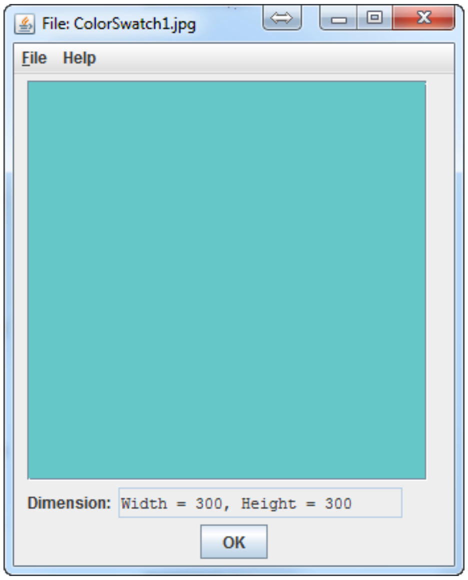
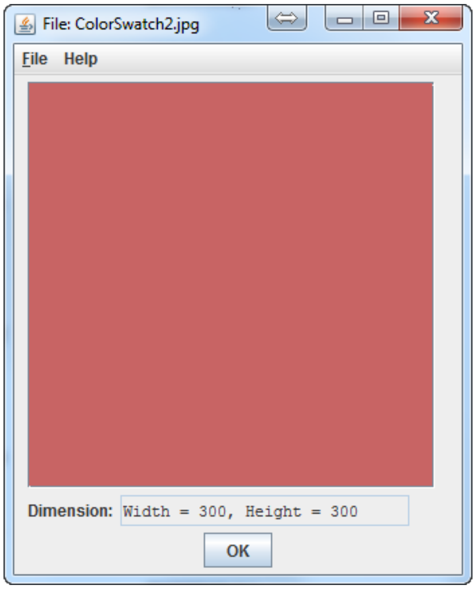
Part A
Question 1

Write a Java program that takes two pictures of the same size and shape and merges them together into a single picture that has alternating bands of the image from each picture. For example, the result of merging the following with 10 bands:



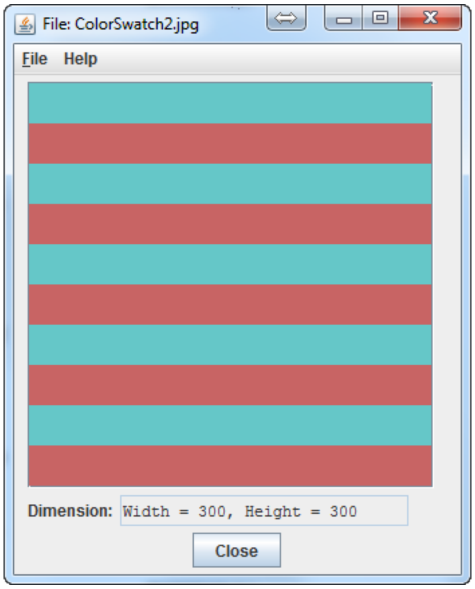
Dimension: Width = 300, Height = 300

merged with



Dimension: Width = 300, Height = 300

would look like:



Dimension: Width = 300, Height = 300

The program should input and display the first picture then input and display the second picture and finally display and then save the result. It should use a method such as:

```
    private void makeBands ( Picture pic1, Picture pic2 ) {
```

