



Astronauts traveling to the moon will not be able to bring everything with them. They will have a very strict allowance on the volume and mass of what they can bring.

Although the first moon rocket, Ares-V/Orion, will not be launched for another 10 years, let's suppose the 'Astronaut Preference Kit' volume limit is 2 1/2 liters per astronaut.

An astronaut wants to bring the following items with him. Assume that the items are all shaped like rectangular solids. Given their dimensions, will he be within the volume limits of the Orion vehicle? (All measurements are in centimeters, and 1,000 cubic centimeters equals 1 liter.)

Item	Length	Width	Height	Total
Toothbrush	17	1	1	
Diary book	25	2	15	
Pen	14	1	1	
Ipod	11	7	1	
Camera	13	9	10	
One paperback book	17	10	2	
Extra glasses	14	5	2	

If the total volume is greater than the PPK limit, what item or items would you leave behind? Is there anything you could do to reduce the volume of these items so that they add up to less than the PPK limit?

If the total volume is less than the PPK limit, what items would you add if the trip was to last 1 week on the Space Shuttle or three months on the International Space Station?

Are there any items you could think of that you would want to substitute instead of the items on this list?

Answer Key

Item	Length	Width	Height	Total
Toothbrush	17	1	1	17
Diary book	25	2	15	750
Pen	14	1	1	14
Ipod	11	7	1	77
Camera	13	9	10	1170
One paperback book	17	10	2	340
Extra glasses	14	5	2	140

The total volume of all these items is 2,508 cubic centimeters. Since 2 1/2 liters equals 2,500 cubic centimeters, the astronaut has to eliminate at least 8 cubic centimeters of material from this list. The total volume is **greater than the PPK limit**.

Some students may not need glasses, while others may decide that reading a book is the last thing they want to do in space with all those great views out the window!

Here are some of the things that NASA astronauts have brought into space:

- 400 US commemorative stamps (Apollo 15)
- Wedding rings (STS-36)
- 33rd Degree Masonic Ring (Gemini 6)
- Florida Hunting License (Gemini-6)
- Piece of wood from Wright Brothers 1903 airplane (Apollo 11)
- Vial of wine and miniature chalice (Apollo 11)
- Walkman with headphones (Spacelab)
- 1923 US Peace Dollar (Apollo 11)
- Moon Tree seeds (Apollo 14)

Can your students research this topic and find more items?