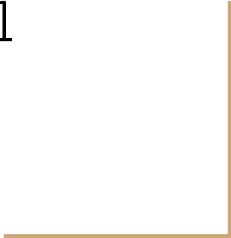# Programming, Problem Solving, and Algorithms

CPSC203, 2019 W1

Announcements

Lab this week is laptop setup: Anaconda's Python3 and PyCharm

"Problem of the Day" starts today!

Today:

Color Representation

Problem Decomposition using Python Classes

POTD

Color Interpretation

What's your favorite color? Do you have a sense for *why* it's your favorite? Does that color influence your dress/decor/purchases?

Psychological: http://www.playbuzz.com/jon10/what-color-matches-your-personality

Cultural: http://markedbydesign.net/blog/meaning-in-color/

Activity - In pairs, choose a color (primary or secondary) and find something in its cultural symbolism that surprises you. Contradictions are especially interesting. Report your findings to the group (briefly).
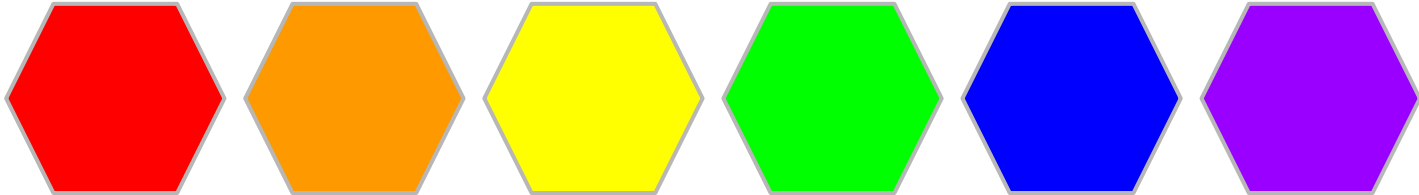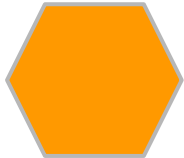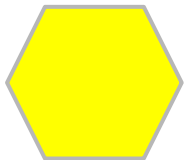
Color - Cultural Interpretation

Activity - In pairs, choose a color (primary or secondary) and find something in its cultural symbolism that surprises you. Contradictions are especially interesting. Report your findings to the group (briefly).
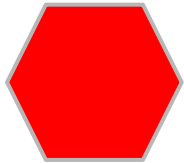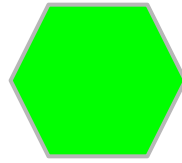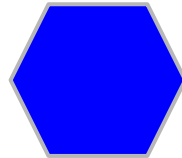
Aphrodisiac
Stop vs. Lucky

Go   Nature
Envy

Lonely   Autumn
Hungry

Calm   Cold
Ocean
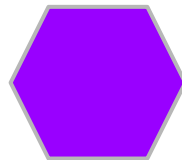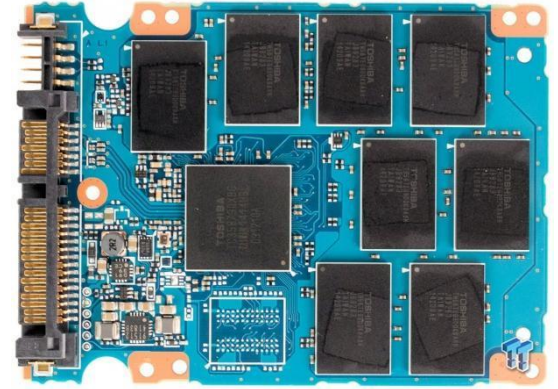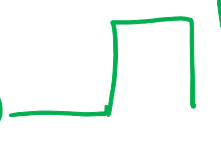
Sunshine
Cowardice! Caution

Royalty
Independence

Color - Representation

First, some general questions...

What does data look like to a computer?

1) Fluctuations in electricity $0 \sqcap^1$

2) binary digits $0/1$

Is that enough?

ref: http://arstechnica.com/information-technology/2012/06/inside-the-ssd-revolution-how-solid-state-disks-really-work/2/

Color - Representation

Can we use bits to represent integers?

0 1 ... 9

3	1	5	7
10^3 +	10^2 +	10^1 +	10^0

$= 3157$

0,1

$\rightarrow$

1	0	1	1
2^3 +	2^2 +	2^1 +	2^0

$8\;4\;2$

0110_2

$= 8 + 2 + 1 = 11$

4 bits $\Rightarrow$ 0 .. 15 $\quad 2^4 - 1$

k bits $\Rightarrow$ 0 .. $(2^k - 1)$

$= 14$
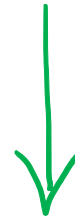
Color - Representation

Can we use integers to represent colors?

