Float Designer

The Movie:

To create a beautiful float for the Rose Parade, you have to think about what goes underneath all of those flowers. Featured: Raul Rodriguez, float designer. *(Movie length: 1:03)*

Background:

The capacity to take pleasure in works of art is present in all of us, and the types of art that we enjoy are as diverse as we are. But in all of that capacity and diversity, there is still something special about the floats of the Rose Parade. Seemingly wrought by giants, riotously colorful, symbolic and narrative, these remarkable artifacts remind us of the ideas, myths, achievements and history that we share.

As with any art form, the creation of a float is a matter of inspiration, exploration, and technique. It is also a matter of calculation: most floats are complex structures of many components, with critical characteristics of size, shape, weight and cost. Add to all of that the challenge of coming up with something new and better every year, and you have the makings of a career that will never be boring.

Curriculum Connections:

Decimals

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These figures describe how much of various types of plant material are required to cover a square feet of area on a float, as well as the cost.

Material	Unit	Amount per square feet	Unit cost
Roses	number of flowers	25	.12
Daisies	number of flowers	16	.08
Marigold	number of flowers	36	.07
Peanut shells	pounds	0.4	.03
Onion seed	pounds	1.5	.42
Rice	pounds	1.2	.54
Sliced potatoes	pounds	3.5	.38

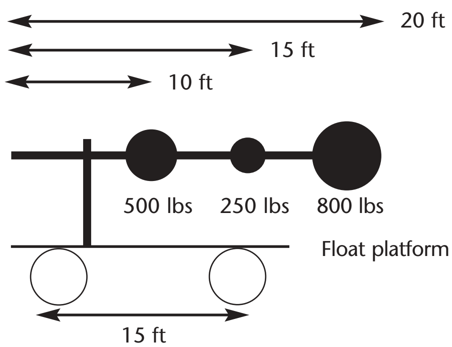
What is the cost for a float with the following requirements?

Material	Amount Needed
Roses	240 square feet
Daisies	180 square feet
Marigold	320 square feet
Peanut shells	36 square feet
Onion seed	74 square feet
Rice	440 square feet
Sliced potatoes	20 square feet

Algebra (expressions, integers)

Sometimes a portion of a float's structure may extend in front of the front wheels or behind the rear wheels. If that happens it is important that the float be designed so that it won't easily tip forwards or backwards. The stability of a float is determined by the position of its center of gravity.

The position of the center of gravity is found by a special kind of averaging of the positions of the weights of the various parts of the float. The average is computed by multiplying the weight of each part by its location (as measured from a specific point, such as the back of the float), and then dividing by the sum of the weights. Here is an example:



Position of center of gravity (as measured from back end of float)

$$= \frac{w_1 \times h_2 + w_2 \times h_2 + w_3 \times h_3}{w_1 + w_2 + w_3}$$

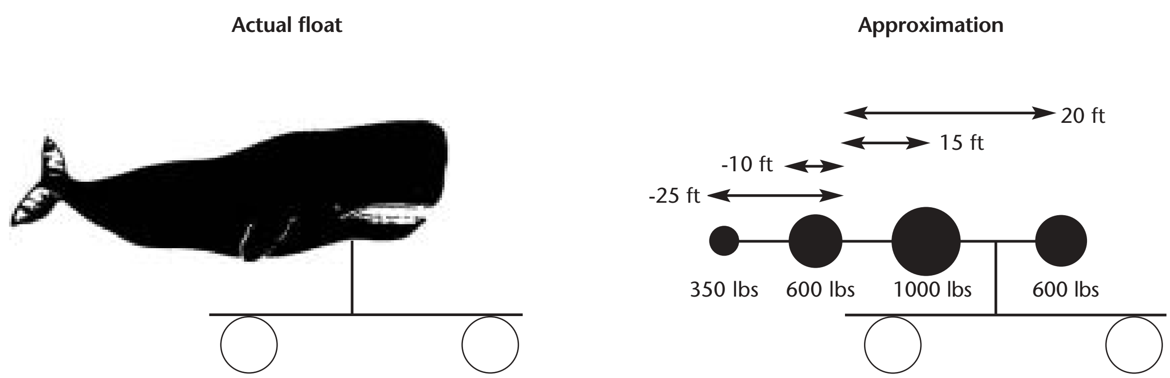
$$= \frac{800 \times 20 + 250 \times 15 + 500 \times 10}{800 + 200 + 500}$$

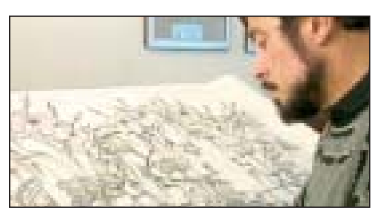
$$= \frac{16000 + 3750 + 5000}{1500}$$

= 16.5 feet (answer in same units as the positions)

In the above example, the position of the center of gravity (16.5 feet) is actually in front of the front wheel (which is 15 feet from the back of the float), and this float would tip over. (Note that we have ignored the platform and wheels of the float for simplicity; in an actual center of gravity computation this would have to be taken into account as well.)

