Can We Take it With Us?

Overview
Students work in teams to determine the maximum amount of payload that they can take on a lunar mission. Students are given a container that represents the maximum weight allowed on a mission. They are also given a list of mandatory mission ratios, a double balance, 80 pennies, and an empty container to weigh their trial payloads. The team closest to the maximum payload weight without going over is declared the winner.

Purpose
By participating in this activity, students will:
- Calculate payload weights.
- Apply given ratios.
- Predict the consequences of weight adjustments.
- Develop team cooperation skills.

Preparation
- Prepare three containers with our maximum "mission weight" (59 pennies).
- Obtain three empty containers identical to the maximum "mission weight" containers.
- Copy our Shuttle inventory sheets for the mission.
- Review Shuttle inventory answer guide
- Obtain and calibrate balance equipment (three double balances).
- Gather 80 pennies for each team.

Materials
Per Team:
- Three double balances.
- Three empty containers (for trial weigh-ins).
- 417 Pennies (three rolls of 59 pennies + three groups of 80 pennies).
- Copies of the Shuttle payload inventory sheets.

Procedure
1. Students are divided into three teams.
2. Each team is given a balance and two identical containers (a max weight container and an empty container), 80 pennies, and a Shuttle payload inventory sheet.
3. Students are given the opportunity to review the payload sheets and ask questions.
4. Students work through three trial weigh-ins.
5. Students complete one final weigh-in.
6. Teacher collects the team answer sheets.
7. The team(s) closest to maximum weight without going over is/are declared the winner(s).
8. Direct students to clean up supplies.

Questions
N/A

Answer Key/What is Happening?
N/A

Payload Inventory Answer Guide for Educators

The following are examples of possible answers that students may come up with while completing the activity entitled, "Can We Take it With Us?." This list is not exhaustive.

Items to be included in payload	Example # 1	Example # 2	Example # 3	Example # 4	Example # 5
Length of mission	__3__Days	__4__Days	__4__Days	__3__Days	__5__Days
Humans in spacesuits	__6__pennies # of humans _2_	__6__pennies # of humans _2_	__9__pennies # of humans _3_	__12__pennies # of humans _4_	__6__pennies # of humans _2_
Food	__18__pennies (# humans × 3 meals × # days)	__24__pennies (# humans × 3 meals × # days)	__36__pennies (# humans × 3 meals × # days)	__36__pennies (# humans × 3 meals × # days)	__30__pennies (# humans × 3 meals × # days)
Tools	__8__pennies (# humans × 4)	__8__pennies (# humans × 4)	__12__pennies (# humans × 4)	__16__pennies (# humans × 4)	__8__pennies (# humans × 4)
Medical kits	__10__pennies (# humans × 5)	__10__pennies (# humans × 5)	__15__pennies (# humans × 5)	__20__pennies (# humans × 5)	__15__pennies (# humans × 5) 1 extra medical kit = 5 pennies.
Total number of pennies	**__42__pennies (17 pennies under max)**	**__48__pennies (11 pennies under max)**	**__72__pennies (13 pennies over max)**	**__84__pennies (4 pennies over max)**	**__59__pennies (exactly!)**