RGB - (red, green, blue), where each "component" is in range 0 through 255.

channel

ex. (255, 0, 127) ==

r g b

fun calculator for color values: http://colorizer.org

How many bits for 256 values?   3   4   5   6   7   8   9   10

2^8

Color - Representation

RGB - (red, green, blue), where each "component" is in range 0 through 255.

How many bits for 256 values?   3   4   5   6   7   (8)   9   10
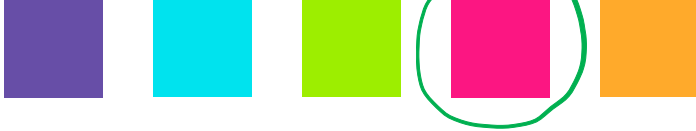
What color is

r   g   b   dark grey

0 1 0 1 1 0 1 1 / 0 1 0 1 1 0 1 1 / 0 1 0 1 1 0 1 1

91   91   91

Easier to read if we use "hexadecimal" representation:

base 16

Each component is represented by 2 hex digits 0123456789abcdef

ex.   #674ea7 ==

$0110_2 =$ ____$_{10}$

Representation (aside)

What do you observe about the following rgb colors?

Red	Green	Blue
255	0	0
17	0	178
45	0	13
200	0	220
62	0	37
130	0	95

Knitting

The language used to communicate patterns uses exactly the same fundamental constructs as Python!!

Sherbet Stripes

Notes: Bright, delicious stripes, vertical on the front and horizontal on the reverse side, make this dishcloth a welcome addition to your kitchen. A simple 4 row repeat of slip stitches creates a fun color work effect that is deceptively simple to work but must be done on double pointed needles to allow you to knit from either end of the work.

Slip Stitch Pattern (worked over four rows)
Row 1 (RS): With CC, *Sl1 WYIB, k1*, repeat between *'s until 1 st remains, Sl1 WYIB.
Row 2 (WS): Slide the work to the other end of the needle and pick up MC to work. *K1, Sl1 WYIB*, repeat between *'s until 2 st remains, K1. Turn work.
Row 3: With CC, *Sl1 WYIF, P1*, repeat between *s until 1 st remains, Sl1 WYIF.
Row 4: Slide the work to the other end of the needle and pick up MC to work. *P1, Sl1 WYIF*, repeat until 1 st remains, P1. Turn.

DIRECTIONS
With MC, CO 33 sts.

K 1 row.

Begin Slip Stitch Pattern and work 11 rep of the 4 row rep. (44 rows of patt.)

Break CC yarn.

K 1 row in MC.

BO all sts.

Finishing
Weave in ends, wash and block to dimensions.

About the Designer
Gillian Wynne Grimm lives in a little white cottage on a tree lined street in Portland, Oregon where she knits, sews and generally enjoys making all manner of crafty and creative things.
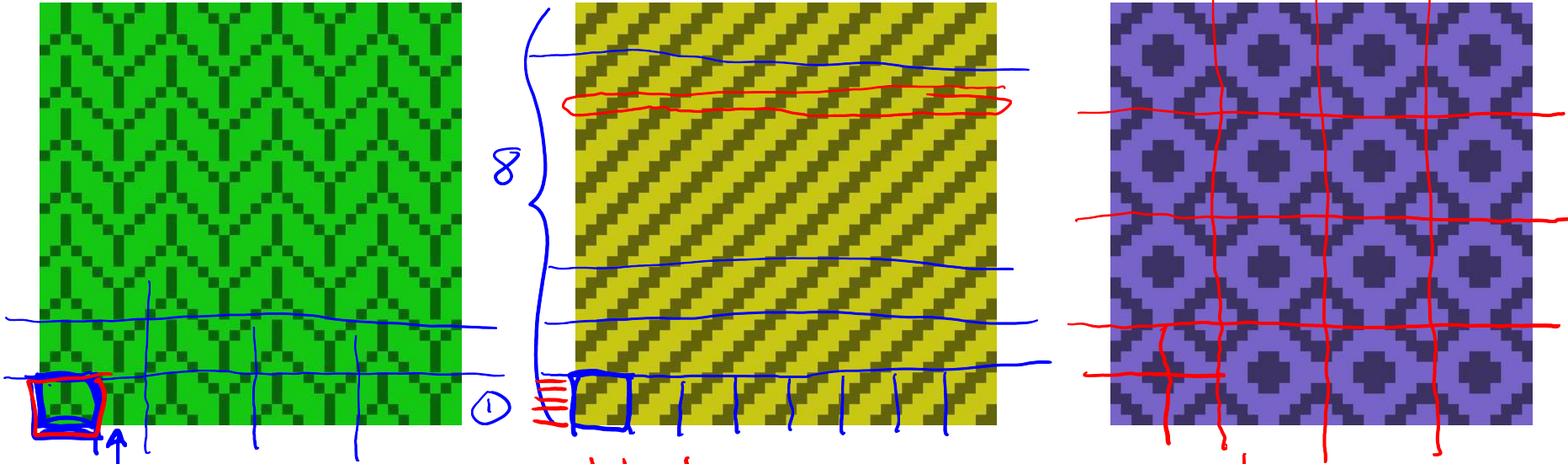Follow along with her adventures at Birchhollowcottage.com.
For pattern support, please contact info@birchhollowcottage.com