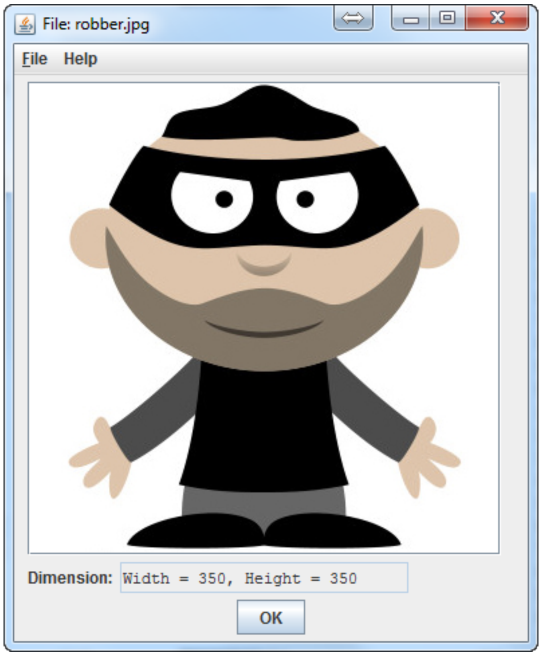
Note: because of integer division, unless the number of bands divides evenly into the height of the picture, the last band may be a different size than the others.

Hint: in order to produce the result, you only need to copy each band of pixels from the first picture (green) onto the second picture (red).

For submission, create 10 bands of alternating image by merging `pic1.jpg` and `pic2.jpg` from the folder `Files` on the desktop. With the result displayed in the displayer, select `File/Print Image of Window...` as output for your submission and save the resulting image as `bands.jpg` in the same folder as the program.

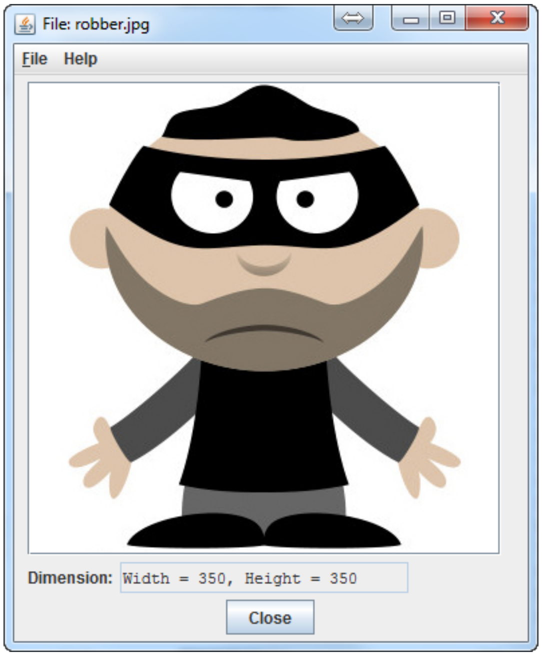
Part A
Question 2

Write a program that changes an image of a felon before capture (with a smile) into an image of the felon after capture (with a frown) as below:



Dimension: Width = 350, Height = 350

before



Dimension: Width = 350, Height = 350

after

Write a method:

```
private Picture crop ( Picture aPic, int x, int y,
                       int width, int height ) {
```

that returns that portion of the picture `pic` of `width` and `height` starting at pixel `(x,y)`.

Write a method:

```
private Picture flip ( Picture aPic ) {
```

that returns a new picture which is the picture `aPic` flipped (i.e. upside down).

Write a third method:

```
private void paste ( Picture orig, Picture paste, int x, int y ) {
```

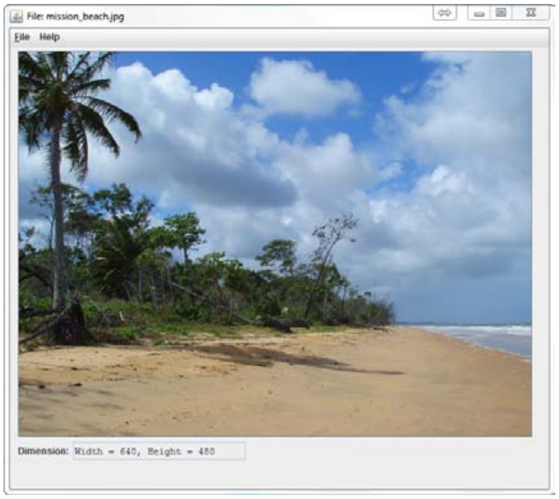
that pastes the picture `paste` onto the picture `orig` starting at pixel `(x,y)`.

