Preparation for Midterm 1

If you can do all of these exercises in under 5 hours, you will do very well on the midterm.

Who knows, some of them might even be on it!

If you’re stuck on an exercise, follow these steps, in order:

* Study the example programs in the Owl folder
* Look over your (or my) solutions to the Practice Exercises
* Re-read your notes from that lesson
* Google it (“what does static mean in Processing?”)
* Ask your classmates
* Ask Mr. Schattman

# Unit 2 Processing basics

Write an if-statement that prints “Yes!” if the last 3 letters of String *s* are equal to “*ing*” and s is less than 10 characters, but prints nothing otherwise.

Write a for-loop that prints the numbers 0.25, 0.50, 0.75, 1.00, 1.25, .1.50,…, 4.75, 5.00.

Write a while-loop that adds the numbers 0.25, 0.50, 0.75, 1.00, 1.25, .1.50,…, until the total exceeds 100. (In other words, this is an arithmetic series with *a* = 0 and *d* = 0.25)

Declare a 1-D array named *dailyTemperatures* that can store 30 integers.

Then fill it with 30 random integers between -25 and 40.

Next, write a loop that finds the minimum temperature in the array.

The 2-D array

8 2 1 0

4 9 1 4

5 7 6 4

can be created using the shortcut int[][] a = {{8, 2, 1, 0}, {4,9,1,4}, {5,7,6,4}}; Write a nested loop that prints array a in rows and columns. Write another nested loop that calculates and prints the averages of each column.

Fill in the return-types of these functions

\_\_\_\_\_\_\_\_ getVolume( Sphere s ) { … }

\_\_\_\_\_\_\_\_ getNumberOfVertices( Polygon p ) {…}

\_\_\_\_\_\_\_\_ isInMandelbrotSet( ComplexNum z ) { … }

\_\_\_\_\_\_\_\_ getRandomArrayOfWords( int numWords ) {…}

\_\_\_\_\_\_\_\_ plotPoint( int x, int y ) { … }

\_\_\_\_\_\_\_\_ getAverageValueInArray( float[ ] a ) { … }

\_\_\_\_\_\_\_\_ getLast2Letters( String s ) { … }

\_\_\_\_\_\_\_\_ printArray( int[ ] a) { … }

//A function in the Fraction class that would be used in setup() as follows:

//Fraction f = new Fraction(3,4);

//Fraction g = f.multByWholeNumber(5)

//g.display() 🡪 prints “15/4”

\_\_\_\_\_\_\_\_ multByWholeNumber( \_\_\_\_\_\_\_ ) { … }

Describe one major difference between Processing functions and functions in mathematics, like *f*(*x*) = 4*x*2

Write a Processing function for the function *f*(*x*) = 3*x*4 + sin(*x*).

Write a function named *getShorter* that takes two Strings as parameters and returns the one that is shorter. In the main function, test the function on “Star Wars VII” and “The Martian”.

Write a function named *getPolynomialValue* that takes two parameters:

* an integer array containing the polynomial’s coefficients in order from largest degree to smallest degree.
* an x-value

and returns the value of the polynomial at x. For example,

int[] p = {1, 2, 0, -5, 2}; //represents p(x) = 1x4 + 2x3 – 5x + 2, where the 0 means x2 is skipped.

float y = getPolynomialValue(p*,* 3); //returns 122, since **3**4 + 2(**3**)3 – 5(**3**) + 2 = 122.

# Unit 4 Object oriented stuff

Declare a 2-D array that can hold an empty 10x10 table of Song objects.

Try to code *Example\_2\_Improved,* and the  *PlayList* and *Song* classes from memory. Sneak quick glances at my version of the code if you need to. Ask questions about any line of that code that you don’t understand.

Add a *divide* function to the *Fraction* class. Then use it in the main program   
to find and display the result. It should work very similarly to the *multiply* function.

Create an animation of a ball flying across the screen up and to the right. If you’re bored, add a *gravity* variable which when set to something greater than 0 results in the ball flying in a parabolic trajectory.

Here is a design for a *Triangle* class. Study it, and then answer the questions that follow.

|  |  |
| --- | --- |
| **Fields** | **Description** |
| float ***x1, y1, x2, y2, x3, y3*** | The (x,y) coordinates of the three vertices |
| float ***A, B, C*** | The angles at vertices (xA, yA), (xB, yB) and (xC, yC) in degrees |
| float ***a, b, c*** | The side lengths opposite the angles ***A, B*** and ***C*** |
| String ***sideType*** | Whether the triangle is equilateral, isosceles or scalene |
| String ***angleType*** | Whether the triangle is acute, obtuse or right |

|  |  |
| --- | --- |
| **Methods/Behaviours** | **Description** |
| **Triangle**( float x1, float y1,   float x2, float y2,   float x3, float y3) | Constructor.  It should set the fields ***xA, yA, xB, yB, xC, yC*** using the parameters passed in from **setup()**.   Then it should set the fields ***a, b, c, A, B, C, sideType*** and ***angleType*** using the functions below. |
| float **getDistance**( float x1, float y1,   float x2, float y2) | Returns the distance between any two points (x1, y1) and  (x2, y2) using the length-of-a-line-segment formula |
| void **setLengths**() | Sets the values of ***a, b, c*** using the ***getDistance*** function and the values ***xA, yA, xB, yB, xC, yC*** |
| void **setAngles**() | Sets the values of ***A, B, C*** using the values ***a, b, c*** |
| void **setSideType**() | Sets the value of ***sideType*** using the values ***a, b, c*** |
| void **setAngleType**() | Sets the value of ***angleType*** using the values ***A, B, C*** |
| float **getPerimeter**() | Returns the perimeter of the triangle. It does not need any parameters because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| float **getArea**() | Returns the area of the triangle. (Coding this requires some planning on paper since the base & height of the triangle have to be calculated using the values ***a, b, c, A, B, C****.*) |
| boolean **isSimilarTo** (Triangle other) | Returns true if *this* is similar to Triangle *other*, and false otherwise. |

One of the functions in the *Triangle* class should be *static*. Which one is it, and why? How would you call that function inside the *main* function of another class?

Code as much of the *Triangle* class in Processing as you can. Then test the functions on a few sample triangles in a main class named *TriangleApp.*

Use Processing to draw this diagram using a nested loop. You’ll need to do some calculations on paper first.