

Picture Yourself

Editing digital images



Lesson

When you combine digital images to make composite pictures, the original images are often at different scales and image types. These differences provide challenges that are easy to overcome, if you understand the image processing tools you are using.

Standing in for Lady Liberty

The Statue of Liberty has been holding that torch aloft since 1886, and she needs a short vacation.

- Launch ImageJ, locate the **Statue** folder inside **07 Picture Yourself**, and open the **Statue.tif** image.

The statue and its base are shown on the left. In the image on the right, the statue has been digitally erased by replacing the statue's pixels with pixels from the sky.

- Open the **Stand-in.tif** image.

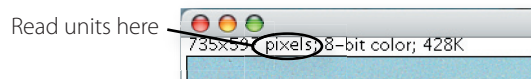
Scaling images

Your first task will be to scale the image of the girl (the target) so that she is the same height as the statue (the source). The scaling factor is calculated using the following formula:

$$\text{scaling factor} = \frac{\text{length (height) of source}}{\text{length (height) of target}}$$

Before you measure the images, you need to make sure they are calibrated in the same units of length.

1. According to the image window status bar, what units of length are used for the statue image?




2. What units of length are used for the image of the girl?

Scanners and digital cameras often automatically calibrate images in inches for printing, and this is the case with the stand-in image. You will need to change the units of the image to match those of the statue image.

- Activate the **Stand-in.tif** image, choose **Analyze > Set Scale...**, enter **pixels** in the **Unit of Length** field, and click **OK**.

Measurements for both images will now be given in pixels. Next, you will measure the height of the statue and the height of the girl, and use them to calculate the scaling factor.

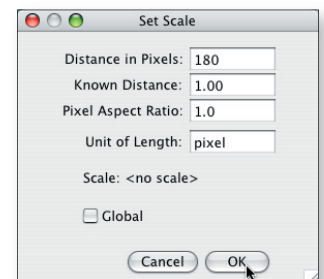
- Activate the **Statue.tif** image, and use the Straight Line Selection tool  to measure the height of the statue. Since the statue is wearing a crown and her stand-in is not, measure from the

Would you like to stand in for Lady Liberty?

You, a friend, or a classmate can stand in for Lady Liberty too. Scan a photograph or take a picture with a digital camera to use in place of the image of the girl provided in the lesson.

Statue trivia


The actual name of the figure in the Statue of Liberty is *Liberty enlightening the world*.



Read length here

bottom of their feet to the tips of their noses. As you drag the line selection, its length is displayed in the ImageJ window status bar.


3. What is the height of the statue in pixels?

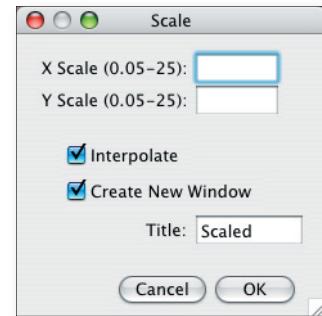
 Activate the **Stand-in.tif** image, and repeat this process to measure the height of the girl, from the bottom of her feet to the tip of her nose.

4. What is the height of the girl in pixels?

5. Calculate the scaling ratio for reducing the stand-in to the same height as the statue. Round your ratio to two decimal places.



6. The scaling factor for reducing an image is less than 1. What happens to an image if you enter a scaling factor greater than 1?

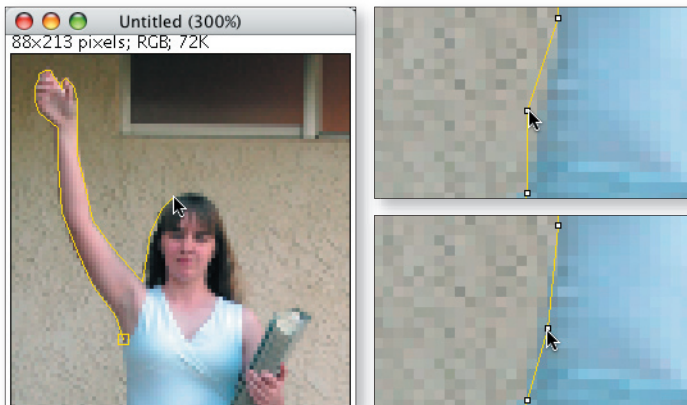
 Choose **Image > Scale...**, check the **Interpolate** and **Create New Window** options, enter the scaling factor you calculated in the **X Scale** and **Y Scale** fields, enter a name for the new window (such as **Scaled**), and click **OK**.




