Computer Programming Fundamentals

CS 152
Professor: Leah Buechley
TAs: Melody Horn, Noah Garcia, Andrew Geyko, Juan Ormaza
Time: MWF 10:00-10:50am
https://handandmachine.cs.unm.edu/classes/CS152_Fall2021/

ASSIGNMENT 7
POSTED BY WEDNESDAY

DO YOUR
COURSE EVALUATIONS

DATA VISUALIZATION RECAP

READING DATA FROM A FILE

- Read data from a .csv file
- Data read in line by line, using Scanner class
- First count the number of rows in the file, need this information to create an array of the correct size
- Then create array to store data and read in the data
- Split each row by commas, using split method
- Store these entries into a String array variable
- Use Integer.valueOf method to transform strings into ints
- Store these ints into an array variable that holds the data

questions?

VISUALIZING DATA: A BAR GRAPH

GRAPHING DATA

- Extend Basic Panel so we can draw stuff
- Add necessary class variables and methods

- Create a window for graphing that fits the data
- Draw a rectangle for each data point
- Rectangle starts at bottom of screen
- Height determined by data point

questions?

RE-DOWNLOAD BasicPanel.jar
ADD AS A LIBRARY

important: download again even if you already have a copy

EXTEND BasicPanel

```
import java.io.File;
import java.io.FileNotFoundException;
import java.util.Scanner;

public class DataVisualization extends BasicPanel {
```

ADD CLASS VARIABLES

```
import java.io.File;
import java.io.FileNotFoundException;
import java.util.Scanner;

public class DataVisualization extends BasicPanel {
    int[][] data;
    int rows;
    final static String FILENAME = "abq_weather.csv";
    final int rectangleWidth = 3;
```

ADD CONSTRUCTOR

```
import java.io.FileNotFoundException;
import java.util.Scanner;
import java.io.File;

public class DataVisualization extends BasicPanel {
    int[][] data;
    int rows;
    final static String FILENAME = "abq_weather.csv";
    final int rectangleWidth = 3;

    DataVisualization () throws FileNotFoundException {
        data = importData();
        rows = data.length;
        setSize(rows*rectangleWidth,200);
    }
```

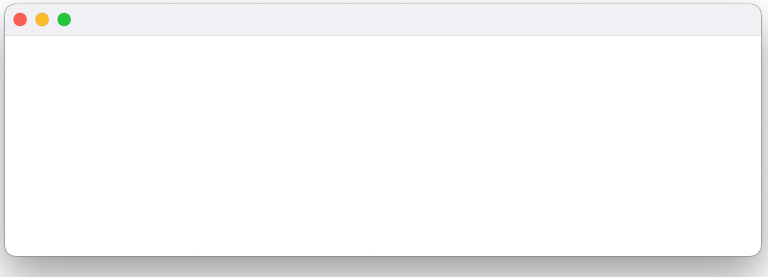
EDIT main

```
import java.io.FileNotFoundException;
import java.util.Scanner;
import java.io.File;

public class DataVisualization extends BasicPanel {
    int[][] data;
    int rows;
    final static String FILENAME = "abq_weather.csv";
    final int rectangleWidth = 3;

    DataVisualization () throws FileNotFoundException {
        data = importData();
        rows = data.length;
        setSize(rows*rectangleWidth,200);
    }

    public static void main(String[] args) throws FileNotFoundException {
        DataVisualization d = new DataVisualization();
        MyFrame frame = new MyFrame(d);
    }
```



questions?

A CORRECTION
GOOD CODING PRACTICES

FILENAME shouldn't be static

```
import java.io.File;
import java.io.FileNotFoundException;
import java.util.Scanner;

public class DataVisualization extends BasicPanel {
    int[][] data;
    int rows;
    final int rectangleWidth = 3;
    final static String FILENAME = "abq_weather.csv";

    DataVisualization () throws FileNotFoundException {
        data = importData();
        rows = data.length;
        setSize(rows*rectangleWidth,200);
    }

    public static void main(String[] args) throws FileNotFoundException {
        DataVisualization d = new DataVisualization();
        MyFrame frame = new MyFrame(d);
    }
```

ADD AN INPUT VARIABLE TO importData METHOD FOR FILENAME

```
static int[][] importData (String filename) throws FileNotFoundException {
    File file = new File(filename);
    Scanner scan = new Scanner(file);
    String line ="";
```

EDIT CONSTRUCTOR

```
DataVisualization () throws FileNotFoundException {
    data = importData(FILENAME);
    rows = data.length;
    setSize(rows*rectangleWidth,200);
}
```

questions?

