



WORKED EXAMPLE 2.2

Working with Pictures



Problem Statement Edit and display image files in the `Picture` class found in the `ch02/worked_example_2` directory of this chapter's companion code.

For example, the following program simply shows the image given below:

```
public class PictureDemo
{
    public static void main(String[] args)
    {
        Picture pic = new Picture();
        pic.load("queen-mary.png");
    }
}
```



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Your task is to write a program that reads in an image, shrinks it, and adds a border. Shrink it sufficiently so that there is a transparent border inside the black border, as in the figure below.



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You should *not* look inside the internal implementation of the `Picture` class. Instead, use the API documentation by pointing your browser to the file `index.html` in the `worked_example_2/picture/api` subdirectory.

The screenshot displays the API documentation for the `Picture` class in a Mozilla Firefox browser. The address bar shows the file path: `file:///home/cay/books/bigj6/code/ch02/worked_example_2/api/index.html`. The page title is "Picture - Mozilla Firefox".

On the left, the "All Classes" sidebar lists `BorderMaker`, `Picture` (selected), and `PictureDemo`.

The main content area shows the "Class Picture" documentation. It includes the package name `java.lang.Object` and the class name `Picture`. Below this, it states "public class **Picture** extends `java.lang.Object`". A description follows: "This class allows you to view and edit pictures."

The "Constructor Summary" section shows a single constructor: `Picture()`, which "Constructs a blank picture."

The "Method Summary" section includes a table with the following methods:

| Modifier and Type | Method and Description |
|-----------------------------|---|
| void | <code>border(int width)</code> Adds a black border to the image. |
| <code>java.awt.Color</code> | <code>getColorAt(int x, int y)</code> Gets the color of a pixel. |
| int | <code>getHeight()</code> Gets the height of this picture. |
| int | <code>getWidth()</code> Gets the width of this picture. |

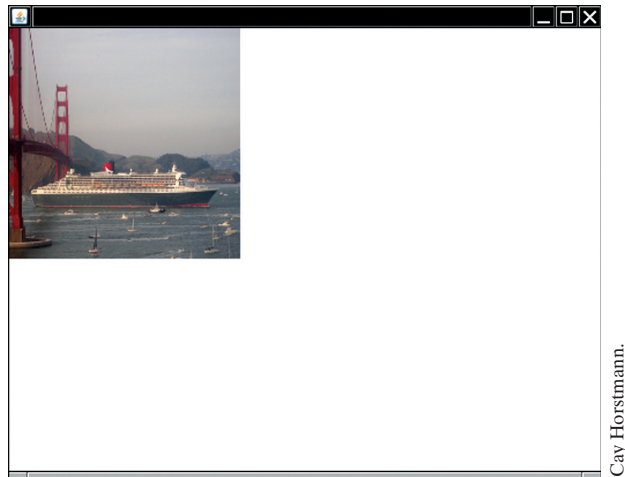
The API contains a number of methods that are unrelated to the task, but two of the methods are clearly useful:

```
public void scale(int newWidth, int newHeight)
public void border(int width)
```

If the method comments are not clear, it is a good idea to write a couple of simple test programs to see their effect. For example, this program demonstrates the `scale` method:

```
public class PictureScaleDemo
{
    public static void main(String[] args)
    {
        Picture pic = new Picture();
        pic.load("queen-mary.png");
        pic.scale(200, 200);
    }
}
```

Here is the result:



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As you can see, the picture has been resized to a 200×200 pixel square.

That's not quite what we want. We want the picture to be a bit smaller than the original. Let's say that the black border is 10 pixels thick, and we want another transparent border of 10 pixels. Then the target width and height are 40 pixels less than the original, leaving 20 pixels on each side for the borders.

Looking at the API, we find methods for obtaining the original width and height. Therefore, we will call

```
int newWidth = pic.getWidth() - 40;
int newHeight = pic.getHeight() - 40;
pic.scale(newWidth, newHeight);
```

Then we add the border:

```
pic.border(10);
```

The result is



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If we can move the picture a bit before applying the border, we are done. Another look at the API reveals a method

```
public void move(int dx, int dy)
```

That's just what we need. The picture needs to be moved 20 pixels down and to the right. Our final program is

worked_example_2/BorderMaker.java

```
1 public class BorderMaker
2 {
3     public static void main(String[] args)
4     {
5         Picture pic = new Picture();
6         pic.load("queen-mary.png");
7         int newWidth = pic.getWidth() - 40;
8         int newHeight = pic.getHeight() - 40;
9         pic.scale(newWidth, newHeight);
10        pic.move(20, 20);
11        pic.border(10);
12    }
13 }
```

Couldn't we have achieved the same result with an image editing program such as Photoshop or GIMP? Yes, but it is an easy matter to extend this program so that it can automatically apply a border to any number of images.
