MATH FOCUS: Scale Drawings and Models

Learn

▣ Read the Problem ▏ ....

> An art gallery mails postcards with photographs of its paintings to interested buyers. A photograph of one of the gallery's large rectangular paintings is 5 inches long and 3 inches wide. The scale relating the size of the photograph to the size of the actual painting is 1 inch to $1\frac{1}{2}$ feet. What are the dimensions of the actual painting?

Reread Ask yourself questions as you read the problem again.

● What is the problem about?

_____

● What kind of information is given?

_____

● What question am I asked to answer?

_____

Mark the Text

▣ Search for Information ▏ ....

Read the problem again. Circle facts about the dimensions and the statements about the scale.

Record List the measurements given in the problem.

The length of the photograph is _____ inches.

The width of the photograph is _____ inches.

The scale used is _____ inch to _____ feet.

Think about how you can use this information to choose a problem-solving strategy.

Decide What to Do

You know the scale and the dimensions of the photograph.

Ask How can I find the length and width of the painting?

- I can use the strategy *Draw a Diagram* to make a scale drawing of the painting to help me visualize the problem.

- I can use the scale and dimensions of the photograph to write proportions so I can find the length and width of the painting.
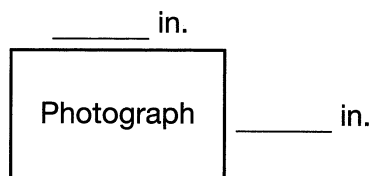
Use Your Ideas

Step 1 Draw diagrams of the photograph and the actual painting. Label the photograph with the dimensions.
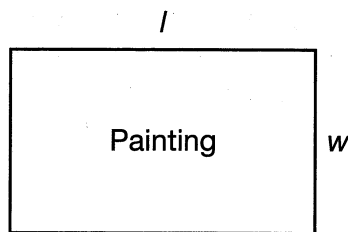
Step 2 Write and solve a proportion using the scale to find the length of the painting. Use l for the length of the painting, in feet.

$$\frac{1}{1.5} = \frac{5}{l}$$

$$l = \underline{\hspace{1cm}}$$

l

| Painting | *w* |

_____ in.

| Photograph | _____ in. |

> Remember that the actual length is measured in feet and the length of the photograph is measured in inches.

Step 3 Write and solve a proportion using the scale to find the width of the painting. Use w for the width of the painting, in feet.

$$\frac{1}{1.5} = \frac{3}{w}$$

$$w = \underline{\hspace{1cm}}$$

So the actual painting is _____ long and _____ wide.

Review Your Work

Check that the photograph's dimensions are proportional to the painting's dimensions. Does $\frac{5}{3} = \frac{7.5}{4.5}$?

Describe How did a diagram help you solve the problem?

_____

_____

Try

Solve the problem.

(1) A rectangular museum lobby is 38 feet long and 28 feet wide. Tom wants to make a scale drawing of the lobby with a scale of 1 inch to 4 feet. Will the drawing fit on a sheet of $8\frac{1}{2}$-inch by 11-inch paper? Explain why or why not.
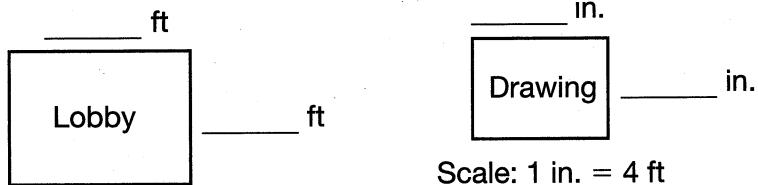
Mark the Text ✏️ - - ➤

Read the Problem and Search for Information · · · · · · · ·

Identify the dimensions and scale in the problem.

Decide What to Do and Use Your Ideas · · · · · · · · · · · · ·

You can use the strategy *Draw a Diagram.*

Step 1 Write the lobby's dimensions in the diagram.

```
_____ ft                              _____ in.
┌──────────────┐                    ┌──────────┐
│              │                    │ Drawing  │ _____ in.
│    Lobby     │ _____ ft          └──────────┘
│              │                    Scale: 1 in. = 4 ft
└──────────────┘
```

Ask Yourself

Once I find the dimensions of the drawing, how do I determine whether the drawing will fit on the paper?

Step 2 Write a proportion to find the length and a proportion to find the width of the scale drawing. Use *l* for the length and *w* for the width of the drawing. Complete the diagram.

$$\frac{1}{4} = \frac{l}{38} \quad \rightarrow \quad l = \underline{\hspace{2cm}}$$

$$\frac{1}{4} = \frac{w}{28} \quad \rightarrow \quad w = \underline{\hspace{2cm}}$$

The dimensions of the drawing are _____ by _____ .

