SPACE EXPLORATION

Jennifer F. Nemeth, Ph.D.
Pack 408, Troop 542
Merit Badge Counselor

Paul Schlosser
Troop 1
Merit Badge Counselor

SESSION 4

Blue: Covered F2F
Green: Done on your own

Requirements for the Space Exploration Merit Badge:

1.Tell the purpose of space exploration and include the following:
   a. Historical reasons,
   b. Immediate goals in terms of specific knowledge,
   c. Benefits related to Earth resources, technology, and new products,
   d. International relations and cooperation.

2.Design a collector's card, with a picture on the front and information on the back, about your favorite space pioneer. Share your card and discuss four other space pioneers with your counselor.

1.Build, launch, and recover a model rocket.* Make a second launch to accomplish a specific objective. (Rocket must be built to meet the safety code of the National Association of Rocketry. See the "Model Rocketry" chapter.)

Identify and explain the following rocket parts:
   a. Body tube
   b. Engine mount
   c. Fins
   d. Igniter
   e. Launch lug
   f. Nose cone
   g. Payload
   h. Recovery system
   i. Rocket engine

4.Discuss and demonstrate each of the following:
   b. The law of action-reaction
   c. How rocket engines work
   d. How satellites stay in orbit
   e. How satellite pictures of Earth and pictures of other planets are made and transmitted

5.Do TWO of the following:
   a. Discuss with your counselor a robotic space exploration mission and a historic crewed mission. Tell about each mission's major discoveries, its importance, and what was learned from it about the planets, moons, or regions of space explored.
   b. Using magazine photographs, news clippings, and electronic articles (such as from the Internet), make a scrapbook about a current planetary mission.
   c. Design a robotic mission to another planet, moon, comet, or asteroid that will return samples of its surface to Earth. Name the planet, moon, comet, or asteroid your spacecraft will visit. Show how your design will cope with the conditions of the environments of the planet, moon, comet, or asteroid.

6.Describe the purpose and operation of ONE of the following:
   a. Space shuttle or any other crewed orbital vehicle, whether government owned (U.S. or foreign) or commercial
   b. International Space Station

7.Design an inhabited base within our solar system, such as Titan, asteroids, or other locations that humans might want to explore in person. Make drawings or a model of your base. In your design, consider and plan for the following:
   a. Source of energy
   b. How it will be constructed
   c. Life-support system
   d. Purpose and function.

8.Discuss with your counselor two possible careers in space exploration that interest you. Find out the qualifications, education, and preparation required and discuss the major responsibilities of those positions.

POLL ON THE ISS MODULES

ISS Modules

Module	Designed/Built	Launched	Launch Vehicle	Use
Zarya (Sunrise)	US / Russia	November 20, 1998	Russian Proton-K rocket	• Primarily used for storage
Unity	US	December 4, 1998	US Space Shuttle	• Mess hall
Zvezda (Star)	Russia	July 12, 2000	Russian Proton-K rocket	• Provide living quarters for researchers • Houses the station's flight control and propulsion systems
Harmony	US	October 23, 2007	US Space Shuttle	• Internal connecting port and passageway to international science labs and cargo spacecraft. • Utility hub providing air, electrical power, water, and other essential systems to support life on the station
Tranquility	ESA Italian Space Agency	February 8, 2010	US Space Shuttle	• Environmental control systems, life support systems, a toilet • Exercise equipment • Observation cupola
Kibo (Scale)	Japan Space Agency	June 3, 2008 September 24, 2008 July 15, 2009	US Space Shuttle	• Scientific research activities • Enables educational, cultural, and commercial opportunities
Cupola (Dome)	ESA	February 8, 2010	US Space Shuttle	• Experimental module, ship docking, and observations of Earth
Leonardo (Named for Da Vinci)	ESA	February 24, 2011	US Space Shuttle	• Multi-Purpose Logistics Module: Storage of spares, supplies and waste

