The Art Director

The Movie:

A set is a place where actors can be placed for filming. Creating a set where everything fits just right calls for an understanding of area. Featured: Ron Wilkinson, Art Director, Paramount Studios. *(Movie length: 2:32)*

Background:

Movies tell stories. Everyone knows that they're fiction, but for the 100-odd minutes that we're in the theatre we want to be able to pretend that what we see is real. Whether or not that's possible depends on the actors, the script, and the people who design, build, and find the settings in which the actors and script are placed. The skills required include, for a start, those of an expert interior decorator, but must also encompass a working knowledge of lighting, camera angles, acoustics—and how to get along with fussy cinematographers and demanding directors.

Curriculum Connections:

Fractions, Measurement, Ratios | 1

Make an exact scale drawing of your classroom, including some of the furniture in it. Use a scale of 1/4 in = 1 ft.

Measurement (area) | 2

A set is supposed to have three walls. Two are 20 feet long and one is 15 feet long. All are 9 feet high. How many square feet of wallpaper will be needed to cover the walls?

Measurement (area) | 3

A *sound stage* is a building in which sets can be constructed and used in videotaping and filming. It includes not only the sets themselves, but also lights, sound equipment and cameras.

This is a diagram of a sound stage floor. Can you fit in four sets with these areas: 1,000 square feet, 1,400 square feet, 1,600 square feet, 1,100 square feet? The sets need not be exactly rectangular, but should be as close to rectangular as possible.

50 ft.

100 ft.
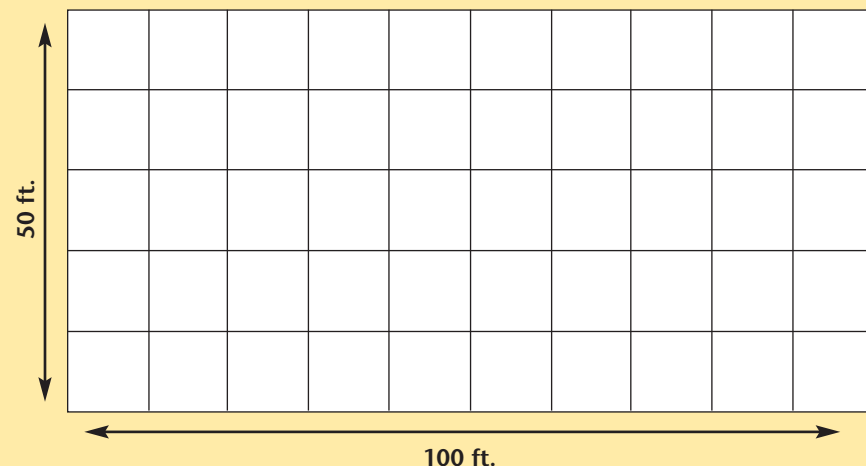
Trigonometry

The diagram below shows the position of a camera which is set up to record a view of the entire set. What is the angle of the camera's field of view?

field of view

set

30 feet

15 feet

20 feet
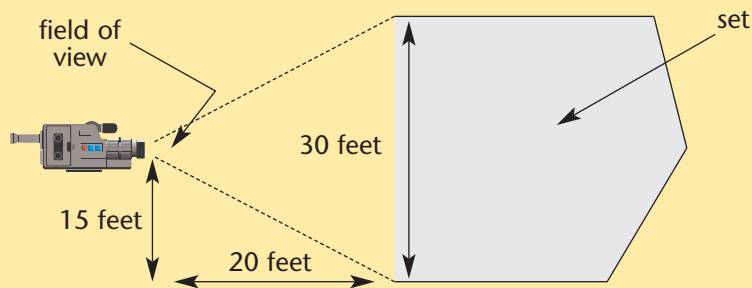
Geometry (simlar figures)

This camera is set up to film an actor standing in front of a wall. How high will the wall need to be so that the camera does not "see" over the top of it behind the actor's head?

