

APPLICATION TASK | Distribute Supplies to Space Expeditions

Name: _____

Goal

Develop a food distribution plan based on how much the food items weigh at various locations in space.

How Does Gravity Affect Your Weight?

Your weight on Earth is a function of Earth's gravitational pull on you, expressed as 1 g. At a different location in space, your weight is your weight on Earth times the other location's g-force.

Connect to Reading



Weightless in Space



SpaceX supply ship arrives at space station with groceries

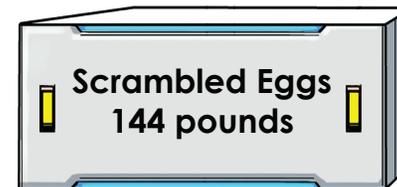
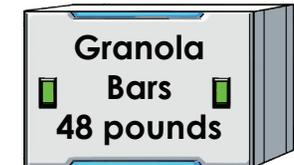
Essential Question How can we solve problems by multiplying whole numbers by fractions?

In this task, you are distributing all the food supplies shown below to at least three space expeditions. You will calculate the weights of items at each expedition's location and then divide the items so that the total weights at each location have a range of less than 30 pounds.

Gravitational Force	
Expedition Location	g-force
Earth	1 g
Moon	$\frac{1}{6}$ g
Mars	$\frac{3}{8}$ g
Space Habitat A	$\frac{2}{3}$ g
Space Habitat B	$\frac{5}{4}$ g

SAMPLE PLAN				
Item	Moon	Mars	Space Habitat A	Space Habitat B
Shrimp Cocktail		9		
Granola Bars				60
Tortillas		27		
Spaghetti		36		
Chicken Soup	20			
Scrambled Eggs	24			
Macaroni and Cheese	28			
Total Weight	72	72		60

Food Supplies



Did You Know? NASA has simulators for zero gravity, the force of gravity on the Moon, and the force of gravity on Mars.

A | Understand

Complete the table to show the weights of the food supplies at the different expedition locations. Some values are entered for you.

Weight (pounds)

Food Supply	Earth	Moon	Mars	Space Habitat A	Space Habitat B
Shrimp Cocktail	24	4	9	16	30
Granola Bars	48				
Tortillas	72				
Spaghetti	96				
Chicken Soup	120				
Scrambled Eggs	144				
Macaroni and Cheese	168				

Think about It Use vocabulary words to complete the sentences.

A box of granola bars weighs 48 pounds on Earth. The box's _____ on Mars is the _____ of 48 and $\frac{3}{8}$. $\frac{3}{8}$ is the _____ of Mars.

Explain It Items on Space Habitat B weigh more than they do on Earth. Why?

Name: _____

Talk about It Talk about how to solve this problem with a partner. Discuss how the table in **section A** helps you meet the requirements of the task.

ACADEMIC AND MATH VOCABULARY

Read each definition. Use these words in discussions and responses to thinking questions.

distribute: to divide into parts

expedition: an organized journey or trip

g: A standard gravity value defined by the International Bureau of Weights and Measures. It states that 1 g corresponds to gravity on Earth.

g-force: a measurement of the value of g, gravity, at a given location

gravity: A force of attraction or downward pull. Gravity on Earth makes everything fall downward toward Earth. Since Mars is a smaller planet than Earth, it has less gravity.

B | Organize

For each plan, enter item weights and the total weights for at least three expedition locations. The range in total weights must be less than 30 pounds.

Plan 1

Food Supply	Earth	Moon	Mars	Space Habitat A	Space Habitat B
Shrimp Cocktail	24				
Granola Bars	48				
Tortillas	72				
Spaghetti	96				
Chicken Soup	120				
Scrambled Eggs	144				
Macaroni and Cheese	168				
Total Weight					

Plan 2

Food Supply	Earth	Moon	Mars	Space Habitat A	Space Habitat B
Shrimp Cocktail	24				
Granola Bars	48				
Tortillas	72				
Spaghetti	96				
Chicken Soup	120				
Scrambled Eggs	144				
Macaroni and Cheese	168				
Total Weight					

Explain It

What do you notice about the items delivered to each location?