Selecting the stand-in image

The stand-in is now the correct size to replace the statue, but before you can copy and paste her onto the empty pedestal you need to select just the stand-in and not the background pixels.

 Use the Polygon tool  to trace the outline of the scaled stand-in image, clicking each time the outline changes direction as shown on the left below. When you return to your starting point, click inside the small box to complete the selection.



The selection outline now shows small handles where you clicked to change direction.

 If your selection outline missed the edge of the stand-in anywhere, you can edit it by dragging the handles to new locations, as shown on the right above.

Copying, pasting, and image types

When you are satisfied with your selection, you are ready to copy and paste the stand-in into position on her pedestal.

 Choose **Edit > Copy** to copy the image of the girl to the ImageJ clipboard.

- ☞ Activate the **Statue.tif** image, and choose **Edit > Paste** to paste the girl into the image.

Oops! There's a problem! When you try to paste the girl, ImageJ tells you that the images must be the same *type* to paste. The image type refers to the number of color channels and the number of bits per channel used to store the image data.

The image type is shown on each image window's status bar, to the right of the pixel dimensions.



7. What type of image is **Statue.tif**?
8. What type of image is the stand-in image?

You will need to change the type of one of the images before you can copy and paste between them. In most situations, a good rule of thumb when copying and pasting between images is to convert all images—even grayscale images—to RGB Color.

9. Which image(s) do you need to convert to RGB Color?



- ☞ Activate the image(s) you need to convert, and choose **Image > Type > RGB Color**.

The image window status bar should now show the image type as **RGB**, and you can now paste the girl into the image.

- ☞ Activate the **Statue.tif** image and choose **Edit > Paste** to paste the girl into the image. Drag the stand-in into place on her pedestal.

Adding the final touches

What is the Statue of Liberty without her torch? You still need to select the statue's torch and copy and paste it into the girl's hand. (If you have time, you may even want to copy and paste the statue's crown onto the girl's head.)

- ☞ Scale, copy, and paste the statue's torch onto the stand-in.
- ☞ You may wish to touch up individual pixels to make the pasted areas blend in better with the background. Use the Color Picker  to choose colors from the image, and the Pencil tool  to edit individual pixels using the selected color.

More practice

For more practice in combining images, open the images in the **Astronaut** folder or the **Rushmore** folder, and try scaling and pasting the boy's face in place of the face of the astronaut or the president.

10. Describe the steps you used to replace the astronaut's or president's head with the boy's head. See the note at right if you think you need to rotate or flip the head.

If you'd like more practice, folders of additional images (**More Backgrounds** and **Careers**) are included in the lesson folder.

Rotating images

You may need to change the angle of an image to make it fit correctly in a chosen background. To rotate an image, choose **Image > Rotate > Arbitrarily**, enter the rotation angle, check the **Interpolate** option, and click **OK**. Positive angles rotate the image clockwise, and negative angles rotate it counterclockwise.

If the head is facing in the wrong direction, you can flip it by choosing **Image > Rotate > Flip Horizontally**.





**Data
Sheet**

Picture Yourself

1. According to the image window status bar, what units of length are used for the statue image?
2. What units of length are used for the image of the girl?
3. What is the height of the statue in pixels?
4. What is the height of the girl in pixels?
5. Calculate the scaling ratio for reducing the stand-in to the same height as the statue. Round your ratio to two decimal places. (Hint: Here's the formula:

$$\text{scaling factor} = \frac{\text{length (height) of source}}{\text{length (height) of target}}$$

6. The scaling factor for reducing an image is less than 1. What happens to an image if you enter a scaling factor greater than 1?
7. What type of image is **Statue.tif**?
8. What type of image is the stand-in image?
9. Which image(s) do you need to convert to RGB Color?
10. Describe the steps you used to replace the astronaut's or President's head with the boy's head.