SPINOFFS

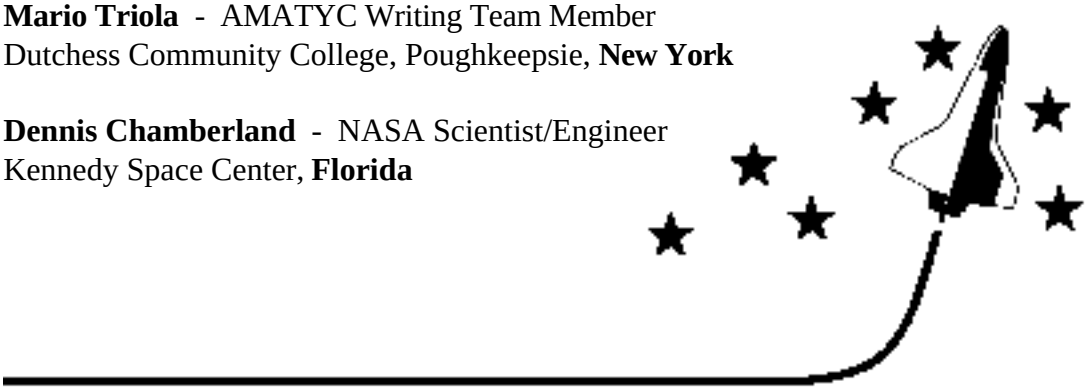
Spinoffs are relatively short learning modules inspired by the LTAs. They can be easily implemented to support student learning in courses ranging from prealgebra through calculus. The Spinoffs typically give students an opportunity to use mathematics in a real world context.

LTA - SPINOFF 6A	Design of a Lunar Base Station Biomass Production Chamber
LTA - SPINOFF 6B	Developing a Biomass Production Chamber
LTA - SPINOFF 6C	Correlation and Regression Applied to Biomass in a Lunar Base Station
LTA - SPINOFF 6D	Analysis of Biomass Production in a Lunar Base Station

Eric Leung - AMATYC Writing Team Member
Harrisburg Area Community College, Harrisburg, **Pennsylvania**

Mario Triola - AMATYC Writing Team Member
Dutchess Community College, Poughkeepsie, **New York**

Dennis Chamberland - NASA Scientist/Engineer
Kennedy Space Center, **Florida**



Project Grant Team

John S. Pazdar
Project Director
Capital Comm-Tech College
Hartford, Connecticut

Peter A. Wursthorn
Principal Investigator
Capital Comm-Tech College
Hartford, Connecticut

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and not necessarily those of the Foundation

Patricia L. Hirschy
Principal Investigator
Asnuntuck Comm-Tech College
Enfield, Connecticut

SPINOFF 6B

Developing a Biomass Production Chamber

In planning for an environment capable of supporting humans on the moon, NASA is working on the development of a **Biomass Production Chamber**. Such a chamber will be used to grow food, and in the process, water and oxygen will be produced as byproducts. The Biomass Production Chamber will be a critical part of a lunar base station that will be inhabited for a considerable length of time. NASA experiments have shown that with x crew members, the required growing area (in m^2) of food is $40x$. This relationship between the variable x (number of crew members) and the variable y (required growing area in square meters) can be described by the equation, $y = 40x$. Both x and y are **variables** in the sense that their values change for different conditions. The table below shows a few different pairs of values found by using the equation, $y = 40x$.

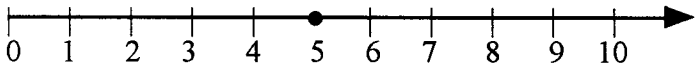
Food

(x) Number of Crew Members	1	2	3	4	5	...	?
(y) Growing Area of Biomass (m^2)	40	?	?	?	200	...	320

Exercises

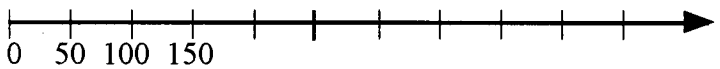
1) Given that x (the number of crew members) and y (the required area of growing biomass) are related by the equation $y = 40x$, complete the above table by entering the missing values. (The missing value in the top row is not 6. Find that particular missing value by using the relationship between x and y, not by incorrectly assuming that the x-values continue the pattern of 1, 2, 3, 4, 5, 6.)

