From Data to Pixels

Day 3, Markku Reunanen

Sorting

ints, *floats* and *Strings* easy: use *sort()*

Note that *sort()* returns the sorted array and doesn't modify the original

For objects not quite as simple: how would Processing know which one is less or more?

Object sorting

Objects need to *implement* the *Comparable* interface

Interface means promising that certain methods are there

In this case *compareTo()*

import java.util.;*

Collections.sort()

Note that this **will** happen in place, the data structure will be modified – unlike with simple *sort()*

Right- and left-handed coordinates

Mathematics use *right-handed coordinates*

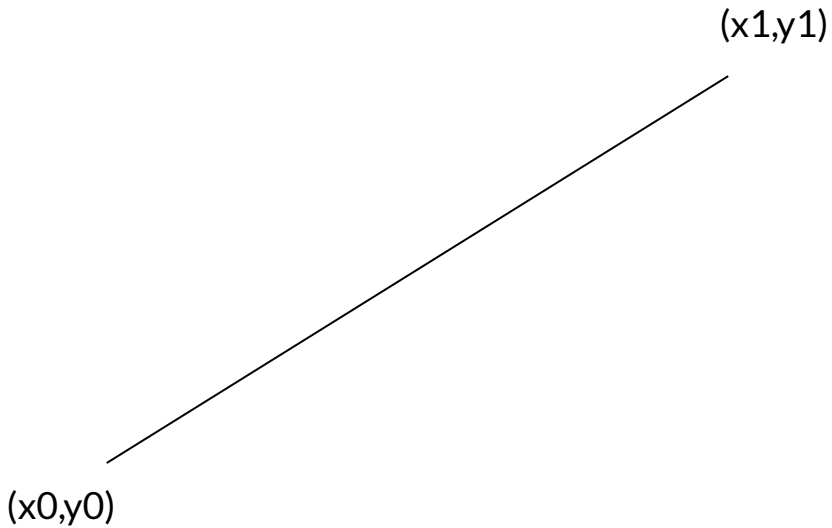
Processing coordinates are *left-handed*

Possible trouble with calculations

Three-finger rule: x (thumb), y (first finger), z (middle finger)

