



Name: _____

Date: _____

Student Exploration: No Alien Left Behind

Vocabulary: dividend, divisor, quotient, remainder

Prior Knowledge Questions (Do these BEFORE using the Gizmo.)

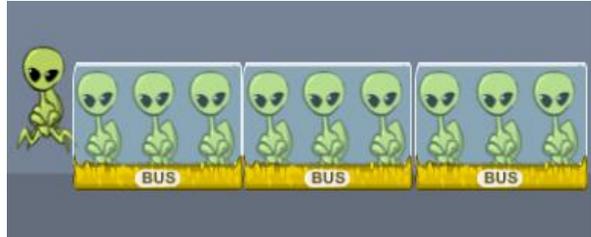
1. Nine friends want to play a game. The game requires teams of three people each. Will everyone get to play? Why or why not?

2. Could you play this game with ten people and have teams of three people each? Explain.

Gizmo Warm-up

In the *No Alien Left Behind* Gizmo™, the alien school children from the planet Zigmo are taking field trips to other planets. Space bus fuel is very expensive, so the Zigmo Congress passed a law requiring full buses only – if a bus has even one empty seat, it is not allowed to go.

Notice the six aliens lined up on the sidewalk in the Gizmo, waiting to leave on their field trip.



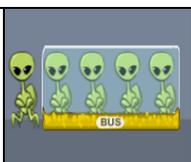
1. Drag yellow space buses to the sidewalk until every alien is inside a bus.

How many buses did you use? _____

2. Drag four more aliens from the school to the sidewalk, for a total of 10. (You could also do this with the **Aliens** slider.) Use the **Bus size** slider to change the bus size to 4. (Notice that the Gizmo will not let you add a third bus because it wouldn't be completely full of aliens.)

How could you get all 10 aliens inside buses? Explain.



Activity A: Field trip to Earth	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> Click the Recall button to bring all buses back. Make sure that the Autopilot checkbox is off. 	
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The alien students of planet Zigmo are boarding space buses for a field trip to Earth. As the Chief of Interplanetary Travel, you must get the aliens on the buses with no alien left behind.

- First, practice with a small number of aliens.
 - Set the number of **Aliens** to 6 and the **Bus size** to 3.
 - Add buses to the sidewalk until every alien is on a bus.
 - Move your mouse over the sentences at the bottom and watch what happens on the sidewalk. Then fill in the blank below:

6 aliens total. Each bus holds 3 aliens. I used _____ buses.

- Now you're ready to put the rest of the classes on buses. Four alien classes are listed below. For each one, find a bus size and a number of buses that gets every alien on a bus. (Note: There is more than one correct way to do some of these.)

A. 12 aliens total. Each bus holds _____ aliens. I used _____ buses.

B. 8 aliens total. Each bus holds _____ aliens. I used _____ buses.

C. 15 aliens total. Each bus holds _____ aliens. I used _____ buses.

D. 14 aliens total. Each bus holds _____ aliens. I used _____ buses.

- The President of Zigmo wants you to write a mathematical report on your work. First, write a practice report for the class of 6 aliens that you put on buses in step 1.

- Set the number of **Aliens** to 6 and the **Bus size** to 3. Drag 2 buses to the sidewalk.
- Click the **Show as division** checkbox. Mouse over the parts of the equation and watch what happens on the sidewalk.
- Write the division equation: _____ ÷ _____ = _____

- Use the Gizmo to write the report (the division equations) for the four classes in step 2.

A. _____ ÷ _____ = _____ C. _____ ÷ _____ = _____

B. _____ ÷ _____ = _____ D. _____ ÷ _____ = _____

- On a separate piece of paper, or on the back of this sheet, draw aliens and buses to match this equation: $21 \div 3 = 7$.



Activity B: Field trip to Mars	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> Click on the Recall button. Make sure that the Autopilot checkbox is off. 	
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Yesterday some alien students took a trip to Mars as part of the Alien Youth Program (AYP). Unfortunately, some aliens were left behind. Investigate what went wrong with the AYP trip.

1. The plan was for 13 aliens to go on the trip. The buses they used held 5 aliens each. Model this with the Gizmo. Then drag as many buses as you can to the sidewalk.

- A. How many aliens were left behind? _____
- B. Click **Show as division**. Write the equation: _____ ÷ _____ = _____
- C. What does “R3” mean? (Hint: Mouseover the R3.) _____

When you divide two numbers and have an amount “left over”, the amount left over is called the **remainder**. The remainder here is the 3 aliens left behind, written as R3.

2. Keep 13 aliens on the sidewalk, but imagine that one more alien shows up (14 total).

- A. What do you think the new equation would be? _____ ÷ _____ = _____
- B. Drag one more alien to the sidewalk and find out. Were you correct? If not, change your equation above.

3. Do this step without using the Gizmo.

- A. Draw what the sidewalk would look like with 10 aliens.



- B. These 10 aliens want to travel in buses that hold 3 aliens each. Draw what this would look like above. (Remember that every bus must be completely full.)
- C. How many aliens does your drawing show being left behind? _____
- D. What division equation represents your drawing? _____ ÷ _____ = _____
- E. Use the Gizmo to check your drawing and answers. Fix them above if you need to.

Activity C: On vacation	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> Click on the Recall button. Turn the Autopilot checkbox on. 	
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You are taking a vacation from your job as Chief of Interplanetary Travel. Unfortunately, your substitute is not highly qualified to fill in for you. Complete this guide to help him out.

- Let's start by making a guide for when the bus size is 3.
 - Set the **Bus size** to 3 and put 6 aliens on the sidewalk. Turn **Show as division** on.
 - Add aliens one at a time by dragging them from the school to the sidewalk. The Gizmo **Autopilot** will send another bus when there are enough aliens to fill it.
 - Complete the table below as you do this.

Bus size of 3								
Total aliens	6	7	8	9	10	11	12	13
Full buses	2							
Aliens left behind	0							

- Look closely at the table. Describe any patterns you see. _____

- Set the **Bus size** to 4. With **Autopilot** still on, use the Gizmo to complete the table below.

Bus size of 4								
Total aliens	12	13	14	15	16	17	18	19
Full buses	3							
Aliens left behind	0							

- Which row in this table represents a remainder? _____

- Is it possible to divide a number by 4 and get a remainder of 5? Explain.

