Civil Air Patrol's ACE Program

Hundreds of Rockets
Grade 2 Additional Foam Rocket
Drug Demand Reduction Manipulative Item Lesson

Topics: rockets, place value, greater and less than (science, math)

Length of Lesson: 40 minutes

Objectives:
- Students will understand place value by creating three-digit numbers.
- Students will compare three-digit numbers.
- Students will determine greater than and less than of three-digit numbers.
- Students will learn parts of a rocket.
- Students will learn how a rocket launches.

National Standards:
CCSS Math:
- 2.NBT.A.3 Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. Understand Place Value:
- 2.NBT.A.4 Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using >, =, and < symbols to record the results of comparisons.

Next Generation Science Standards:
- K-2-ETS1-1 Asking questions, making observations, and gathering information are helpful in thinking about problems.

Background Information:
The first rockets we know about were used in China in the 1200s. During the next 700 years, people made bigger and better rockets. These rockets were used for fireworks, wars, and for sending the first men to land on the moon. Rockets are still being launched today to send equipment, experiments, and astronauts into space.

Rockets have four main parts: **payload** (the top, or nose cone area where whatever is being launched is stored, be in materials or humans); **structure** (the long body of the rocket); **guidance system** (the fins and the electronic systems that control the direction of the rocket's flight); and the **propulsion system** (the area where the engine or fuel is stored to propel the rocket upward).

Rockets are propelled into space using liquid or solid fuel. Following Newton's 3rd Law of Motion, 'for every action, there is an equal and opposite reaction,' when a rocket's engines or fuel is ignited, the power of the engine pushing downward thrusts the rocket upward.

When rockets are launched into space, scientists are using large numbers to determine the amount of fuel, capacity, and weight the rockets can carry. To be able to read and add these large numbers, scientists need to be able to recognize and understand the place value of numbers. Scientists must also calculate the distance that a rocket will need to travel to reach its destination. Those distances are extremely large numbers. For instance, the moon is around 239,000 miles from Earth. The Apollo missions to the moon had to carry enough fuel to travel that far and return safely. But missions to Mars will have to travel at least 35,800,000 miles just to reach our neighboring planet.

In this lesson, second grade students will be reading, writing, and understanding number values in the ones, tens, and hundreds places. They will then determine which is greater than and less than.

Materials:
- finger rockets (provided by CAP to students)
- "Parts of a Rocket" worksheet
- "*Hundreds of Rockets*" worksheet

Lesson Presentation:
1. Show the "I Didn't Know That: How Rockets Work" video.

2. Discuss the definition of a rocket with students.

3. Quiz students about the four main basic parts. They may use simpler names than those in the Background Information, so, the following will be fine to use: a nosecone, fins (that look like little wings), an engine, and a body that holds fuel and connects the nosecone to the fins. (If you wish to use the proper names from the Background Information, you can use the labeled rocket photo worksheet included herein.)

4. Distribute the finger rockets to the students.

5. Call out the four parts of the rocket and ask students to point to them on their rocket.

6. Review how students' rockets will travel forward from ACE Academic lesson #8. (And/or, watch this "Finger Missiles - Quick Demo" video.) Allow the students to practice launching their rockets.

7. When students have all practiced launching their rockets, tell students that they will now count how long their rocket stays up by counting how many seconds the rocket stays in "space." (All students should have a number between 1 and 9.)

8. Next, review with students the three place values of the ones, tens, and hundreds places with a demo by the teacher on the whiteboard or other writing area, and/or by viewing the video, Place Value Instructional video.

9. Have students divide into groups of three. In each group, one person will be "Hundreds," one person will be "Tens," and one person will be "Ones." After students have assigned each member a place value, tell students that they are going to create a three-digit number by launching their rockets into space and counting how long it takes to land back on Earth. One student at a time should launch their rocket and the group should record the number in the correct place value for each person in the first section of the *Hundreds of Rockets* sheet, included herein. Students will practice reading the three-digit number that has been created by the group.

10. Repeat the process and have students record their number is their correct place value for each person in the second section of the *Hundreds of Rockets* sheet. Students will practice reading the three-digit number that has been created by the group.

11. Review greater than and less than signs and meanings and/or show the video, "Greater Than Less Than Song for Kids | Comparing Numbers by Place Value."

12. Students will then complete the work on sections three and four on the *Hundreds of Rockets* sheet.

Summarization:
Ask students what they learned from today's lesson. Ask them to explain the importance of rockets. Ask students to read some of their three-digit numbers aloud. Ask them to explain how they use place value to help them determine which is the largest number. Ask them to give an example of the kinds of numbers that scientists at NASA work with during mission planning. Have students explain why it is important to be able to recognize the place value of a number, or, to put numbers in order from smallest to greatest.

Character Connection: Tell students that in order to stay on target in life, we must know where it is we want or need to go and do our very best to get there. For example, if we want to make it to third grade, we must aim to get to third grade by following directions in second grade, doing our homework, asking questions when we do not understand something, and doing our best when we do work in second grade. We must always think about where it is we are trying to get and make good choices to help us get there! Making good choices will help keep us flying in the right direction!

<u>Drug Demand Reduction (DDR) Connection:</u> See page 9 of this guide.