GRAPHING DATA

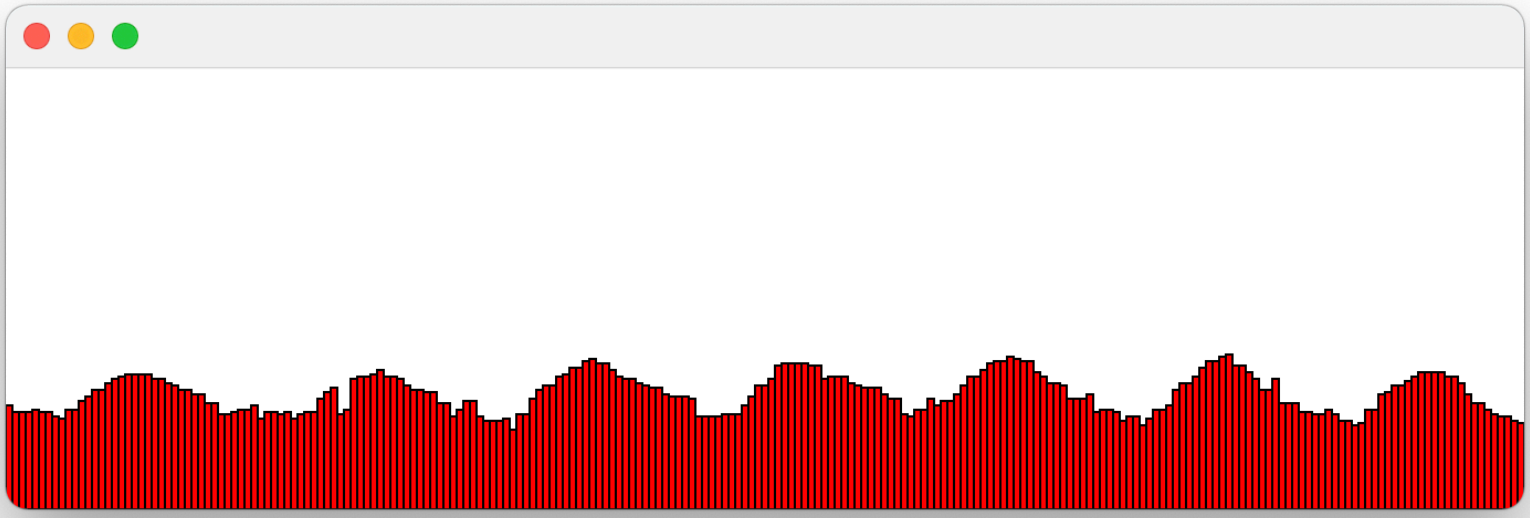
- ~~Extend Basic Panel so we can draw stuff~~
- ~~Add necessary class variables and methods~~

- ~~Create a window for graphing that fits the data~~
- Draw a rectangle for each data point
- Rectangle starts at bottom of screen
- Height determined by data point

DRAW A RECTANGLE FOR EACH DATA POINT

DRAW A RECTANGLE FOR EACH DATA POINT

```
final int rectangleWidth = 3;
```



```
width = rows * rectangleWidth
```

CREATE A barGraph METHOD

```
void barGraph(Graphics g) {

}
```

CREATE A barGraph METHOD

```
void barGraph(Graphics g) {
   for (int i=0; i<rows; i++) {


    }
}
```