Design Teams & Objectives

Eagle 14

- Joseph R
- Charlie
- Henry
- Lance
- Caleb
- Liam

Moderators
Schlosser
Gregg

Project Supernova

- Austin
- Kevin
- Gavin
- Joseph T
- Tyler

Moderators
Fountain
Pennington

Spatius Explorations

- Robert
- Michael
- Jonah
- Kiran
- Colin

Moderators
Myers
Cooper

Space Scouts

- Jacob
- Connor
- Joshua
- Gabriel
- Dylan

Moderators
Nemeth-Seay
Christ

Goals for today's Break-Out

- Present your Base Designs

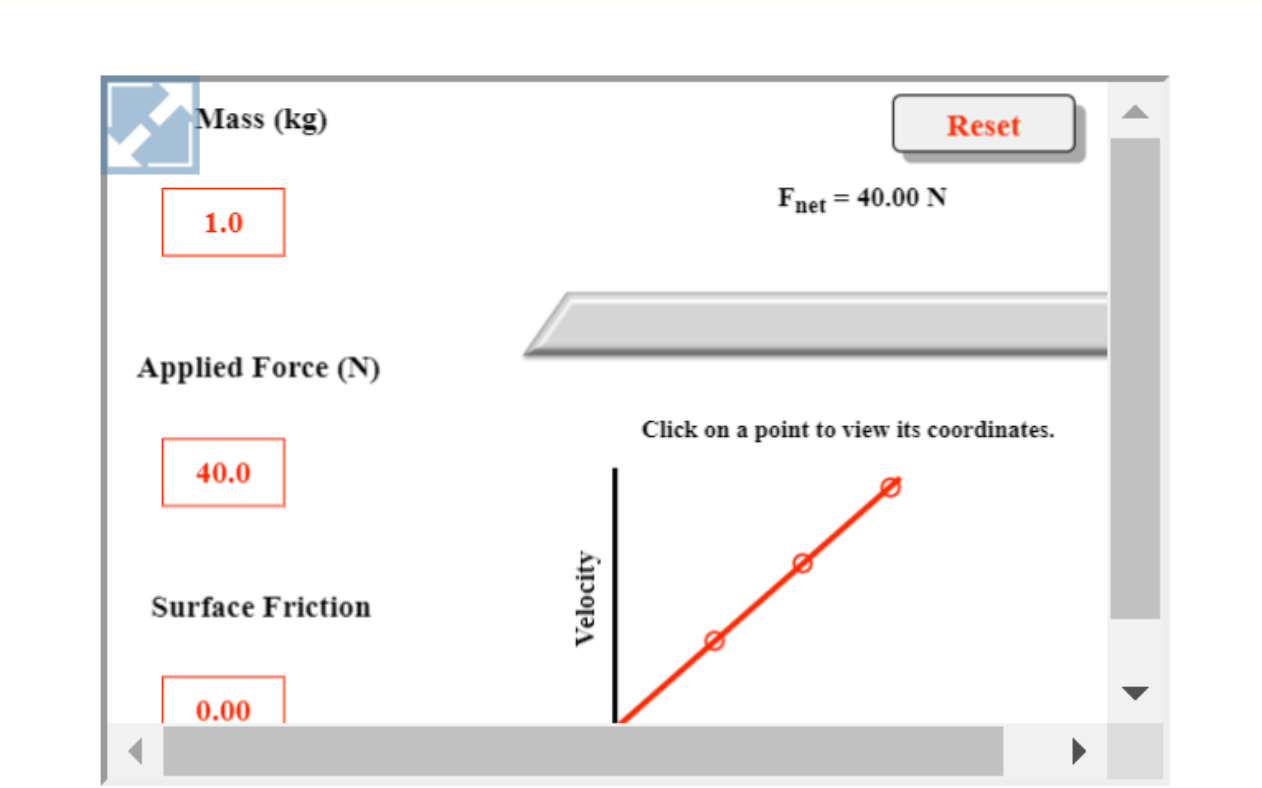
Space Exploration Merit Badge Counselors in Baden-Powell

Horry, Adam	Plymouth Meeting	610-762-4327	ahorry@comcast.net
Manero, Gregory Troop 320	Flourtown	215-402-0667	gmanero@earthlink.net
Robinson, Richard	Plymouth Meeting	610-828-8486	rrobinson@janney.com
Schlosser, Paul Troop 1	Oreland	610-354-2695	pjs2164@verizon.net
Watson, James	Fort Washington	267-468-0865	scoutmaster540@comcast.net
Nemeth, Jennifer Troop 541/542	Fort Washington	610-334-0159	Jfnemeth1@netscape.net

BACK-UP SLIDES

Sir Isacc Newton's Laws of Motion

Second Law: Force equals mass times acceleration (F = m * a)