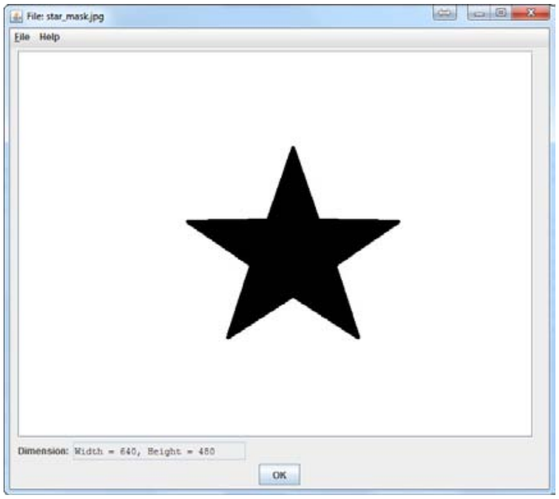
To produce the image above, crop the smile from the before picture (starting at `(125,170)` with width `100` and height `30`). Flip the smile resulting in a frown. Paste the frown onto the original picture at `(125,170)`. Your program should display the original image and then the modified image and then save the modified image.

For submission, run the program using the image `robber.jpg` from the folder `Files` on the desktop. With the result displayed in the displayer, select `File/Print Image of Window`... as output for your submission and save the resulting image as `frown.jpg` in the same folder as the program.

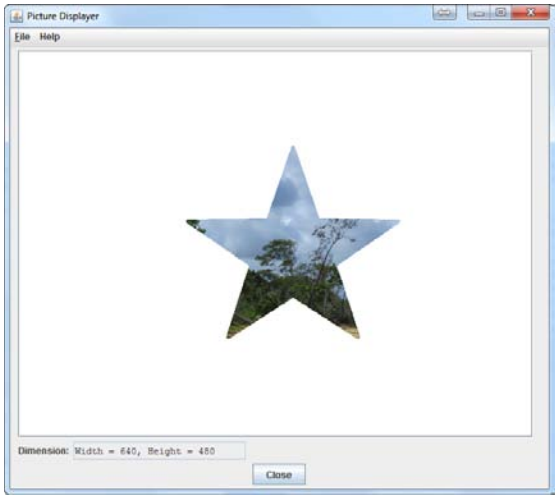
Part A
Question 3

Write a program to use one image to select part of another image, the first image serving as a mask. The resulting image will be white with the exception of the pixels corresponding to the black pixels in the mask. These pixels will be the same color as the corresponding pixels in the image being masked. For example, with the mission beach image and the mask (star shape) below:





The result will be:



The image and the mask can be assumed to be of the same size (i.e. width and height). The program should load a picture and display it on a `PictureDisplayer` and then load a mask and display it on the `PictureDisplayer`. It should then produce a new picture with the same dimensions with pixels as described above and display it on the `PictureDisplayer`. Pixels in the mask within distance 50 units of the `Color` constant `BLACK` should be considered as black.

Write a method:

```
    private Picture applyMask ( Picture aPic, Picture mask ) {
```