plot every data point

CREATE A barGraph METHOD

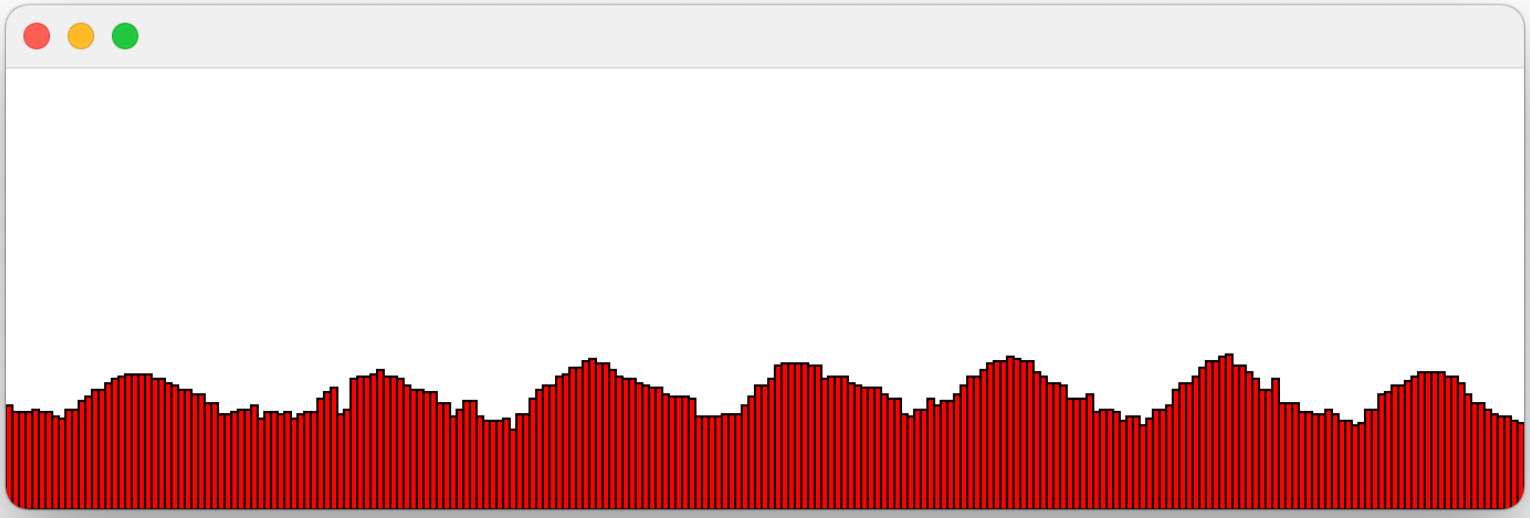
```
void barGraph(Graphics g) {
   for (int i=0; i<rows; i++) {
        int temperature = data[i][0];

    }
}
```

temperature is stored in first column of array

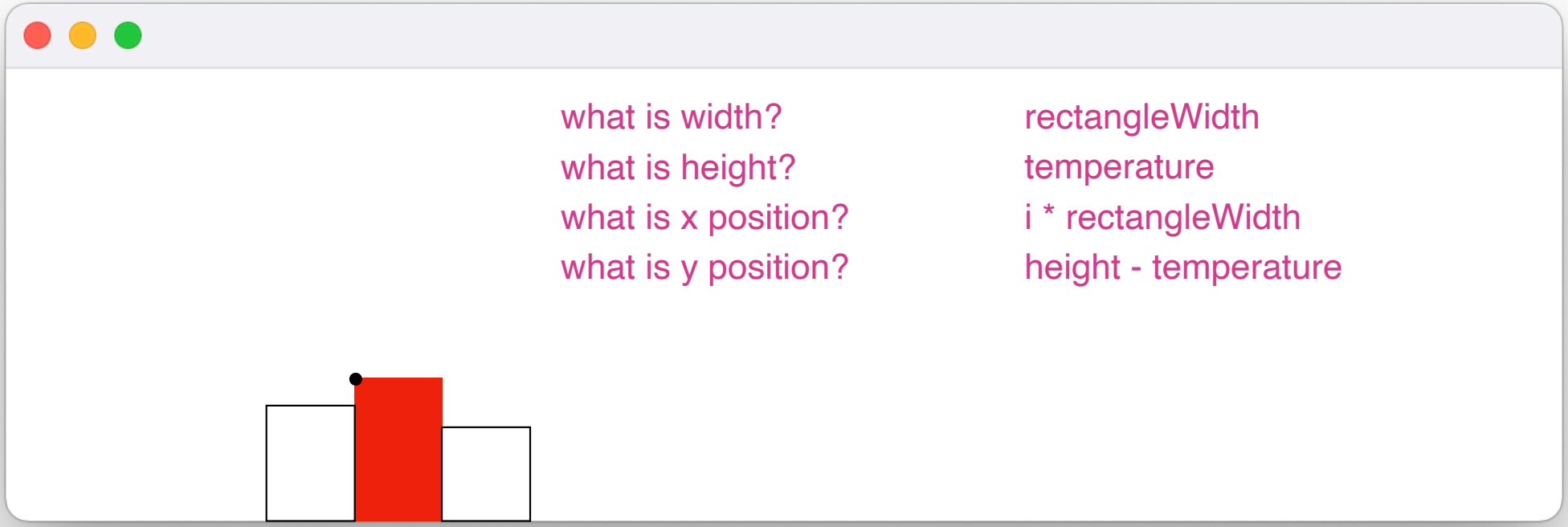
DRAW A RECTANGLE FOR EACH DATA POINT

```
final int rectangleWidth = 3;
```



```
width = rows * rectangleWidth
```

