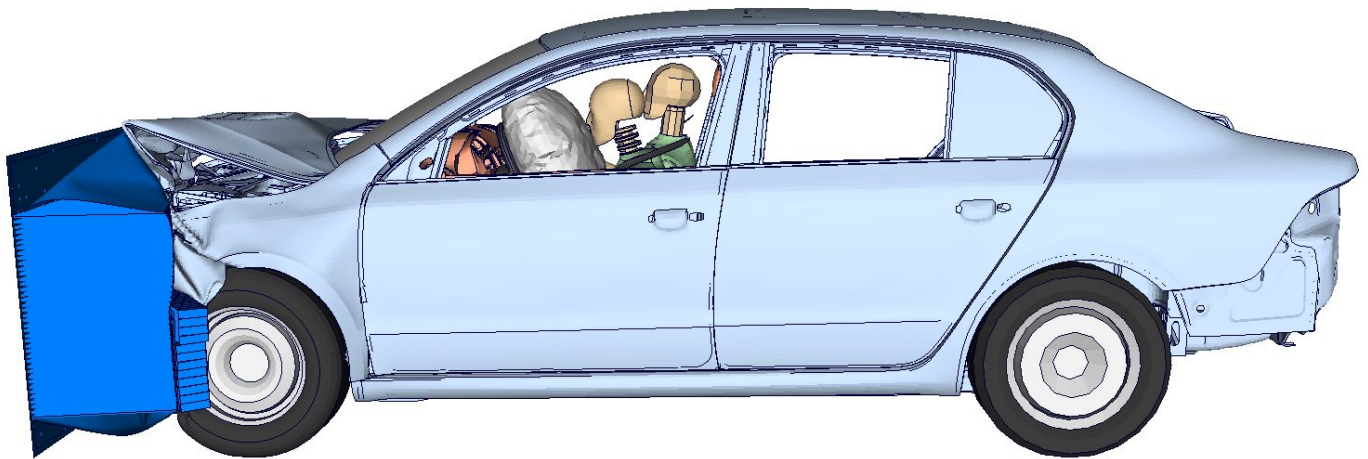


Name _____

Hour _____

Force Design Challenge



Due Date: _____.

Driving Question

How does force affect motion?

Objective: Your task is to use your knowledge of motion, force and Newton's Laws to construct a car that will keep an egg safe during a crash after traveling down a 2-meter long ramp.

Criteria: Your car must include the following:

- Egg must be able to 'enter' and 'exit' the car easily.
- Car must have 4 wheels.
- You are responsible for supplying the materials to build the car.**

Constraints: Your car must follow these guidelines:

- You will be given ONE (1) real egg for the final test.
- Wheel base must be no wider than 18cm.
- Distance from axle to axle must be no longer than 28cm.
- Car width may be no wider than 20cm. Car length may be no longer than 30cm.
- Wheel&tire diameter may be no larger than 8cm.
- Car materials must be general household items, except for the wheels and tires.
- You are responsible for supplying the materials to build your car.**

Evaluation of the Egg Car:

Car meets criteria and constraints	____/5
Car crashworthiness	____/16
TOTAL	____/21
Data, Graph, Analysis, and Reflection	____/30

Car Crashworthiness

Ramp Slope	Egg Condition After Crash	Points
10°	Completely broken	0
10°	Cracked & leaking	1
10°	Cracked but not leaking	2
10°	Not cracked	3
20°	Completely broken	4
20°	Cracked & leaking	6
20°	Cracked but not leaking	8
20°	Not cracked	10
30°	Completely broken	12
30°	Cracked & leaking	14
30°	Cracked but not leaking	16
30°	Not cracked	18

Initial Design:

Make a **sketch** of your initial design and **label** the materials. Make a **list** of all materials off to the side of your sketch. (3 points)

Data Collection

Record your data for the 3 different ramps. (9 points)

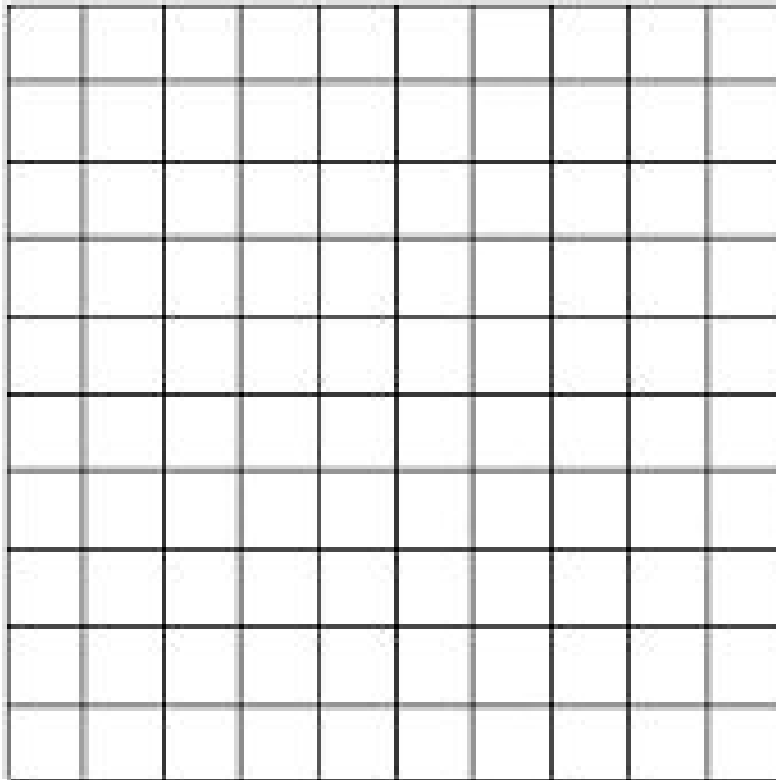
Ramp Length (m)	Time Completed (sec)	Average Speed (m/sec)	Car Acceleration (m/s/s)	Car Mass with egg (g)	Force on Impact (N)

Graph:

Graph the data for **average speed on all three ramps.** (8 points)

Graph checklist:

- title
- label and units (x-axis)
- scale (x-axis)
- label and units (y-axis)
- scale (y-axis)
- graphs



Reflection:

Which of Newton's three laws of motion best describes the egg? Explain how you know. (2 points)

Which specific types of forces are acting on the egg during the drive? Explain where and when those forces are acting on the marble. (2 points)

Are balanced or unbalanced forces acting on the egg? Explain how you know. (2 points)

Analysis

What were your original plans? How and why did they change as you started working on your car? (2 points)

Tell me about your contribution to the group compared to your teammates' contributions. (2 points)