Name: _____

ACADEMIC AND MATH VOCABULARY (continued)

product: the result you get when you multiply two numbers

range: the difference between the least value and the greatest value in a data set

simulator: a device that creates a realistic imitation of the conditions in an environment, such as zero gravity in space

space habitat: a type of space station intended as a permanent settlement

weight: the mass of an object multiplied by the downward gravitational force; how heavy an object is

whole number: a number greater than or equal to zero that is not a fraction or decimal

C | Solve

Choose one plan. List the items and total weights for each expedition that receives food supplies.

Total Weight of Food Supplies at Expedition Location and on Earth (lb)

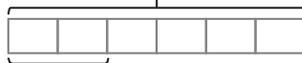
Expedition	Moon	Mars	Space Habitat A	Space Habitat B
Items				
Total Weight on Expedition				
Total Weight on Earth				

D | Check

Use bar models to check your solution. One model has been completed for you as an example.

Moon

Weight on Earth



60 lb

Weight on the Moon

$$60 \div 1 = 60$$

$$60 \times 6 = 360$$

Space Habitat A

Mars

Space Habitat B

Name: _____

CONNECT TO SCIENCE

The effect of gravity must be considered when planning a space expedition.

What kinds of food supplies do astronauts use in space?

Is it fair to divide the food items based on the weight of the items at each expedition location? Explain your reasoning.

Extend Weigh objects in the classroom and calculate their weight at expedition locations.

Name: _____

Weightless in Space

Written by Raymond Lamborn

Illustrated by Maryn Roos

Lexile®: 970L, 194 words



Did you know that your weight would be different in outer space? It would also be different if you were on another planet.

If you weigh 100 pounds on Earth, you would weigh less than 40 pounds on Mars—but you'd weigh more than 250 pounds on Jupiter.

How does your weight change from planet to planet? It's all about gravity. When two bodies, like your body and the Earth, get near each other in space, they automatically pull towards each other. That pull is called gravity.

Since the Earth is so much bigger than you are, it pulls you tightly to its surface—and you could never just float away. The bigger you are, the harder the Earth pulls, and it is this pull that your bathroom scale measures.

If you were on a smaller planet like Mars, the pull on your body would be much less, so you would weigh less. But if you were on a gigantic planet like Jupiter, the pull on you would be much stronger, and you would weigh a lot.

If you'd like to learn more about gravity and space, you might want to become an astronaut!

Name: _____

SpaceX supply ship arrives at space station with groceries

MARCIA DUNN, AP Aerospace Writer

January 12, 2015

Lexile®: 860L, 191 words



CAPE CANAVERAL, Fla. (AP) — A shipment of much-needed groceries and Christmas presents finally arrived Monday morning at the International Space Station. The SpaceX company's supply ship, Dragon, pulled up at the orbiting lab two days after its launch. Station commander Butch Wilmore used a robot arm to grab the capsule and its 5,000 pounds of cargo.

The space station's six astronauts were getting low on supplies. The previous supply ship, owned by Orbital Sciences Corp., was destroyed in a launch explosion in October. NASA scrambled to get equipment lost in the blast aboard Dragon.

Dragon should have arrived well before Christmas but there were issues with the rockets. Dragon was stalled for a month. "We're excited to have it on board," U.S. astronaut Wilmore said. "We'll be digging in soon." He's especially excited to get more mustard. The station's cabinet of condiments is empty.

NASA is paying SpaceX and Orbital for shipments. But Orbital's rockets are grounded until next year because of its launch accident. SpaceX is the only supplier capable of returning items to Earth. The company is delivering as many supplies as possible.

Russia and Japan also plan to send deliveries this year.

Accuracy: # of reading errors: _____ (Indep. = 0–4, Instr. = 5–10, Frust. = 11+)
Speed: To calculate: $11460 \div$ _____ (Reading time in seconds) = _____ WPM