ROLLER COASTER

Core Outcomes -

Students will be able to explain and demonstrate the following concepts: Newton's Three Laws of Physics, inertia, impulse, momentum, energy transfer and circular motion. Students will be able to define: elevation, circular loop, clothoid loop (upside down teardrop loop).

Challenge:

Using prefabricated CPEP kits, students are challenged to design, construct, evaluate, test and enter a Roller Coaster in the CPEP Day competition.

Each kit will contain the following:

- (1) Roller Coaster Base - ¾" x 3 ½" x 36" (Pine)
- (1) Roller Coaster Track - ¾" I.D. x 72" (Foam pipe insulation cut in half)
- (2) Roller Coaster Supports - ¼" x 36" (Birch Dowel)
- (2) Roller Coaster Supports - ¼" x 24" (Birch Dowel)
- (2) Roller Coaster Supports - ¼" x 12" (Birch Dowel)

Rules:

- Design and build a model roller-coaster that will carry a marble from the starting point to the ending point as fast as possible, without breaking a raw egg at the end. *The raw egg will be supplied by the judges on CPEP Day*. The design must include a receptacle to hold the egg at the end of the track. In addition to the aforementioned steps, students will also be judged on the most creatively designed roller coaster. The design must incorporate the theme of Reuse, Reduce and Recycle.
- The maximum height, length and width of the overall roller-coaster must be less than or equal to 1 meter (39.37 inches).
- The roller-coaster must contain at least one loop or 1 corkscrew, and it must include a second elevation after the loop or corkscrew.
- At least one point of the roller coaster track must touch the base.
- The length of the roller coaster track supplied is 6 feet long. The track cannot be lengthened or shortened.
- Students who wish to compete in the overall design contest must incorporate the theme reuse, recycle and reduce in their design. Each student must be prepared to explain to the CPEP judge how the theme was incorporated in the design. Other designs will not be eligible for the Best Design Award.

Judging and Scoring

The following formula will be used to calculate the winning roller coasters:

$$\text{SCORE} = \frac{(A+B+C+D)(F)}{E}$$

(A) HEIGHT - Vertical distance between highest and lowest points of track

Meters	Inches (equiv)	Points
0 - .25	0 – 10	5
.251 - .50	10.1 – 20	10
.51 - .75	20.1 – 30	15
.751 – 1.0	30.1 – 39.37	20

(B) LOOPS & CORKSCREWS

1 loop only	5
1 corkscrew only	5
2 loops	30
1 loops & 1 corkscrew	20

(C) SECOND ELEVATION

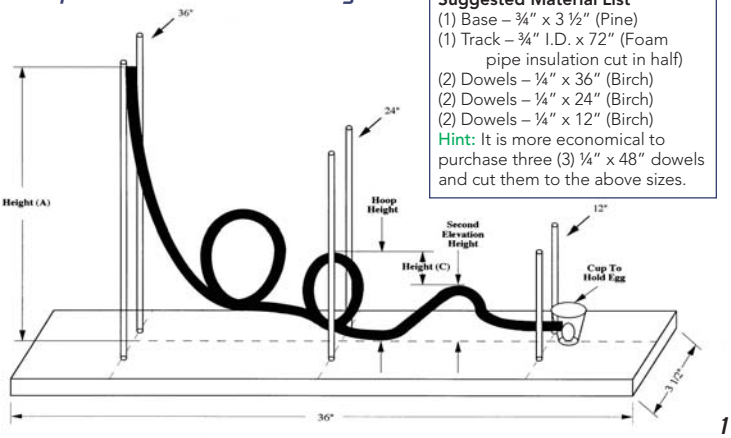
	Points
If 2ND elevation is lower than ½ hoop height	5
If 2ND elevation is higher than ½ hoop height	10
If 2ND elevation is within 1 inch of hoop height	20

(D) ORIGINALITY OR CREATIVITY 0 – 10 points

(E) TIME – (time it takes for marble to complete the roller coaster)

(F) DID THE EGG BREAK 0 points if Yes
1 point if No

Sample Roller Coaster Assembly



Suggested Material List
(1) Base – ¾" x 3 ½" (Pine)
(1) Track – ¾" I.D. x 72" (Foam pipe insulation cut in half)
(2) Dowels – ¼" x 36" (Birch)
(2) Dowels – ¼" x 24" (Birch)
(2) Dowels – ¼" x 12" (Birch)
Hint: It is more economical to purchase three (3) ¼" x 48" dowels and cut them to the above sizes.