THINK ABOUT ONE RECTANGLE

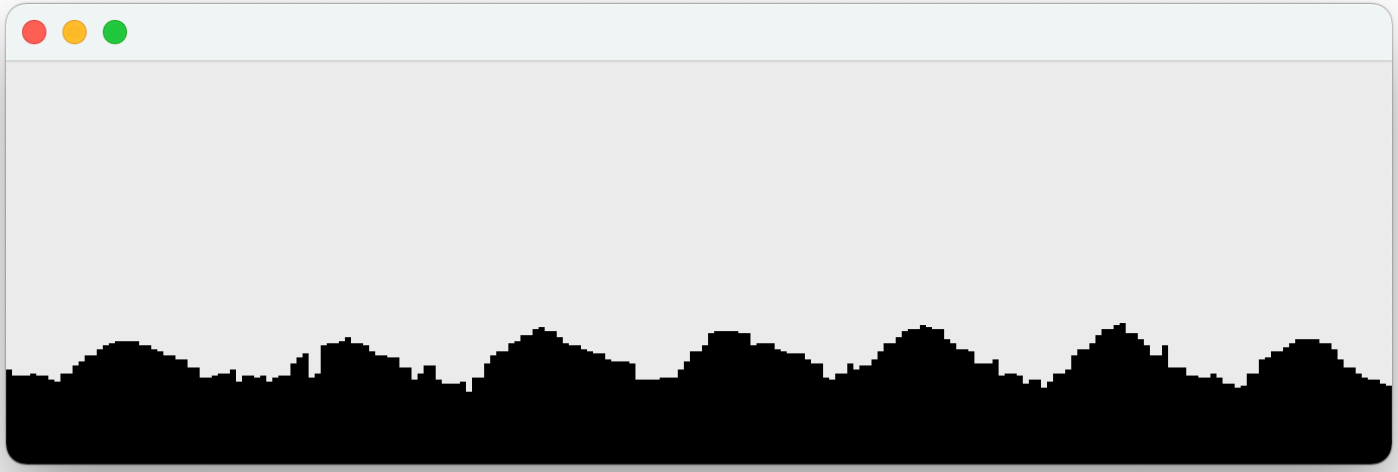


CREATE A barGraph METHOD

```
void barGraph(Graphics g) {
   for (int i=0; i<rows; i++) {
        int temperature = data[i][0];
        g.fillRect(i*rectWidth, height-temperature, rectWidth, temperature);
   }
}
```

ADD A paintComponent METHOD

```
@Override
protected void paintComponent(Graphics g) {
    barGraph(g);
}
```



questions?

GRAPHING DATA

- ~~Extend Basic Panel so we can draw stuff~~
- ~~Add necessary class variables and methods~~

- ~~Create a window for graphing that fits the data~~
- ~~Draw a rectangle for each data point~~
- ~~Rectangle starts at bottom of screen~~
- ~~Height determined by data point~~

IMPROVING OUR GRAPH

- Add color
- Add x and y axes including tic marks
- Add a title

IMPROVING OUR GRAPH

- Add color
- Add space for axes around graph
- Draw square around graph area
- Draw y axis tic marks to show scale and values
- Draw x axis tic marks to show scale and values
- Draw axis labels
- Draw title

