TM_big_hw2

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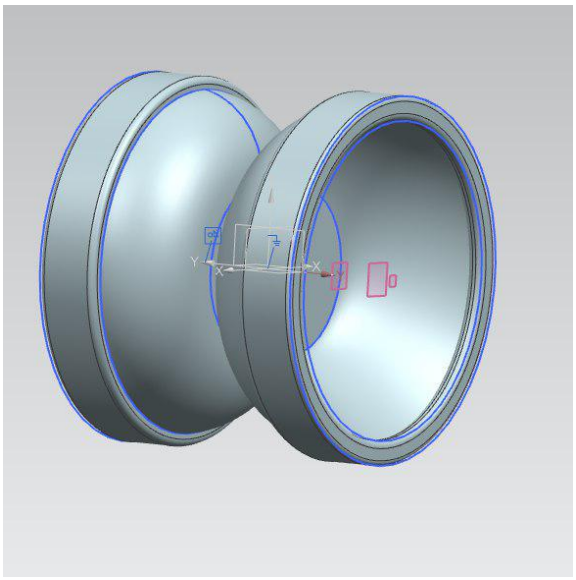
Description: There is the yo-yo.



Real yo-yo and CAD model. It was created for calculating inertia.

Calculated yo-yo parameters:

Volume = 0.000022904 m^3

Mass = 0.06385 kg

Inertia radius = 0.022530346 m

Ix, Iy, Iz = 0.000020159 $kg \cdot m^2$, 0.000024800 $kg \cdot m^2$, 0.000020384 $kg \cdot m^2$

Iyz, Ixz, Ixy = -0.000000000 $kg \cdot m^2$, -0.000000000 $kg \cdot m^2$, -0.000000000 $kg \cdot m^2$

Size of the yo-yo can be found by yourself using caliper.

Task: Yo-yo is fixed on the corner of the table. It will begin to unwind after unfixing due to the gravity force. This yo-yo is designed in such a way that,

having unwound, it starts to come back, but not to the full height. The process of movement is an analog of a damping pendulum. The task is as follows. It is necessary to find the number of oscillations before complete attenuation, as well as the height by which the yo-yo rises each time. In order to solve this problem, it is necessary to conduct an experiment and develop a mathematical model. This model must be grounded. It is also necessary to compare the simulation result and experimental results.

Provided tools for doing an experiment:

- yo-yo;
- ruler;
- USB camera;
- caliper.

Constraints:

- Need to make at least 5 experiments with different initial string length;
- Each experiment should be done 3 times.

A report should contain.

1. What tools were used (languages and so on).
2. Yo-yo math model. This model should be grounded (explained).
3. Experiment procedure explanation (with pictures).
4. Tables:
    1. initial string length over the number of oscillations; (Mean value and STD)
    2. max distance from bottom position (oscillation amplitude) over oscillation; (Mean value and STD)
5. Compare experimental and modeling results. Provide evidence and/or assumptions of result difference.