Assessment:
- teacher observation
- completed worksheets

Additional activity ideas to enrich and extend the primary lesson (optional):
- [Place Value games](#) from Education.com
- [Place Value games](#) from Turtle Diary

- Share some of the distances from the sun that various planets within our solar system travel in their orbits. If desired, you can use the [Planetary Fact Sheet](#) - distances of planets from the sun in U.S. units. Allow the students to try to read some of the three-digit numbers you write on the board for them.
  a. Or compare how far other planets are from the earth using the [earth to other planets calculator from NASA](#).
  b. Help the students place those planets in order from the smallest to the greatest distance (from the sun and/or the earth).
     (1) This will involve looking at thousands and millions in place value, so this is a challenging task.
     (2) You may prefer to help them place the planets in order, and then show them the distances for each planet. (The [Solar System Gallery of photos](#) can be used to show images of planets to help students place planets in order.)
  c. Rather than compare planetary distances, you may wish to have your students compare the size of various rockets instead. Comparisons may be based on height, diameter, or mass at liftoff. You may want to use [How Do Rockets Stack Up?](#) (comparison of rocket stats)

Additional Resources:
- [How Do Rockets Work?](#)
- [NASA Rocket Parts](#)
- ["Place Value Song For Kids | Ones, Tens, and Hundreds"](#) (video)
- ["Solar System Size and Distance"](#) (video)

4 Main Parts of a Rocket
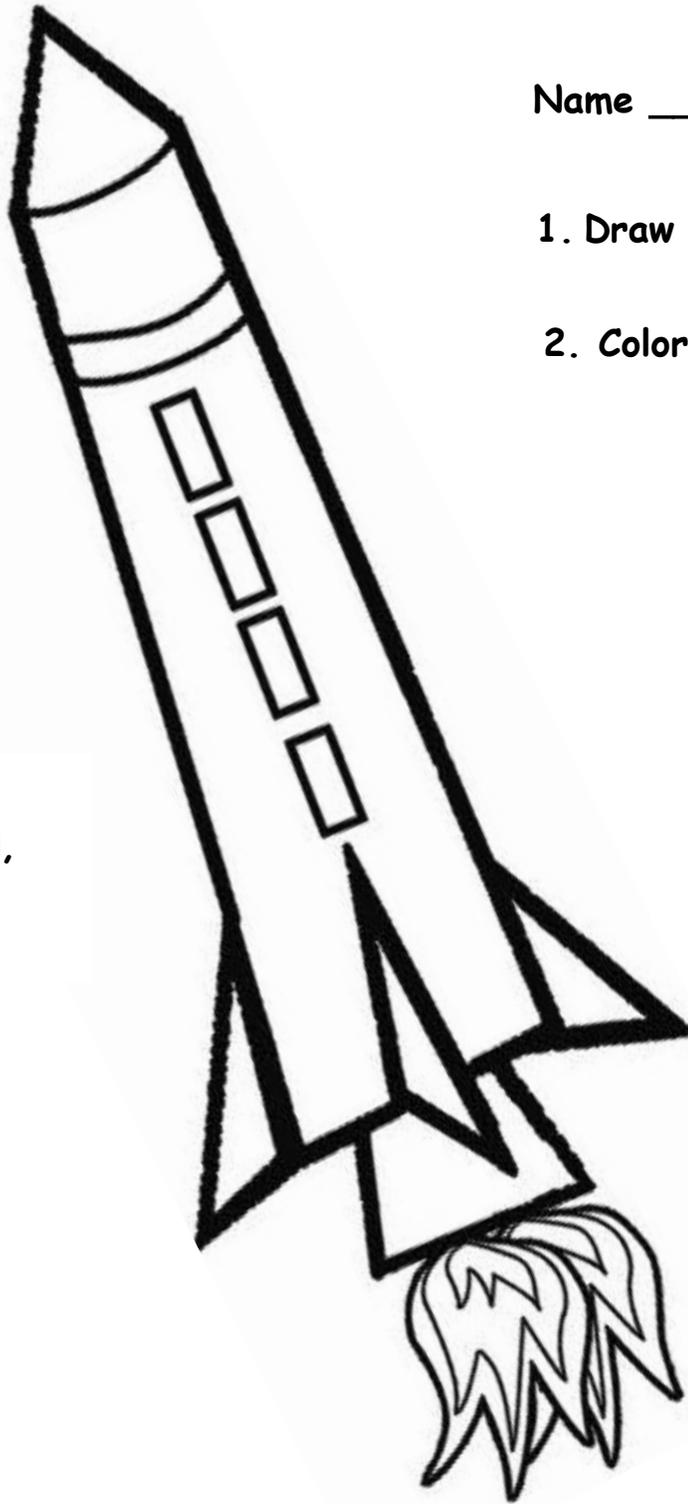
**Payload Section
(nose cone)**

Name _____

1. Draw a line to each part.

2. Color each part.

**Structural Section
(body)**

**Guidance System
(fins, and, if included,
the GPS system
to guide the rocket)**

**Propulsion System

(engine and fuel area)**

Hundreds of Rockets

Name _____

In your group of three students, take turns launching your finger rockets, counting the seconds the rocket is in the air, and writing the number in YOUR assigned place value section on each person's sheet. Read your number starting with the hundreds place.

1. _____ _____ _____
   Hundreds   Tens   Ones

Now, do this a second time and write your numbers in your place value section on each person's sheet. Read your number starting with the hundreds place.

2. _____ _____ _____
   Hundreds   Tens   Ones

Now, look at numbers, #1 and #2.
Which number is the largest of the two?

Write the number that is **>** (greater than) the other one below. Read the number starting with the hundreds place.

3. _____ _____ _____
   Hundreds   Tens   Ones

Now, look at numbers, #1 and #2.
Which number is the smallest of the two?

Write the number that is **<** (less than) the other one below. Read the number starting with the hundreds place.

4. _____ _____ _____
   Hundreds   Tens   Ones

Civil Air Patrol Aerospace Connections in Education (ACE) Program 2020