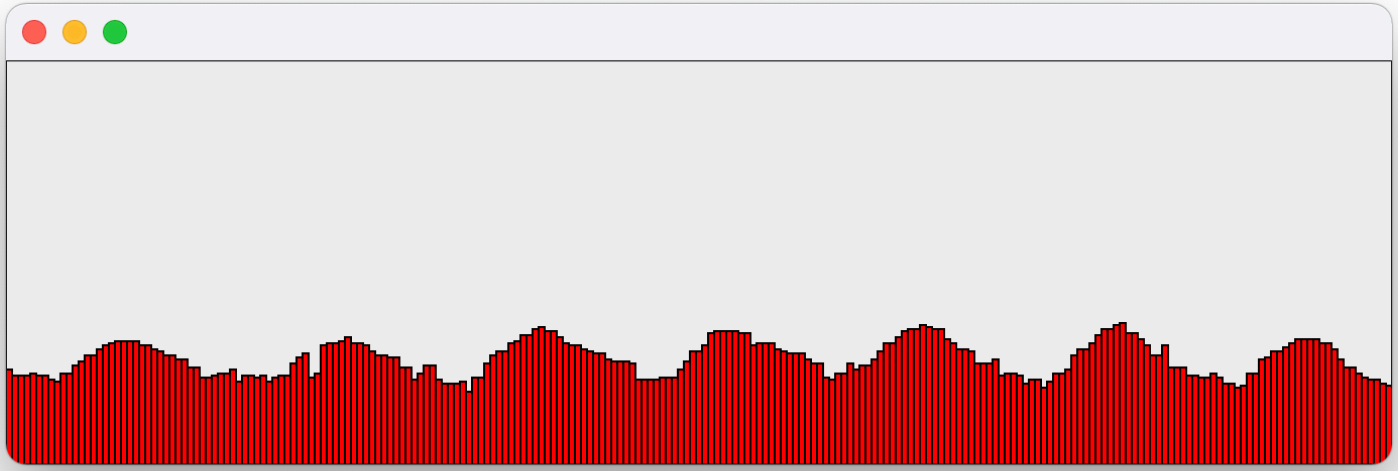
ADD COLOR

```
void barGraph(Graphics g) {
    Color graphColor = Color.RED;
    for (int i=0; i<rows; i++) {
        int temperature = data[i][0];   //get temperature data for that row
        //draw the rectangle
        g.setColor(graphColor);
        g.fillRect(i*rectangleWidth, height-temperature, rectangleWidth, temperature);
    }
}
```

ADD COLOR + RECTANGLE OUTLINES

```
void barGraph(Graphics g) {
    Color graphColor = Color.RED;
    for (int i=0; i<rows; i++) {
        int temperature = data[i][0];   //get temperature data for that row
        //draw the rectangle
        g.setColor(graphColor);
        g.fillRect(i*rectangleWidth, height-temperature, rectangleWidth, temperature);
        //draw the rectangle outline
        g.setColor(Color.BLACK);
        g.drawRect(i*rectangleWidth, height-temperature, rectangleWidth, temperature);
    }
}
```

COLOR + RECTANGLE OUTLINES



ADD SPACE FOR AXES

ADD SPACE FOR AXES: VARIABLES

```
public class DataVisualization extends BasicPanel {
    int[][] data;
    int rows;
    final String FILENAME = "abq_weather.csv";
    final int rectangleWidth = 3;
    final int graphHeight = 200;
    final int spacer = 50;
```