Of course real floats are much more complicated than the illustration above, but the positions of their centers of gravity can be estimated by approximating their actual structure with a simpler structure. Estimate the position of the center of gravity of this float, using the approximation of its structure. (Note that negative numbers are used to represent positions behind the back of the float.)





Parade Pros

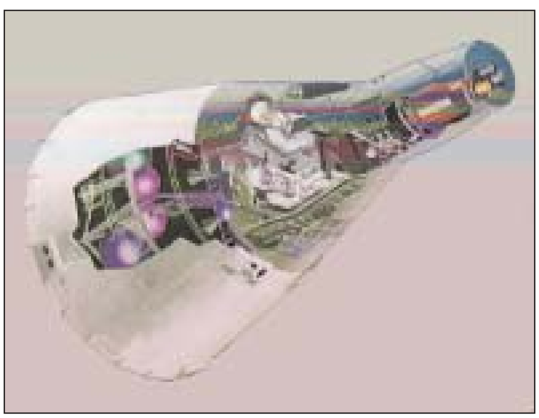
To: Design Team
From: VP Client Services

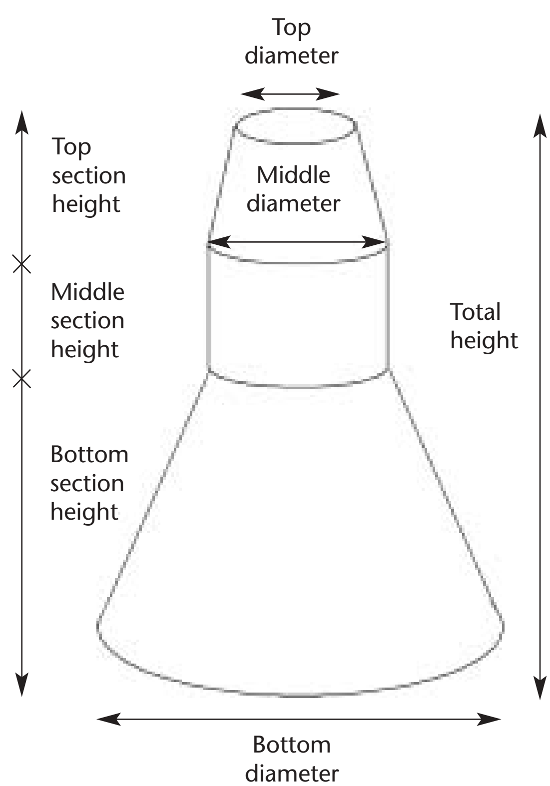
We have a new client this year, who has asked us to design and build a float for this year's Rose Parade. The theme of the parade is "Mystery and Discovery". Our client wants a float that depicts the NASA Gemini missions, in which a man "walked in space" for the first time in human history.

On the float we are going to build a larger-than-life model of the spacecraft used for the Gemini missions. Below at left is an artist's idea of what the spacecraft looked like in flight, supplied by NASA. At right is a scale drawing of the spacecraft.

Use the scale drawing to build an accurate model of the spacecraft, and find the amount of surface area it has. Based on your model's surface area, figure out what the surface area of the float's spacecraft will be. It will have a height of 35 feet.

Your model needs to be accurate, and it needs to be sturdy. Use your imagination to decide what the outside of the spacecraft should look like.





Teaching Guidelines: ParadePros
Math Topics: Geometry (solids), Ratios

Students should work in groups of two or three members. They can use straws (or coffee stirrers) and tape to make the basic structure of the capsule, which they then cover with construction paper.

A good way to start is to make a base which is a ten-sided or twelve-sided regular polygon (with sides of roughly 2 inches) to approximate the circular shape which is the actual base of the spacecraft.

Cutting the construction paper so as to fit conic parts of the structure will take quite a bit of trial and error. Students should tape it on loosely to make sure that it fits well, then remove it and make measurements to determine the areas of the pieces of paper.

To find the surface area of the actual float, students will need to first find the ratio of the height of the float spacecraft (35 feet) to the height of their model. That number is squared, then multiplied by the surface area of the model to find the surface area of the float.

To understand why the ratio is squared, you may wish to ask students to compare the surface area of cubes that have heights of 2, 4, and 6 feet. If they make a table of their results they will see that the ratios of the areas of the cubes are the squares of the ratios of the heights.

Geometry (surface area of solids), Percent, Decimals

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A client wants a parade float which consists mainly of a large globe that represents the Earth. The globe is to be 25 feet in diameter, and each continent is to be represented by flowers of a different color. Using the percent figures given in this table, work out how many square feet of area is covered by each continent and by all of the oceans combined.

Region	Percent	Square feet?
Entire World	100.00%	
Total Land	29.20%	
Total Water	70.80%	
Continents		
Asia	8.73%	
Africa	5.89%	
North America	4.76%	
South America	3.49%	
Antarctica	2.59%	
Europe	2.04%	
Australia	1.51%	

If you enjoyed this Futures Channel Movie, you will probably also like these:

Inventing with Polygons, #1007	This inventor uses polygons to build amazing expandable structures.
Geometry and Structural Engineering, #1009	Structural engineers use shapes to design huge buildings and bridges.
Models for Movies, #4005	Building miniature replicas with a full-scale imagination, Greg Jein reproduces every detail of the Star Trek space vessels.