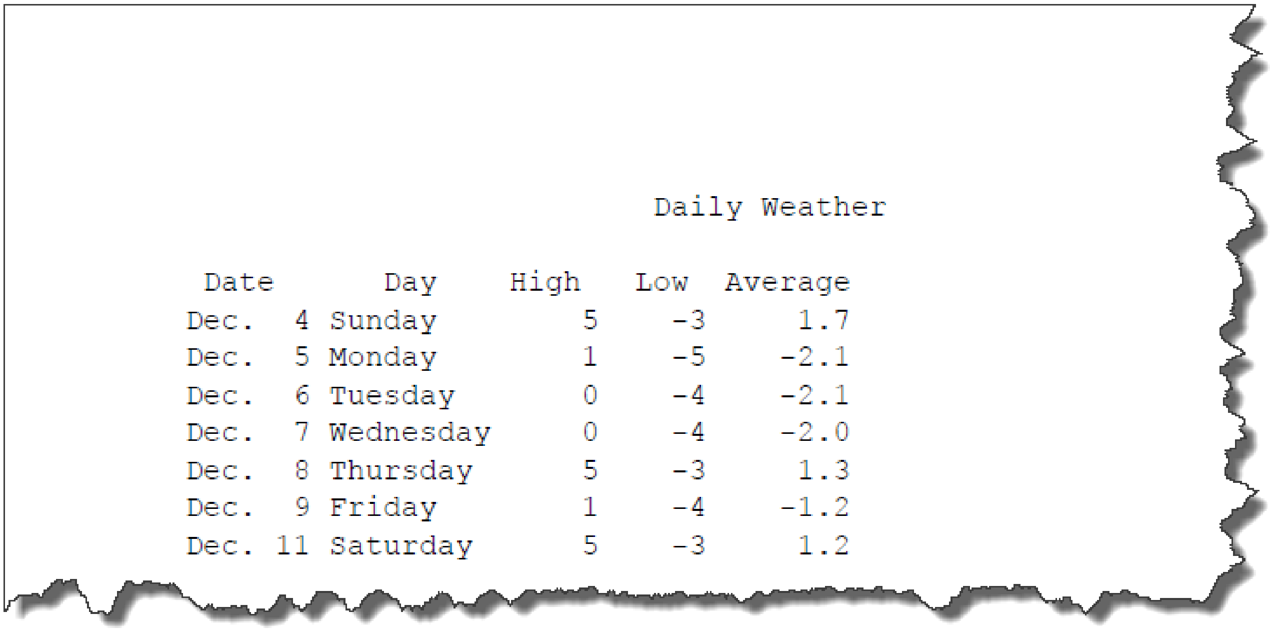
which performs the transformation as described above.

For submission, load the `mission_beach.jpg` image with `star_mask.jpg` as the mask from the folder `Files` on the desktop to produce the new image. With the result displayed in the displayer, select `File/Print Image of Window`... as output for your submission and save the resulting image as `masked.jpg` in the same folder as the program.

Part B
Question 1

Write a java program to summarize weather measurements on a daily basis. A file contains measurements for a number of days. For each day it contains the following: date (`String`), day (`String`) followed by 24 hourly temperature measurements (`int`).

The program should produce a report summarizing the temperature data as follows:



```
                          Daily Weather

 Date      Day      High   Low  Average
Dec.  4 Sunday         5    -3      1.7
Dec.  5 Monday         1    -5     -2.1
Dec.  6 Tuesday        0    -4     -2.1
Dec.  7 Wednesday      0    -4     -2.0
Dec.  8 Thursday       5    -3      1.3
Dec.  9 Friday         1    -4     -1.2
Dec. 11 Saturday       5    -3      1.2
```

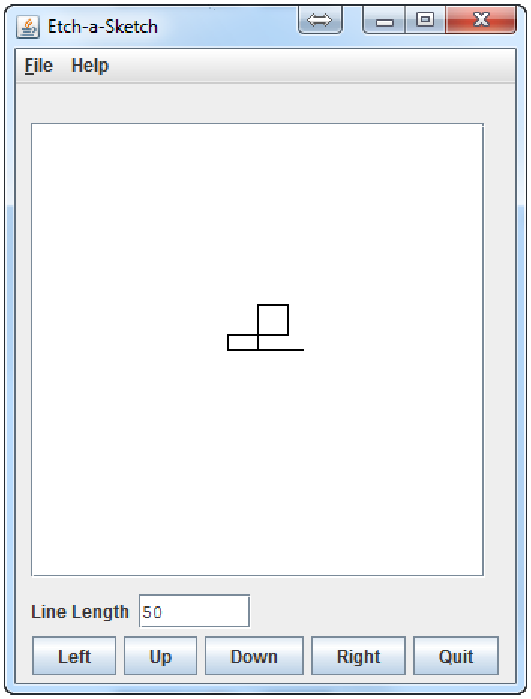
Make use of appropriate methods in your solution.