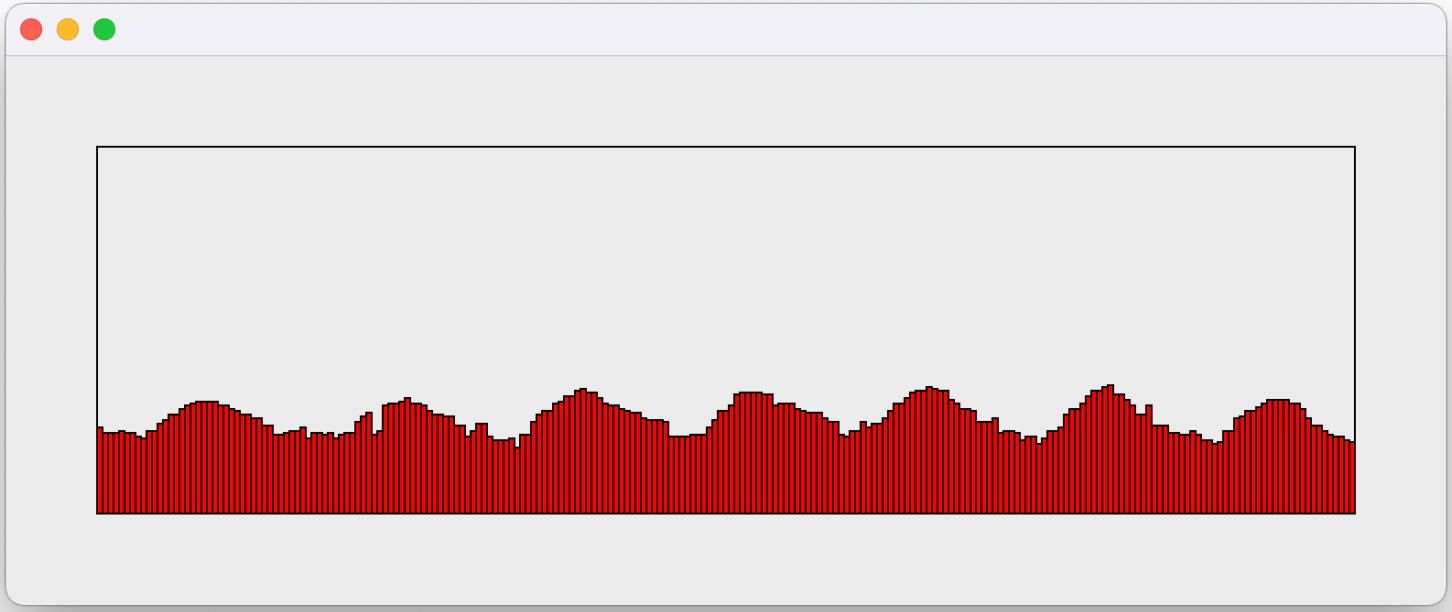
INCREASE SIZE OF WINDOW

```
DataVisualization () throws FileNotFoundException {
    data = importData(FILENAME);
    rows = data.length;
    setSize(rows*rectangleWidth+spacer*2, graphHeight+spacer*2);
}
```

DRAW GRAPH WITH SPACE

```
void barGraph(Graphics g) {
    Color graphColor = Color.RED;
    for (int i=0; i<rows; i++) {
        int temperature = data[i][0];   //get temperature data for that row
        //draw the rectangle
        g.setColor(graphColor);
        g.fillRect(i*rectangleWidth+spacer, height-temperature-spacer, rectangleWidth, temperature);
        //draw the rectangle outline
        g.setColor(Color.BLACK);
        g.drawRect(i*rectangleWidth+spacer, height-temperature-spacer, rectangleWidth, temperature);
    }
}
```

ADD SPACE FOR AXES



ADD TIC MARKS: Y

DRAW TIC MARKS

```
void barGraph(Graphics g) {
    Color graphColor = Color.RED;
    for (int i=0; i<rows; i++) {
        int temperature = data[i][0];   //get temperature data for that row
        //draw the rectangle
        g.setColor(graphColor);
        g.fillRect(i*rectangleWidth+spacer, height-temperature-spacer, rectangleWidth, temperature);
        //draw the rectangle outline
        g.setColor(Color.BLACK);
        g.drawRect(i*rectangleWidth+spacer, height-temperature-spacer, rectangleWidth, temperature);
    }
    g.drawRect(spacer,spacer,rectangleWidth*rows,graphHeight);

    //draw y tic marks
    for (int i=0;i<graphHeight;i=i+25) {
        g.drawLine(spacer-5,i+spacer,spacer+5,i+spacer);
    }
}
```

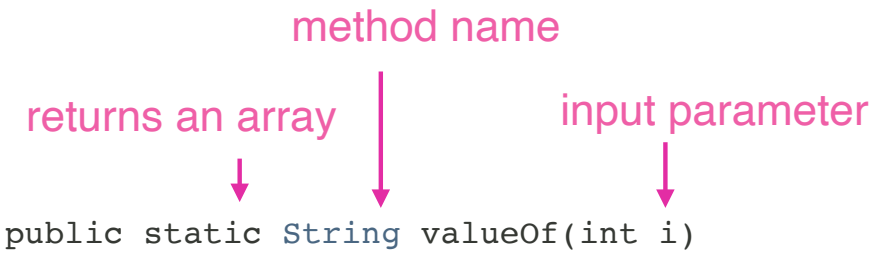
draw a 10 pixel horizontal line on y axis every 25 pixels

