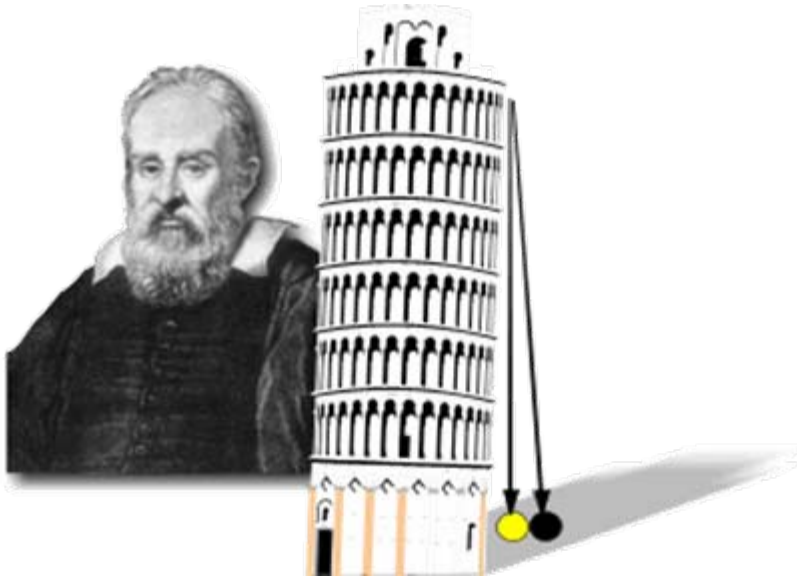


Forces of Motion: Rockets!



What Makes Things Move?

Who was the first scientist credited with exploring how things move?



<http://www.space.gc.ca>

Galileo Galilei
(1564–1642)

Galileo studied what makes things move, exploring:

Falling objects

Gravity

Friction

Forces

What Makes Things Move?

One scientist is known for the three physical laws he discovered.

What is his name, and what are his laws called?



Newton explained Galileo's discoveries with his three "Laws of Motion".

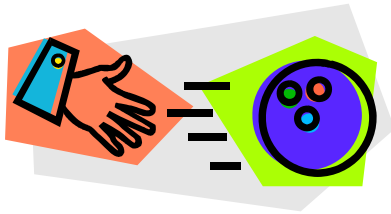
Sir Isaac Newton (1642 – 1727)

Newton's 1st Law

Law of Inertia



“An object at rest tends to stay at rest”



“An object in motion will stay in motion at a constant speed in a straight line unless acted on by a force”



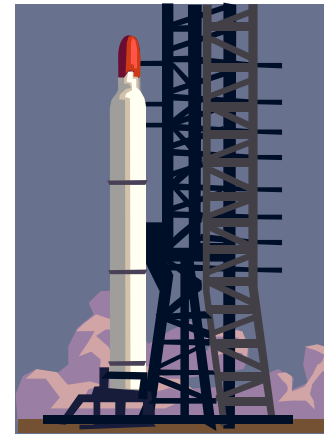
Newton's 2nd Law

Law of Acceleration

$$F = ma$$

Force = (mass) x (acceleration)

“The more force on an object, the more it accelerates. The more massive an object is, the more it resists acceleration”



Newton's 2nd Law – Rockets

Law of Acceleration

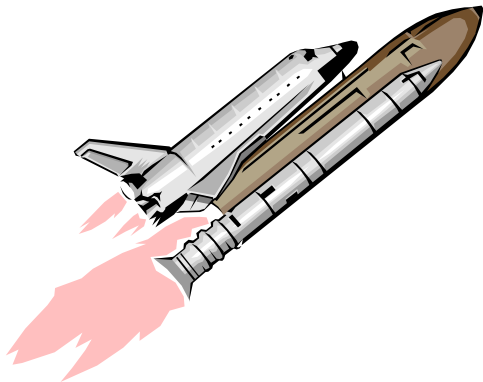
$$F = ma$$

$$a = F/m$$

Acceleration is directly proportional to the Force.

Acceleration is inversely proportional to the mass.

The more force (thrust) from the rocket engine, the greater the acceleration.

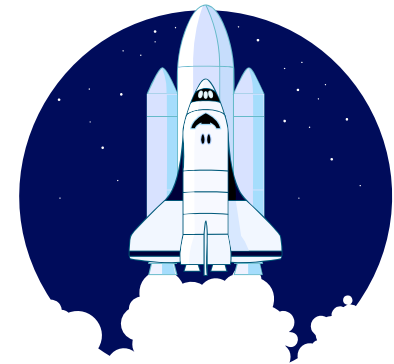
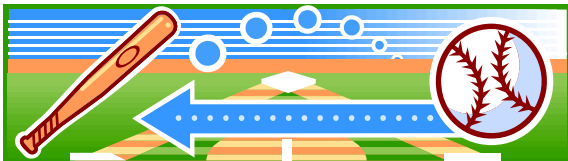


The lighter the rocket, the greater its acceleration for a given thrust.