? feet

4 feet

6 feet

10 feet

25 feet
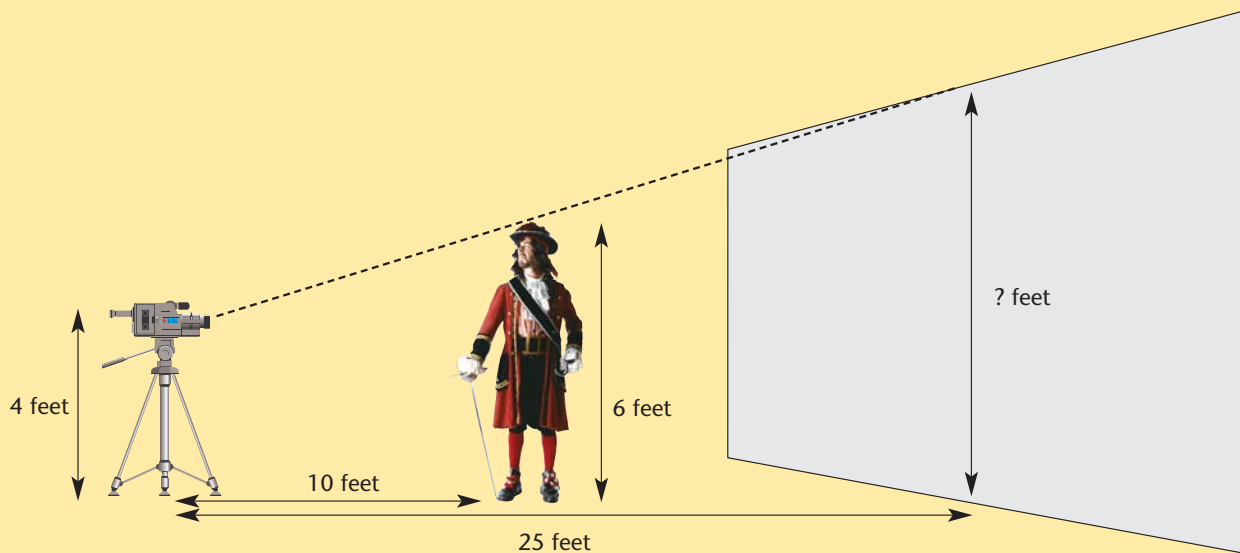
Algebra (variables)

- Dimensions of the set
- Area of the set
- Cost of construction
- Positions of cameras
- Positions and intensities of lights
- Positions of actors
- Positions of microphones

Algebra (patterns and functions)

The farther you get from a light source, the less intense is the light. Based on the chart below, what is the light intensity at a distance of 60 feet from the source? 80 feet?

Distance from source (feet)	Light intensity, relative to intensity at 10 feet (percent)
10	100
15	44.44
20	25
30	11.11
40	6.25

To: Art Director
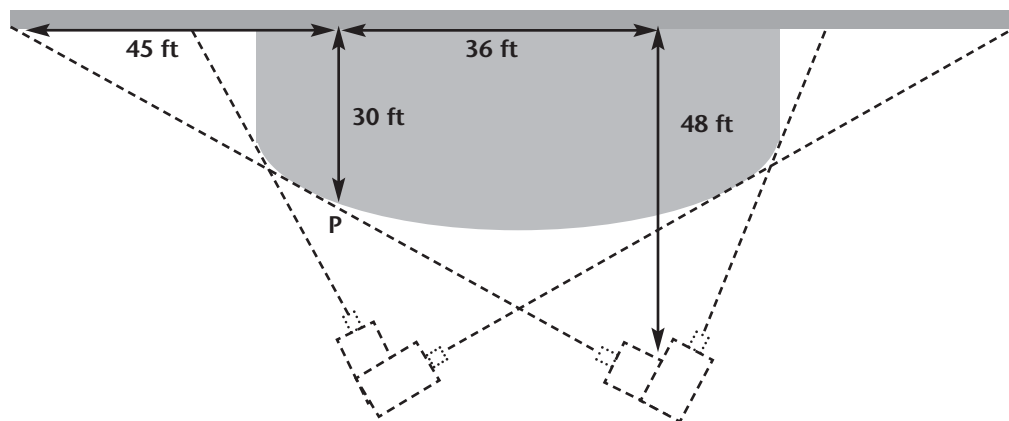**From: Director**
Re: The "Heaven on Earth" set

Jim,

We have had a request from the producer regarding the "Heaven on Earth" set, and I need your help.

