls bounce.
  - b. balls.
  - c. Ask what child thinks may happen if you pull the ball out more or less.

## Explain/Explore:

- 1. through a marble run.
- 2. Work together with your child to build a marble run. You can build a tower of varying heights according to the pictures below (alternating 1x4s).
  - a. Lead your child in making the top connectors and corner turns (a 2x4 and 2x2 tile down the center of a 4x4 plate with corresponding plates underneath to create the grooves for the toilet paper rolls, framed by 1x4 bricks to keep the marble centered. Corner turns are similar but on 8x8 plates).
  - b. The goal is to move three marbles through the marble run, with the first marble released at the top and hitting two additional marbles in succession (each previous marble stops when it hits the next one).
- 3. You can put towers together in groups, line them up and connect them with toilet paper tubes and start testing.
  - a. Child should:
    - i. corners.





1. Ask if child has played with a "Newton's cradle" (the physics toy with a row of metal balls

- Point out that the energy from the outside balls is transferred through the inside
  - i. Child may answer that the end ball will bounce further if the first ball is pulled out more, or less if the first ball is pulled not as far.

Explain that they will use the same ideas from the Newton's cradle to move marbles

Try a few towers together to see how marbles move, especially around

ii. Adjust the height of the towers to see how that impacts speed.