2) Values of a variable can be represented on a number scale, such as the one shown below. The crew size of 5 is shown as a point on the scale.



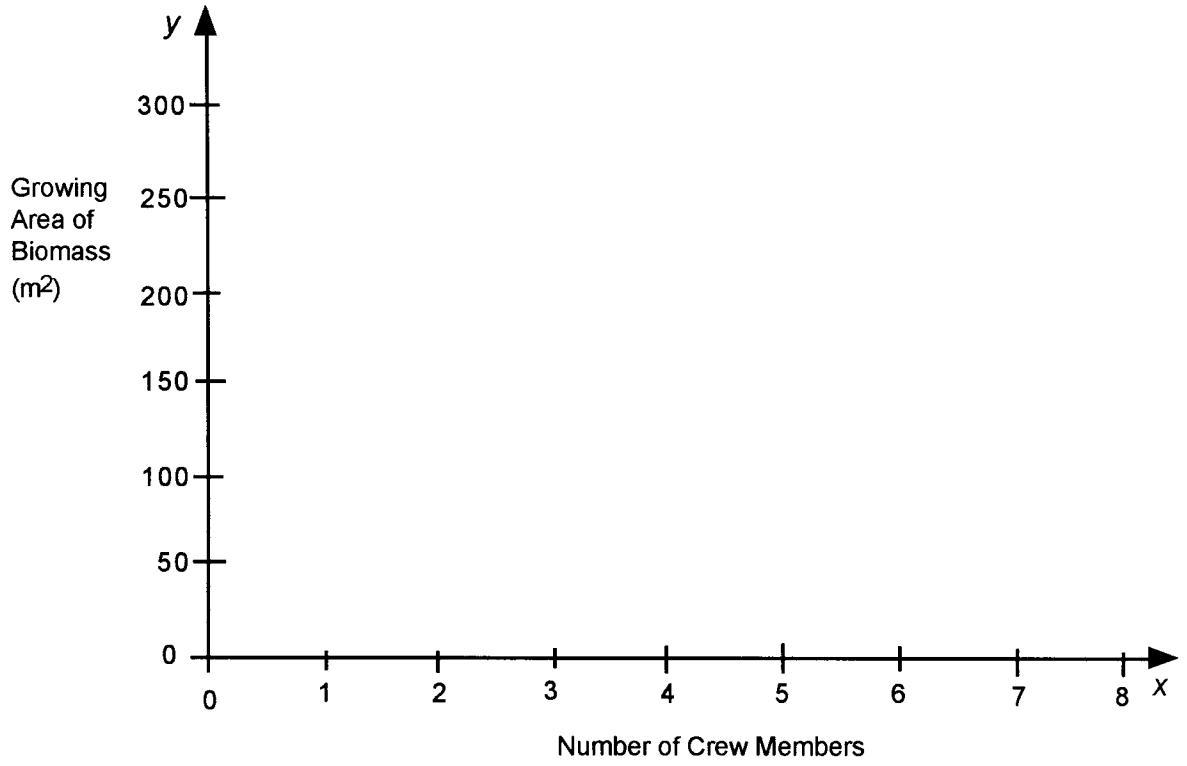
x (Number of Crew Members)

Construct a similar number scale that could be used to represent the values of y (the growing area of biomass). On this new scale, plot the point corresponding to 40 m^2. Note that on this new scale, we use **distances** to represent **areas** of growing biomass. Instead of showing the actual areas themselves, we are using their magnitudes for placement along the number scale. Number scales can therefore be used to represent areas, distances, volumes, temperatures, amounts of money, test grades, weights, or other such quantities.



y (Growing Area of Biomass)

3) We can now use the x scale and y scale together in the x-y coordinate system, as shown below:



Plot the six points corresponding to the six pairs of x-y values listed in the completed table from Exercise 1. Then, connect the six points with a straight line.

4) From the graph, estimate the y value (growing area of biomass) corresponding to the point on the line where $x = 6$ crew members. What growing area is required for a crew of 6?

5) From the graph, estimate the x value corresponding to a growing area of 280 m^2. How many crew members can be supported with a growing area of 280 m^2?

6) The straight line is a *graphic* representation of the algebraic relationship expressed by the equation $y = 40x$. *Verbally* describe that relationship by completing this statement: "The relationship between the number of crew members and the required growing area of biomass (in m^2) can be found by taking the crew size and ... "