Knitting

Program Design

each of these is 40x40

what are the smallest pieces that, when replicated, will create the design?

A handcraft is a collection of **blocks**, each of which has a **location**.

Every **block** is a collection of rows. Every row is a collection of **stitches**.

Every **stitch** is either "knit" or "purl."

Classes in Python

Mechanism for creating user-defined types.

Used to identify attributes with an object.

Associates functionality with the relevant objects.

Ex:

```python
8    @dataclass
9    class color:
10       """
11       color: simply gathers color components
12       """
13   ● red: int = 120
14       green: int = 120
15       blue: int = 120
```

Design Strategies

1. Decompose a problem into classes
2. List the data associated with each class
3. Write the "driver" code that illustrates the functionality you expect from each class.
4. Implement the functions you expect.
5. Run the driver code to test your functionality.

Demo & Reflection

https://repl.it/@ckh205/knittingSkeleton

Review the code we've written and make 3 observations:

1. Line ___: _____
2. Line ___: _____
3. Line ___: _____

Was our decomposition necessary? Why not just use a 2d array of rectangles?

Abstraction/Encapsulation:

Adding Functionality

Creating blocks is an arduous task. We'd like a way to make new blocks out of old ones! How many different kinds of blocks are found in this image? How are they related to one another?
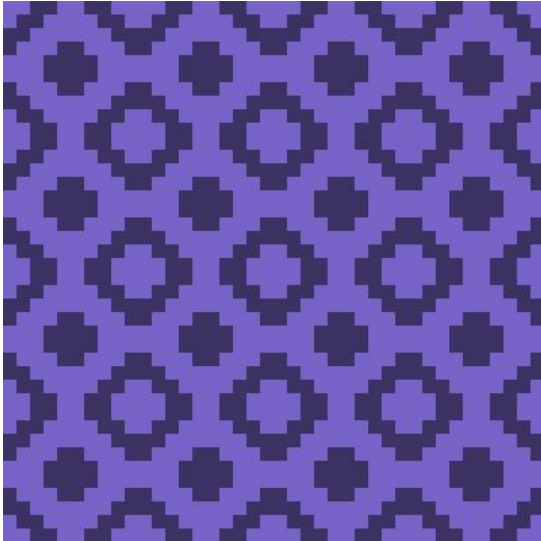
Flip Vertical

