Opening Exercise

Suppose that you are given three integers in int variables.

Describe a way to encode their values into a single int value.

Now suppose that all three integers have values ≤ 256.

How can you encode their values into a single int value without losing any information?
Possible Solutions, Part 1

add the values
choose the largest
average the values

The last of these corresponds to grayscale in an image.
Is it a lossy or lossless encoding?
Possible Solutions, Part 2

> Integer.MAX_VALUE
  2147483647
> 256 * 256 * 256
  16777216

An integer consists of 32 bits, and each of our values takes at most 8 bits.

How can we use the empty bits?
Part 2 — With 1-Digit Values

6  1  3

613
6 \times 10 \rightarrow 60 + 1 \rightarrow 61 \times 10 \rightarrow 610 + 3 \rightarrow 613
Exercise #2

Write a Pixel method named `setColorFrom( int encoded )` that changes the pixel's color to the RGB values encoded in the int argument.

Methods you can use in Pixel:

getRed(), getGreen(), getBlue()
setRed(), setGreen(), setBlue()
getColor(), setColor()
Our Picture Compression

Success!

For a Picture of $n$ pixels,
we now require only $n$ integers,
not $3n$ integers.

... but.
But What?

That is already how Pixels are represented!

The methods
getRed(),
getGreen(),
getBlue()
don't look up the values of variables.
They *compute* the values upon request.
Recap: Data Compression

Often we can find a way to store the same amount of information in less space — with a different encoding.
Recap: Lossy versus Lossless

A compression algorithm that loses information is called **lossy**.

A compression algorithm that retains all information is called **lossless**.

Lossy algorithms can generate smaller files, at some cost in the quality of the file for some purposes — including decompression.
Our Idea for Compressing Sound

Instead of using 2 bytes for each sample value, we could use 1 byte to record each sample change!

For a Sound of size $n$, we now require $n+1$ bytes instead of $2n$ bytes.
Our DiffSound Class

class declaration
instance variables
constructors
methods

access modifiers
public versus private
static versus (not)
Exercise: Decompression

Write a DiffSound method named decompress() that returns a Sound object.

The returned Sound should reconstruct the original set of sample values.
Javadoc as a Tool

At a command-line prompt:

mac os x > javadoc DiffSound.java

generates the file: DiffSound.html

mac os x > javadoc *.java

generates hyperlinked documentation for all the Java source files in the current directory.