



STEM ACTIVITY: Using Airplane Space Efficiently

Grades 5–12

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USING AIRPLANE SPACE EFFICIENTLY: OVERHEAD COMPARTMENTS

The amount of space available inside an airplane is limited, so it is important to use it as efficiently as possible. This includes space for people to sit, space to move around, and space for bags and other items.

Many travelers bring carry-on suitcases when they travel. These are placed in large overhead compartments. But, as more and more people have brought carry on suitcases with them, it has become common for the overhead compartments to become full, prompting engineers to look for creative ways to expand the space in overhead compartments.

In recent years, some airplane manufacturers have redesigned their overhead compartments so they can hold more carry on suitcases. One of the most common commercial airplanes in the United States is the 737. The diagrams below show examples of old and new overhead compartments in 737s.

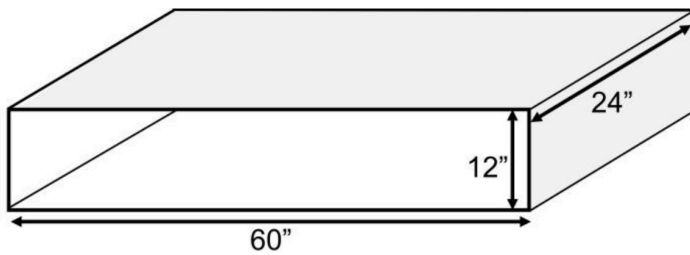


Figure 1.
Old overhead compartment

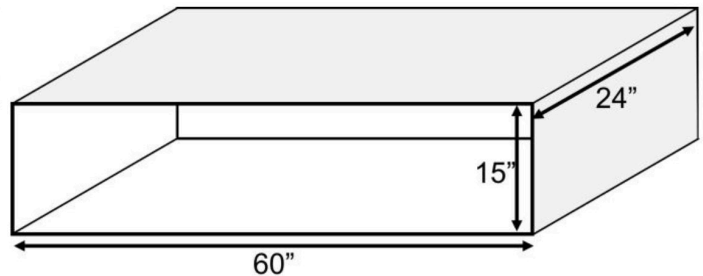


Figure 2.
New, redesigned overhead compartment

- Calculate the volume of both the old and new overhead compartments.
 - Old overhead compartment:
 - New overhead compartment:
- How much did the volume increase when the overhead compartment was redesigned?
- Why do you think the carry-on suitcase can only be 22 inches tall?

4. The picture to the right shows the maximum allowable size for a carry-on suitcase. Calculate the volume of this suitcase.

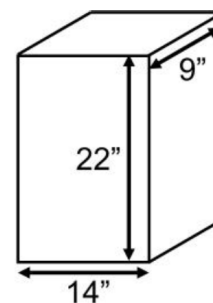
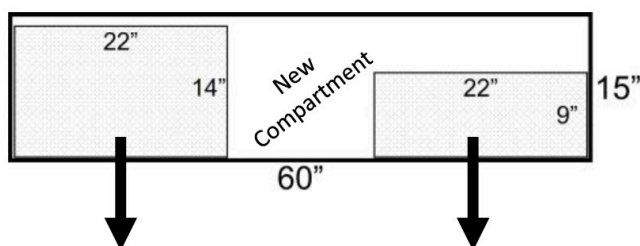


Figure 3.
Dimensions of a carry-on suitcase

There are several different ways that suitcases can be placed in overhead compartments. The next two questions will look at some of these ways.

5. Suitcases can be placed in the overhead compartment with the long side (the 22 inch side) going from side to side as shown below. When placed in this way, the 14 inch side can go up and down or the 9 inch side can go up and down. For each of the placements shown, indicate whether it would fit and, if so, how many suitcases would be able to fit in the compartment this way.

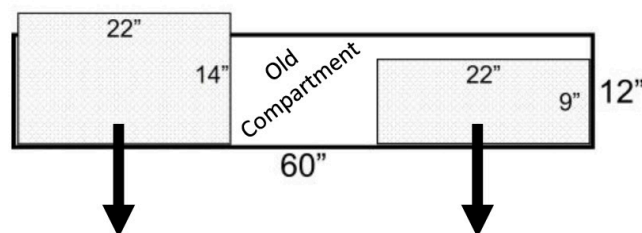


Will it fit? _____

Will it fit? _____

How many will fit? _____

How many will fit? _____



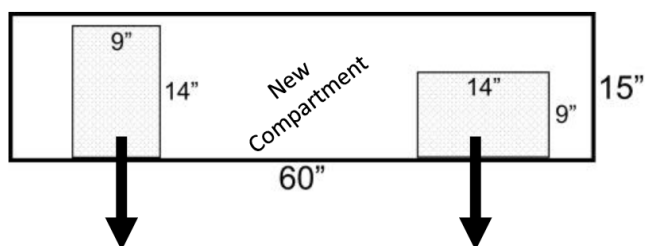
Will it fit? _____

Will it fit? _____

How many will fit? _____

How many will fit? _____

6. Suitcases can be placed in the overhead compartment with the long side (the 22-inch side) going from the front to the back of the compartment. When placed in this position, the 14 14-inch side can go up and down or the 9 9-inch side can go up and down. For each of the placements shown, indicate whether it would fit and, if so, how many suitcases would be able to fit in the compartment this way.

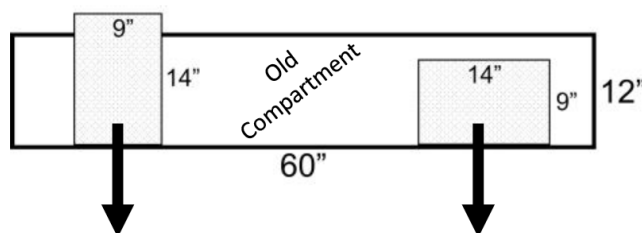


Will it fit? _____

Will it fit? _____

How many will fit? _____

How many will fit? _____



Will it fit? _____

Will it fit? _____

How many will fit? _____

How many will fit? _____

7. Based on your answers to questions 5 and 6:
 - a. Which method of placing bags in the overhead bin would allow the most suitcases to fit in the **old** overhead compartment?

 - b. How many suitcases would fit in a bin? _____

8. Based on your answers to questions 5 and 6:
 - a. Which method of placing bags in the overhead bin would allow the most suitcases to fit in the **new** overhead compartment?

 - b. How many suitcases would fit in a bin? _____

9. If there are 30 total overhead bins on an airplane, how **many** more suitcases would fit on an airplane if it had the new overhead compartments instead of the old ones?

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