INERTIA LAB SAIL CAR

PocketLab Edition

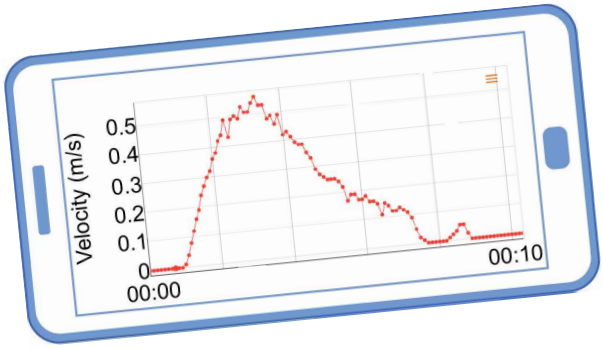
TeacherGeek

Name:_____

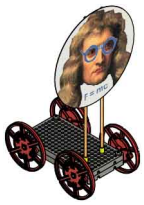
Check out the **Lab Set-Up Video** by scanning the QR Code or going to **teachergeek.com/sailcar**

What's inertia? Is it good or bad?

Experiment with your sail car to find out!



LAB SUPPLIES



"Built" Sail Car

Build the Sail Car using the **Go Guide**, available at **teachergeek.com/sailcar**

Fan

Plastic Cup

100 Pennies
or 250 g (9 oz) of weights

PocketLab Sensor

Get a PocketLab at **thepocketlab.com**

The PocketLab must be paired with a compatible phone, tablet, Chromebook, or computer.

INERTIA LAB SAIL CAR

INERTIA & BALANCED FORCES

***Inertia* is an object's resistance to changes in its motion. When the forces are balanced, objects will continue moving the same speed and direction.**

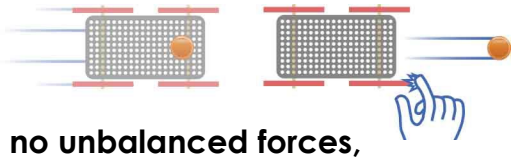
STATIONARY OBJECTS

1. Try placing a penny on a scrap of paper. If you quickly yank the paper out, the penny won't move.

With no unbalanced forces, this penny will never move.

MOVING OBJECTS

2. Place a penny on your car and push it fast. Stop the car with your hand, and the penny will continue moving.

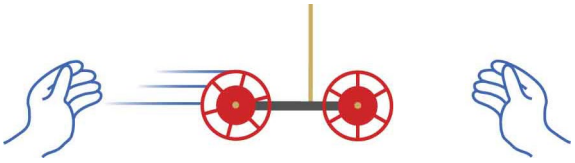


With no unbalanced forces, this penny will never stop.

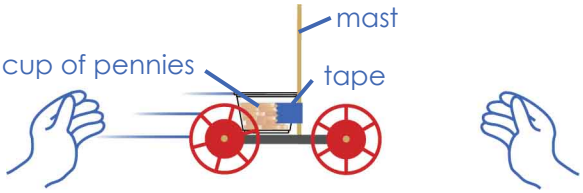
INERTIA & UNBALANCED FORCES

Adding mass to the car adds inertia, so it takes bigger forces to speed it up or slow it down.

3. Gently roll a car back and forth between your hands. Notice how much force you are using to start and stop it.

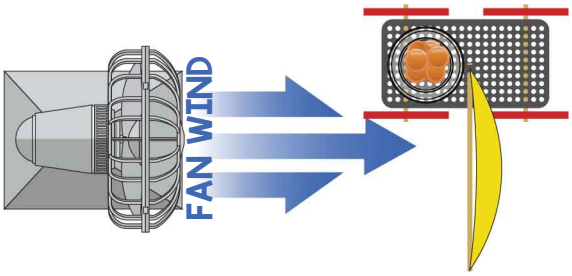


4. Tape a cup of pennies to your masts and roll it again. It should take more force to start and stop the car.

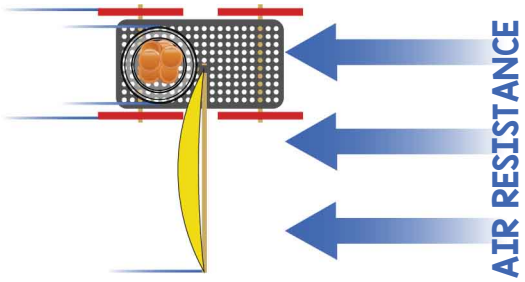


HOW MUCH INERTIA?

Lots of mass (inertia) means your car won't gain much speed from the fan's wind…



…but it also means that it won't lose much speed from air resistance.



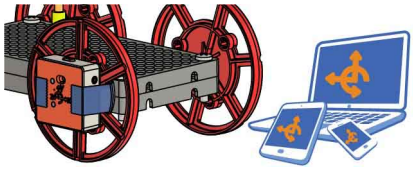
Air resistance slows your car down as it gets far from the strong winds of the fan.

INERTIA LAB SAIL CAR

MEASURING MOTION

You are going to use a PocketLab test inertia. But first, let's see how it works.

5 Set up your PocketLab.



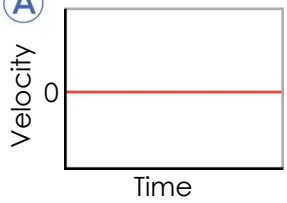
6 Play with your car! Then try to match the graphs. **Use the word bank to describe the motion each graph represents.**

WORD BANK

Use one choice **from each column** in your answers.