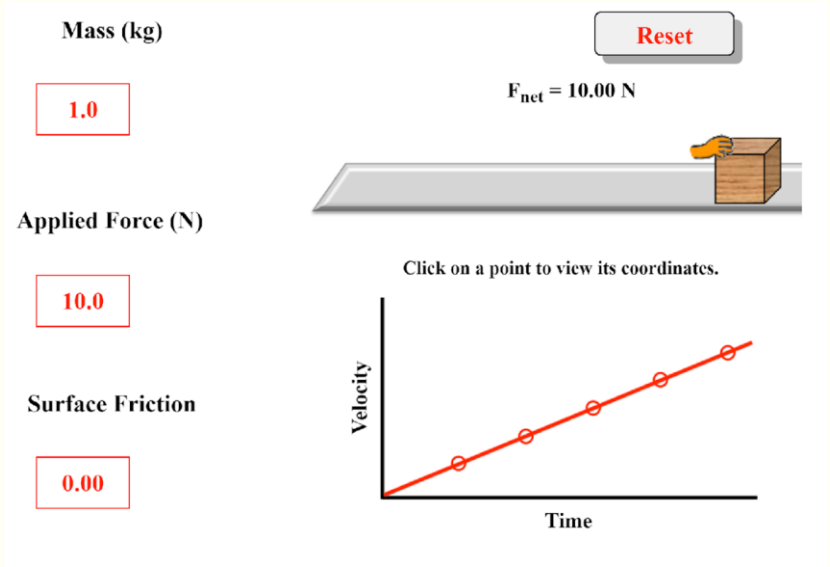


https://www.physicsclassroom.com/Physics-Interactives/Newtons-Laws/Force/Force-Interactive

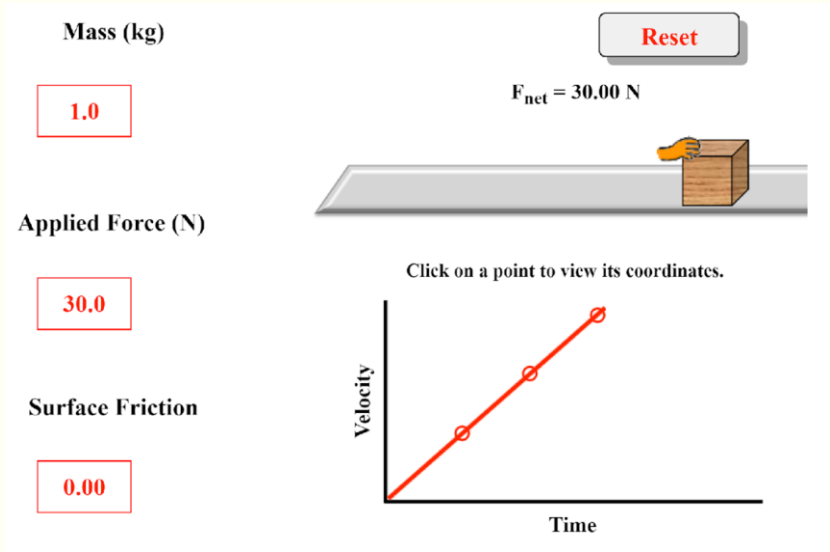
Sir Isacc Newton's Laws of Motion

Second Law: **Force equals mass times acceleration. (F = m * a)**

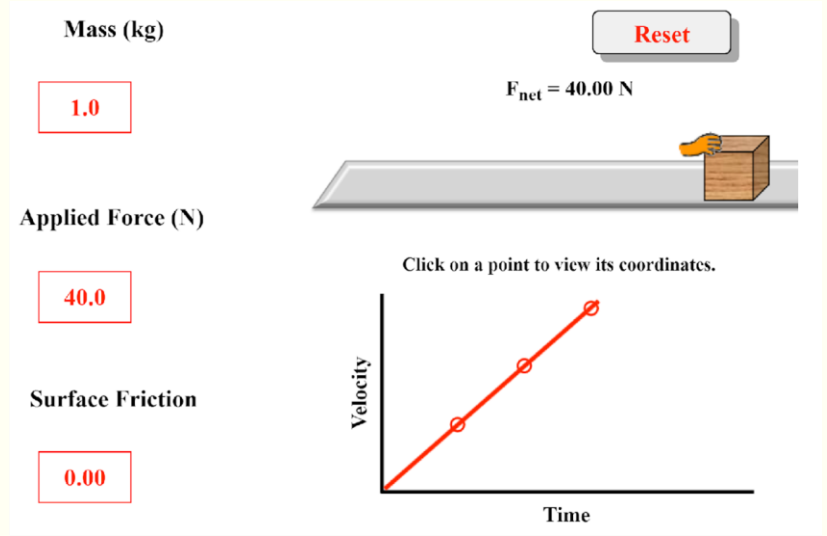
Force = 10



Force = 30



Force = 40



This is to be done on your own; Document the role of ISS modules in Req #6 in your workbook

Take a Tour of the International Space Station

Video 4
FGB
1st piece of the station
Suzez space vehicle
9:39

Part 1: Station Tour: Zarya and Zvezda

Video 3
Cupola
Shows the suz\uz spaced
Exercise equipment –ber
Show the entry into the P
6:07

Part 2: **Station Tour: Cupola and Leonardo**

Video 1
Science Modules
Exercise equipment – bike
5:10

Part 3: Station Tour: Destiny, Columbus, Kibo

Video 2
Bathrooms
Mess Hall
Sleeping
8:41

Part 4: Station Tour: Harmony, Tranquility, Unity