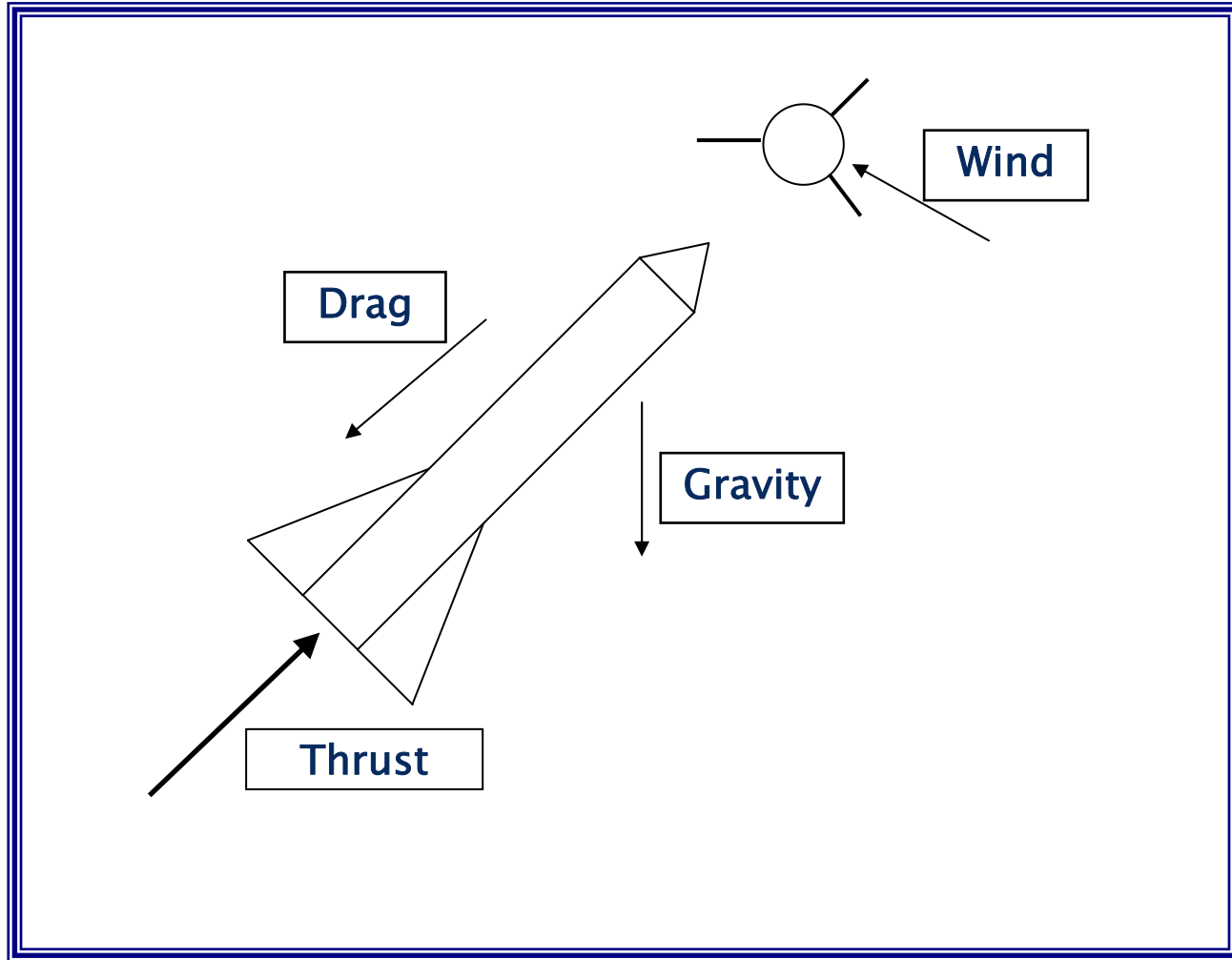
Newton's 3rd Law

Law of Action/Reaction

“When one object exerts a force on a second object, the second object exerts an equal but opposite force on the first object”



Forces acting on a Rocket



Rockets demonstrate all 3 laws!

1st Law: The rocket will stay put until acted on by a force.



2nd Law: The amount of Force needed to accelerate the rocket depends on its mass.

3rd Law: The thrust from the rocket pushes it away from the earth.



Forces of Motion

Let's launch Rockets!