For submission, run the program using the file `weather.txt` in the folder `Files` on the desktop. Generate the report to Cute PDF Writer as the file `report.pdf` in the same folder as the program. Print the `report.pdf` file as output for your submission.

Part B
Question 2

Etch A Sketch™ is a children's drawing toy with a drawing surface and two knobs that control moving the "pen" in the left-right and up-down directions.

Write a program that emulates the Etch A Sketch™ using a `BasicForm` with a `Turtle` drawing on a `Canvas` widget such as:



Line Length 50

The form starts with a blank canvas and presents a text field for specifying line length and four buttons that indicate four directions for drawing the line (`Left`, `Up`, `Down` and `Right`). The turtle starts at the middle of the canvas and the pen is always down. In response to the user pressing a button, the program moves the turtle in the indicated direction the specified number of units (drawing a line in one of the four cardinal directions). When the `Quit` button is pressed, the program terminates.

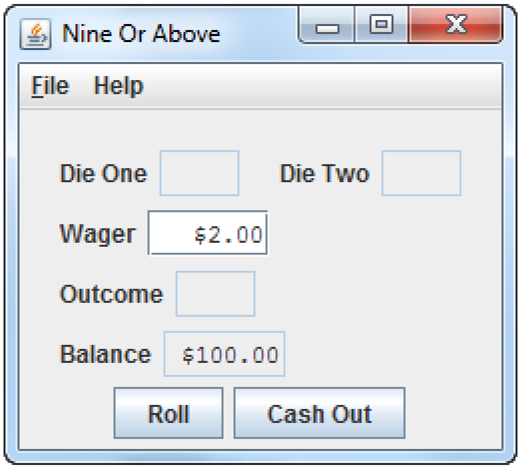
For submission, run your program and draw a figure with at least six lines. Before pressing `Quit`, select `File/Print Image of Window`... to print the window for submission and then select `File/Save Image of Window`... and save the image as `sketch.jpg` in the same folder as the program.

Part B
Question 3

Write a program to simulate playing a simple dice game played with standard 6-sided dice. A wager is placed (i.e. the player decides how much they will bet) and two dice will be rolled. The rules for payouts are as follow:

- if total of dice is 9 or above the player wins the amount of their wager.
- if total of dice is 8 or below the player loses the amount of their wager.

The player starts with $200 (balance). The program should present a form similar to:



Die One

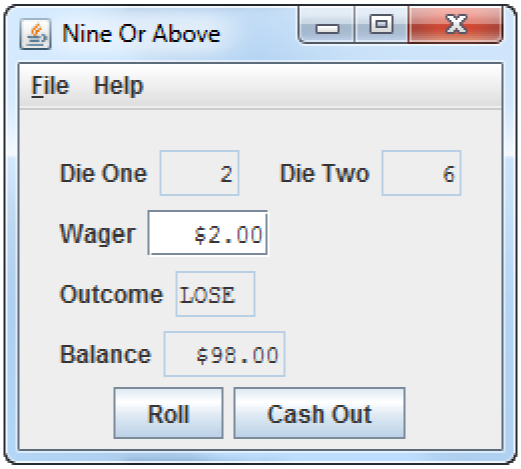
Die Two

Wager $2.00

Outcome

Balance $100.00

the player can enter a wager (the program should set a standard wager of $2) and presses `Roll`. The dice are rolled, the outcome is determined (win or lose), the balance is updated and the information displayed:



Die One 2

Die Two 6

Wager $2.00

Outcome LOSE

Balance $98.00

At this point the player can keep or change the wager and `Roll` again or can decide to quit by pressing `Cash Out`.

For submission, run the program and simulate 7 rolls of the dice. For the last wager, increase the wager to $5.00. Before pressing `Cash Out`, select `File/Print Image of Window`... to print the window for submission and then select `File/Save Image of Window`... and save the image as `dice.jpg` in the same folder as the program.