DRAW Y-AXIS LABELS

```
void barGraph(Graphics g) {
    Color graphColor = Color.RED;
    for (int i=0; i<rows; i++) {
        int temperature = data[i][0];   //get temperature data for that row
        //draw the rectangle
        g.setColor(graphColor);
        g.fillRect(i*rectangleWidth+spacer, height-temperature-spacer, rectangleWidth, temperature);
        //draw the rectangle outline
        g.setColor(Color.BLACK);
        g.drawRect(i*rectangleWidth+spacer, height-temperature-spacer, rectangleWidth, temperature);
    }
    g.drawRect(spacer,spacer,rectangleWidth*rows,graphHeight);

    //draw y tic marks
    for (int i=0;i<graphHeight;i=i+25) {
        g.drawLine(spacer-5,i+spacer,spacer+5,i+spacer);
        g.drawString(String.valueOf(i),spacer-30, height-(i+spacer));
    }
}
```

JAVA valueOf METHOD FOR Strings



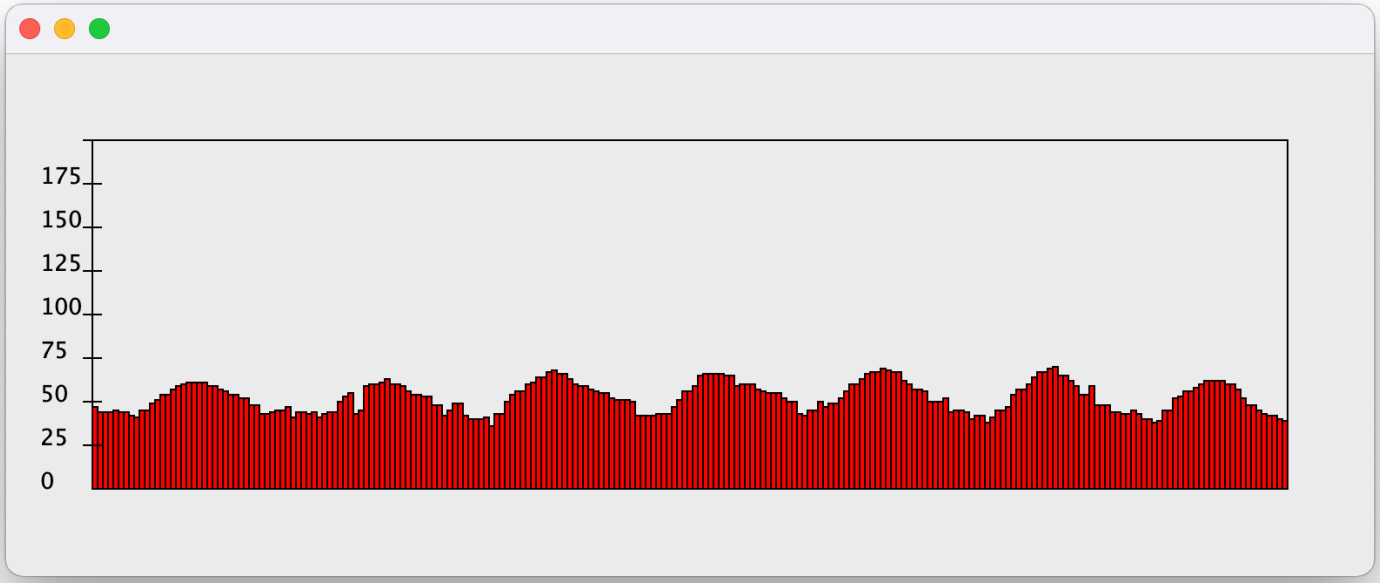
Returns the string representation of the `int` argument.

Parameters:
`i` – an `int`

Returns:
A string representation of the `int` argument.

https://docs.oracle.com/en/java/javase/16/docs/api/java.base/java/lang/String.html#valueOf(int)

ADD TIC MARKS: Y



Thank you!

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