

**Teacher/School:** Deborah Knight / Hardee Junior High

**Unit Title:** Friction and Gravity

**Grade Level:** 7th Grade

**Subject/Topics:** Friction, Gravity and Free Fall

**Time Needed:** 2 weeks (40 minute classes)

**Learning Objectives:**      **What will students learn?**

- The main objectives are that the student will be able to:
- Describe friction and identify the factors that determine the friction between two surfaces.
- Explain how mass differs from weight.
- State the universal law of gravitation.
- Describe the effects of gravity and air resistance on an object in free fall.

**Sunshine State Standards:**

- SC.A.1.3.2-The student understands the difference between and mass.
- SC.C.2.3.1-The student knows that many forces (eg, gravitational, electrical and magnetic) act at a distance (eg, without contact.)
- SC.C.2.3.2-The student knows the common contact forces (eg, friction, buoyancy, tension.)
- SC.C.2.3.3-The student knows that if more than one force acts on an object, the then forces can reinforce or cancel each other, depending on their direction and magnitude.
- SC.C.2.3.6-The student explains and shows the ways in which a net force can act on an object.

**Materials/Supplies:**

- Movie day: Mythbusters DVD with "Penny Drop" episode
- Sticky sneakers lab: volunteer shoes, large paper clip, masking tape, 20 N spring scale, 5 N spring scale, mass set, balance.
- Demos: ruler, change, paper, 2 glass plates, marbles, DVD player, projector and screen.

**Prerequisite Skills:**

Measuring and recording data.

**Instructional Procedures:**      **What will the teacher be doing?**      **What will the students be doing?**

Discussion - lecture with notes and discussion, example problems, etc.

Independent work time - for students to work on the classwork assessment options they choose.

See pages 3-4 for the student handout with information.

- Day 1: Read and discuss text, part 1. Discuss assignment sheet, and what will be tested.
- Day 2: Demo-spinning plates on marbles. Discuss different types of friction and its uses. Independent work time.
- Day 3: Watch Mythbusters Penny Drop episode. Discuss myth, how they tested it, and their conclusion. Also discuss how applies to unit in class.
- Day 4: Demo-does weight affect what lands first? Discuss gravity, free fall, projectile motion, and air resistance. Independent work time.
- Day 5: Movie clip-from Zero G flight, showing mass and weight of beans. Discuss mass vs. weight. Independent work time.

- Day 6: Demo/Discussion: Measuring mass and weight, figuring weight in newtons. Individual work time.
- Day 7: Discuss universal gravitation. Review. Independent work time. Day 8: BW-essay question. Sticky Sneakers lab, part 1.
- Day 9: BW -essay question. Sticky Sneakers lab, part 2. Review
- Day 10: Work due. Test.

**Differentiated Instruction:**

Students have options in which class work assignments to complete. In needed or requested, students could work in teams, suggest assignment options not listed on the assignment sheet, or choose a different method of recording work.

**Assessment:**

Classwork assignments (options on page 4), vocabulary quiz, written work and participation for the in class lab, section test (using iRespond units.)

### Friction and Gravity (pp 55-61)

#### Objectives (you will be able to):

- Describe friction and identify the factors that determine the friction between two surfaces.
- Explain how mass differs from weight.
- State the universal law of gravitation.
- Describe the effects of gravity and air resistance on an object in free fall.

#### Sunshine State Science Standard:

- SC.A.1.3.2-The student understands the difference between mass and weight.
- SC.C.2.3.1 -The student knows that many forces (eg, gravitational, electrical and magnetic) act at a distance (eg, without contact.)
- SC.C.2.3.2-The student knows the common contact forces (eg, friction, buoyancy, tension.)
- SC.C.2.3.3-The student knows that if more than one force acts on an object, the forces can reinforce or cancel each other, depending on their direction and magnitude.
- SC.C.2.3.6-The student explains and shows the ways in which a net force can act on an object.
- SC.C.2.3.7-The student knows that gravity is a universal force that every mass exerts on every other mass.
- SC.E.1.3.1 -The student understands the vast size of our Solar System and the relationship of the planets and their satellites.

#### Vocabulary:

projectile	air resistance	weight	newton
friction	terminal velocity	fluid friction	free fall
sliding friction	rolling friction	gravity	

#### Formula:

Weight = mass x acceleration due to gravity (9.8 m/s<sup>2</sup>)

#### Major Points:

- \_\_\_\_\_ is a force that one surface exerts on another when they rub against each other.
- \_\_\_\_\_ is the measure of the force of gravity on an object.
- Mass is a measure of the \_\_\_\_\_ that an object contains.
- The force of gravity acts between all objects in \_\_\_\_\_.

### **Classwork Assignment Options:**

- You need to finish several activities from the following list.
- Make your choices based on your skills, interests, and the point values for each activity.
- Be sure each activity is labeled.
- Staple all the pages together and turn in.

To earn an A, you must do 75 points of activities; however, you may earn UP TO 100 POINTS.

All assignments MUST be completed before they turned in - otherwise they will receive a F (59%) and be returned to owner to finish.

**All assignments are due no later than:** \_\_\_\_\_.

### **Check off the assignment when you finish it.**

- Define vocabulary words on a vocabulary paper or on vocabulary cards. Ask for a baggie if you use the cards. (15 points)
- Worksheet M 1-1 RR Friction and Gravity. Finish it, get Ms. Knight's initials, then grade it yourself, and correct anything you got wrong. (15 points)
- Worksheet M 1-1 E The Great Pyramids. Finish it, get Ms. Knight's initials, then grade it yourself, and correct anything you got wrong. (15 points)
- Design and carry out an experiment that investigates the friction created by at least 3 different surfaces. Write down (1) your procedures, (2) your results, and (3) your conclusion. (20 points)
- Describe the function of lubricants (what they do.) List 3 lubricants and where they are used. (5 points)
- Estimate the mass of 5 objects, then determine the mass using the scale. Record the information in a chart. Make sure you have the correct units! (15 points)
- Turn in a "Mythbusters Up Close" paper for the *Penny Drop* episode. Get worksheet from the hanging file, take notes during the movie, get Ms. Knight's initials, then grade it yourself, and correct anything you got wrong. (15 points)

### **Assessment dates (the points do not contribute toward the class work assessment!):**

√ Vocabulary quiz: \_\_\_\_\_

√ In class lab assignment: Sticky Sneakers \_\_\_\_\_

- You will need to bring 1 (preferably NOT STINKY) shoe to work with!! Not the one you are wearing!

√ Section test: \_\_\_\_\_