Column 1	Column 2
Move backward	Constant speed
Move forward	Speeding up
Not moving	Slowing down

A



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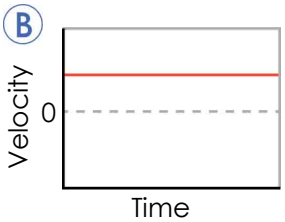
B



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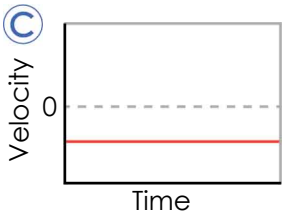
C



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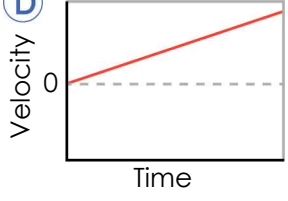
D



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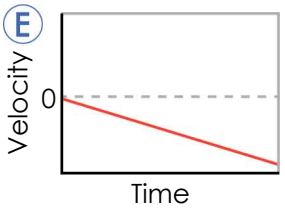
E



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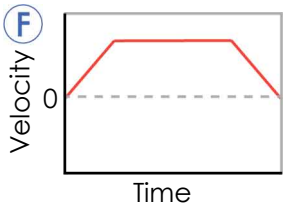
F



It starts by _____ _____

Then it _____ _____

Lastly, it _____ _____

Now that you can measure motion, let's use the PocketLab to explore inertia.

INERTIA LAB SAIL CAR

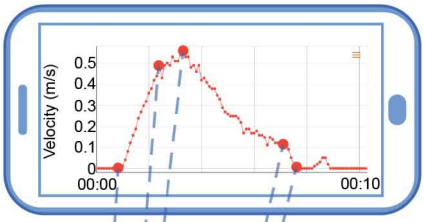
GET SOME DATA!

How does changing inertia (mass) affect your car's velocity?
Set up an experiment to find out!

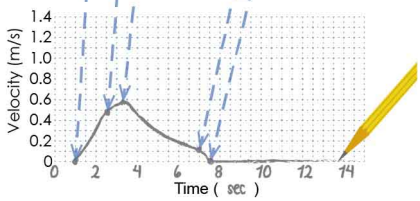
7 What variables do you need to keep track of?

Independent Variable(s)	Dependent Variable(s)	Control Variable(s)

8 Using the most pennies your vehicle can haul, sail your car down the track. Record the velocity data using the PocketLab.



9 Transfer your PocketLab's velocity graph to the axes below. The graph doesn't need to be perfect, but you should transfer over important points and match the general shape.



Velocity (m/s)
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0

Time ( )

Legend

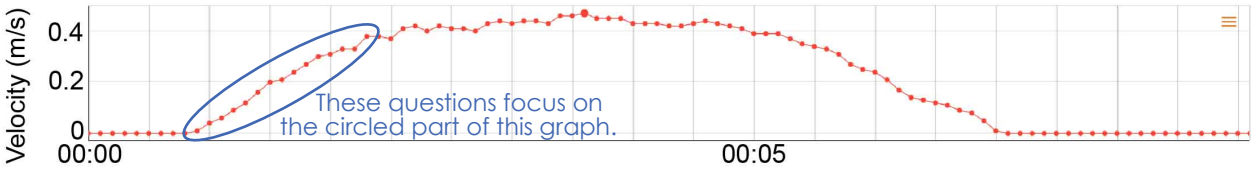
10 Now get data using only half of the pennies you used in Step 8. Then get data with no pennies. Fill in the legend so you can tell one experimental condition from the other.

EXAMPLE
Legend
100 pennies
50 pennies
0 pennies

INTERPRET RESULTS

What does your data tell you about inertia and motion?

11 Answer the questions below referencing the circled part of the graph.



A Describe the sail car's motion. Use one choice from each column of the word bank.

_____

_____

WORD BANK

Column 1	Column 2
Move backward	Constant speed
Move forward	Speeding up
Not moving	Slowing down

B Describe any unbalanced forces acting on the car and explain how you know forces are balanced/unbalanced.

_____

_____

_____

_____

C If you increased the mass of the sail car, how would this part of the graph change? Use your car's data from p. 4 to justify your answer.

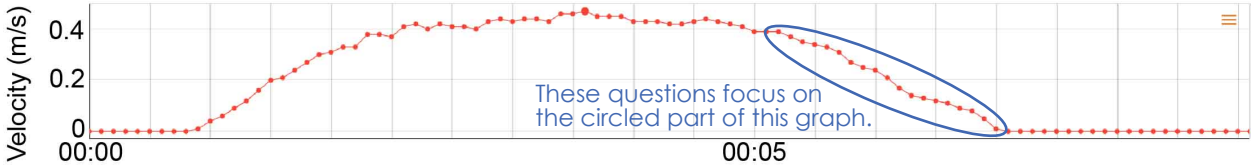
_____

_____

_____

_____

12 Answer the questions below referencing the circled part of the graph.



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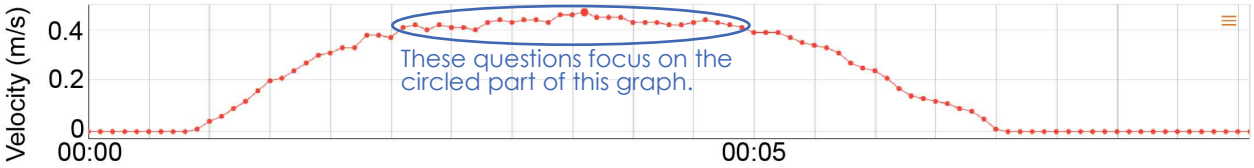

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CONCLUSION

Identify patterns and use them to build a better sail car!

15 What is inertia, and how is it related to mass?

16 How does inertia affect the motion of your sail car?

17 Do you want your sail car to have a lot or a little mass? Why?