As you know, that studio is currently set up with a long flat "sky" background behind the stage and the cameras positioned in front of the stage, like this:
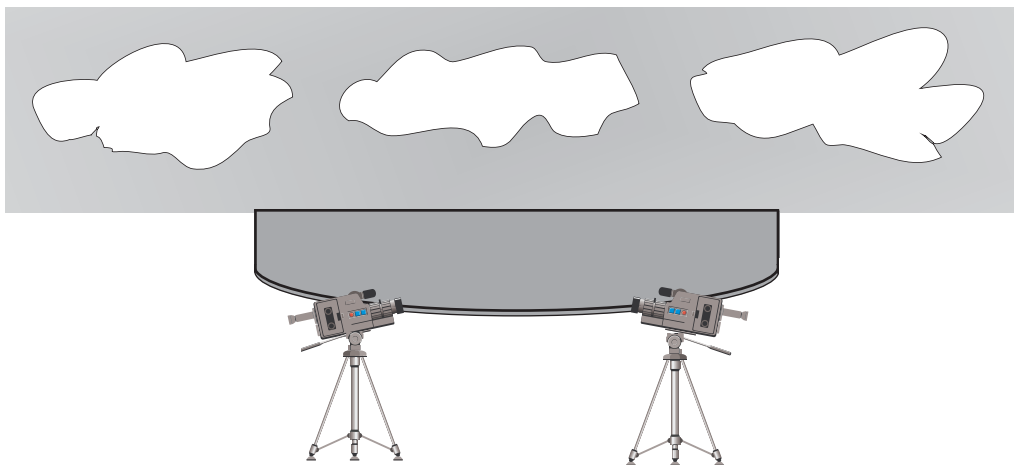
Here's the top view, with, some dimensions:

As you can see from the dotted lines of sight, the backdrop is just long enough to cover the most extreme camera angles we might have.

Now though, the producer has asked if we can bring the stage out another 6 feet, while leaving the cameras where they are. This means that the point labeled "P" in the above diagram would be 36 feet out from the backdrop, instead of 30 feet. So we will need to extend the backdrop in order to cover what will then be the most extreme camera angle.

The question is, how much farther would the backdrop need to extend?

I need an answer right away, of course.

Holly

Teaching Guidelines: Heaven on Earth
Math Topics: Geometry (similar triangles), Algebra (solving equations)

Distribute the handout and ask students to spend time studying it in small groups, with the assignment of understanding the problem clearly.

Discuss their responses until it is clear everyone understands that when the set is extended, the camera angles will change and therefore the backdrop will need to be longer. You may wish to draw a sketch something like this (or, with more advanced students, you may choose to ask them to try to draw a sketch that shows the main points of the question):
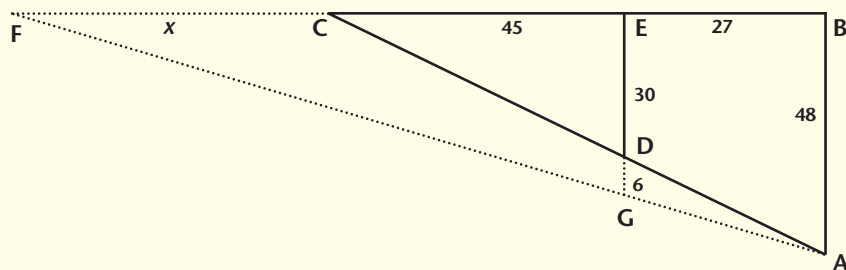
In this sketch, the solid lines represent the current situation, and the dotted lines represent the new camera line of sight and backdrop position.

The key to the solution is to notice the similar triangles in this figure. In the original set, triangle ABC is similar to triangle DEC, and thus the ratios of the sides are equal (10/15 = 16/24).

In the new set, triangle ABF will be similar to triangle GEF. Setting the ratios of the sides equal, you have:

$$\frac{48}{27 + 45 + x} = \frac{30 + 6}{45 + x}$$

Solving this equation gives x = 36 feet.

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Creating a Campground, #4009	Creating campsites in the New Mexico wilderness calls for a knowledge of ratios and proportions.
The Tools of Graphic Design, #4015	Graphic artists lay out images and type with tools like rulers, triangles and compasses and computers, so the printer can perfectly recreate the designer's work.