So the drawing _____ fit on a sheet of $8\frac{1}{2}$ by 11-inch paper.

Explain. _____

Review Your Work ·

Check that you have compared the correct dimensions.

Identify Meg says the drawing will not fit because it is $9\frac{1}{2}$ inches and the paper is only $8\frac{1}{2}$ inches. What mistake could Meg have made?
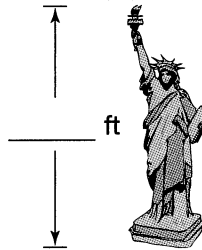
_____

_____

Apply

Solve the problems.

(2) A scale model of the Statue of Liberty is in an art museum. The model is 5 feet tall and the scale is 1 foot = 10 yards. About how tall, in feet, is the actual Statue of Liberty?

Let h = the actual height, in yards.

$$\frac{1}{10} = \frac{}{h}$$

$h =$ _____

_____ yards = _____ feet

Scale: 1 ft = _____ yd

Answer _____

Relate How could you rewrite the scale so that you do not have to convert yards to feet after solving the proportion?
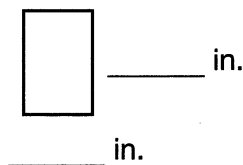
_____

_____

(3) An artist enlarged a 4-inch by 6-inch rectangular photograph using the scale 1 inch = $1\frac{1}{2}$ feet. What are the dimensions of the enlarged photo?

Original Photograph   Enlarged Photograph
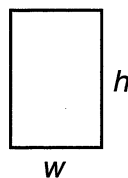
_____ in. h

_____ in. w

Scale: 1 in. = _____ ft

$$\frac{1}{1\frac{1}{2}} = \frac{}{w} \qquad \frac{1}{1\frac{1}{2}} = \frac{}{h}$$

Answer _____

Recognize How is this problem different from the others you have solved so far in the lesson?
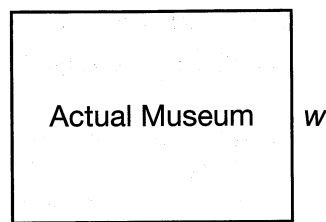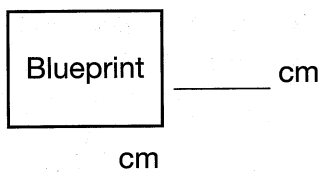
_____

_____

(4) An architect is drawing plans for a new museum. On a blueprint, the rectangular museum is 20 centimeters long and 15 centimeters wide. The scale is 1 centimeter = 7.2 meters. What is the perimeter of the actual museum?

Blueprint _____ cm

_____ cm

Scale: 1 cm = _____

Actual Museum | w

l

Answer _____

Determine Lisa solved the problem by first finding the perimeter of the museum on the blueprint. Then she used the scale to find the actual perimeter. Does this method work? Explain.

_____

_____

(5) A totem pole outside an art museum is 40 feet tall. Gary wants to make a scale drawing of it on an $8\frac{1}{2}$-inch by 11-inch sheet of paper. If the scale he uses is 1 inch = $3\frac{1}{2}$ feet, will the drawing fit on the paper? Explain.
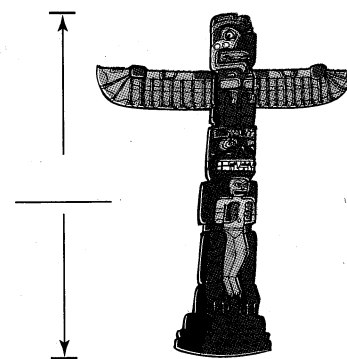
Answer _____

Examine What information given in the problem is not needed to solve it?

_____

_____

Practice

Solve the problems. Show your work.

(6) Along a street on a city map, it is 5.2 centimeters from the art museum to the history museum, and 3.9 centimeters from the art museum to the city library. What is the actual distance along the street from the history museum to the art museum if the scale is 1 centimeter = 300 meters?

Answer _____

Conclude What is another question you could ask based on the information in the problem?

_____

_____

(7) A large sculpture sits in front of a modern art museum. There is a scale model of the sculpture inside the museum that is 26 inches long. The scale of the model is 1 inch = $1\frac{3}{4}$ feet. What is the length of the actual sculpture?

Answer _____

Justify How did you arrange the units when you set up your proportion to solve this problem?

_____

_____

Look back at the problems in the lesson. Choose one problem and change at least two of the numbers. Write and solve a new problem. Check that the strategy *Draw a Diagram* can be used to help solve

Create   the problem.