Suppose we want to create a new block which is just the vertical reflection of a given block. Sketch the new block. Describe how you would accomplish the flipped block, in terms of the block representation in our code (list of rows).
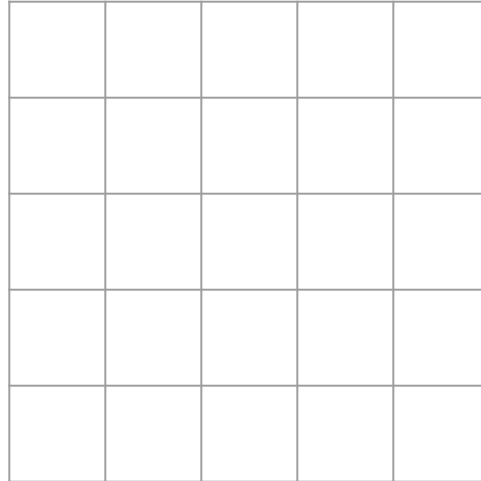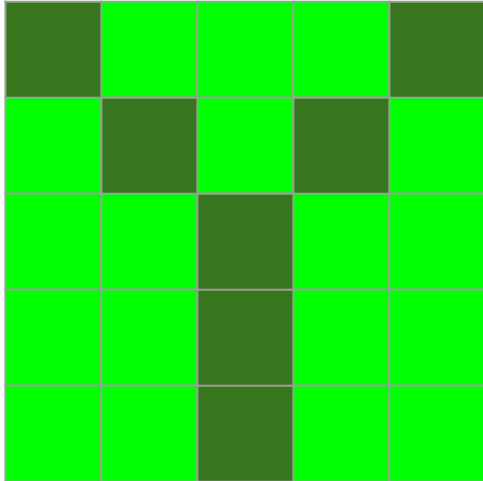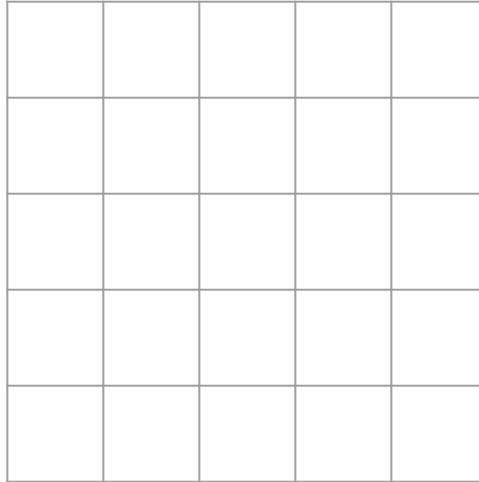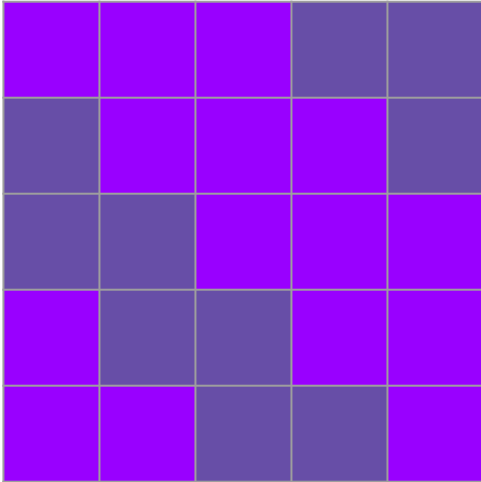
1.

2.

3.

4.

Flip Horizontal

Suppose we want to create a new block which is just the horizontal reflection of a given block. Sketch the new block. Describe how you would accomplish the flipped block, in terms of the block representation in our code.
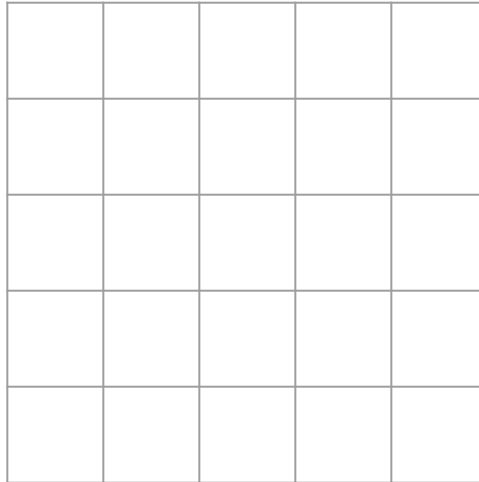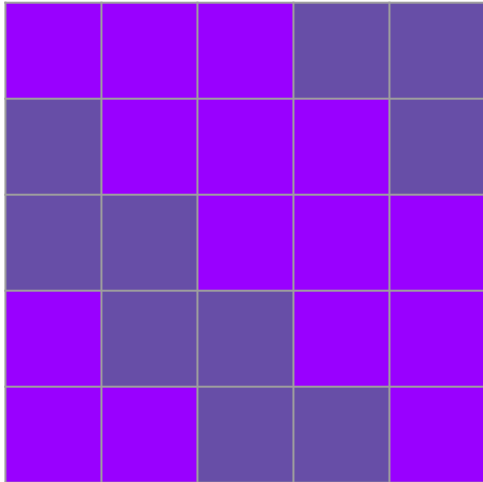
1.

2.

3.

4.

Rotate 180

Suppose we want to create a new block which is a 180 degree rotation of a given block. Sketch the new block. Describe how you would accomplish the flipped block.

1.

2.

3.

4.

POTD #1 Tue

https://repl.it/@ckh205/POTD01

Describe any snags you run into:

1. Line ___: _____
2. Line ___: _____
3. Line ___: _____
4. Line ___: _____
5. Line ___: _____

ToDo for next class...

POTD: Wed, Thu

Reading: TLACS Ch 4 (intro to turtle graphics and iteration)

Play: https://www.google.com/search?q=color+picker

Adapt: Use today's demo to create a handcraft of your own! Upload your creation to https://bit.ly/2ly0z8Q (please make unique file names)

References:

TLACS Ch 17

https://docs.python.org/3/library/dataclasses.html