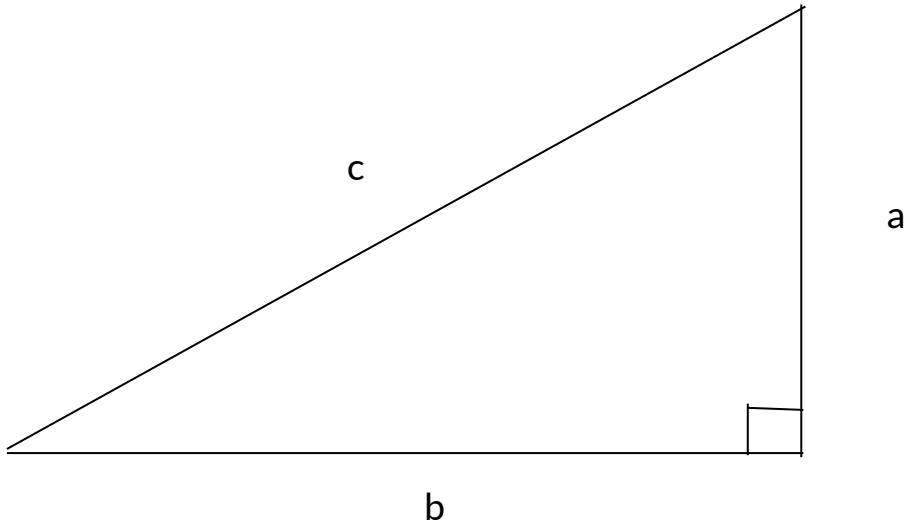
Rotation rule: grabbing and thumb

Distance



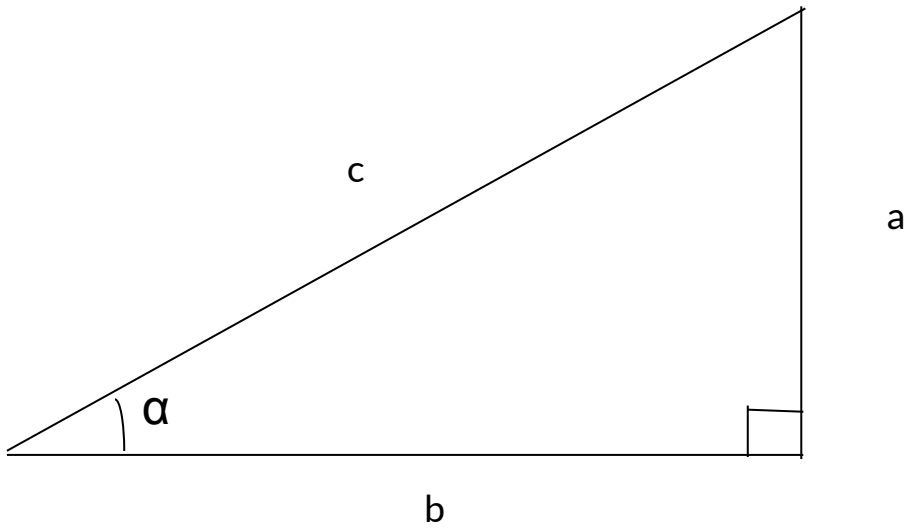
There is *dist()* for this

Pythagorean theorem



$a^2 + b^2 = c^2$

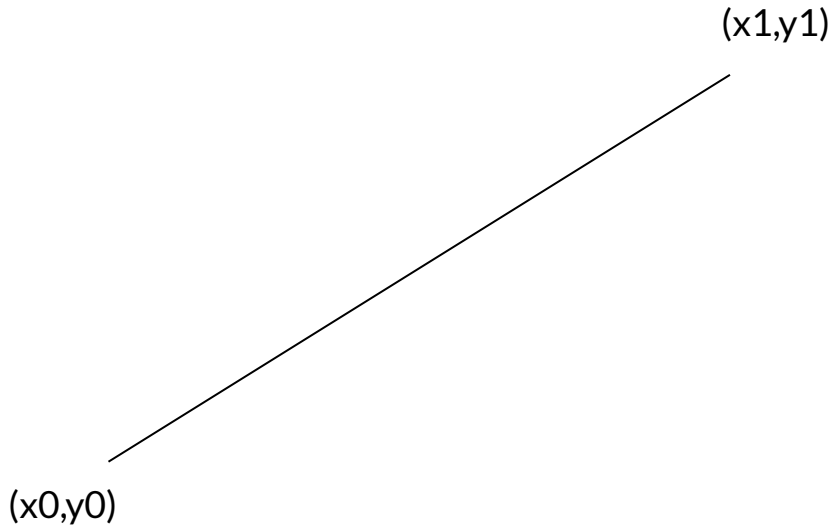
Angles



$\tan \alpha = a/b$

$\alpha = \arctan a/b$

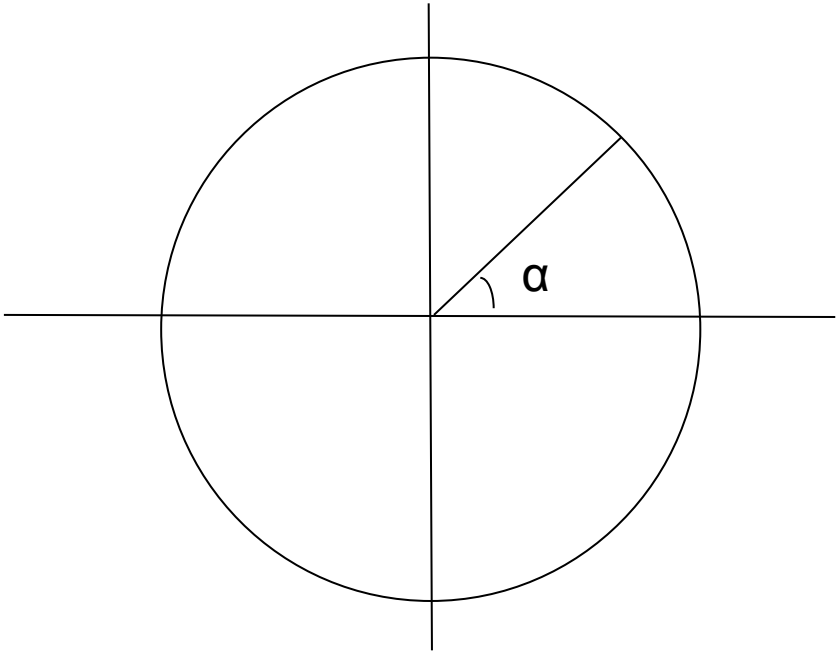
Direction



dx = x1 - x0, dy = y1 - y0

Normalizing: divide by length, *dist()*

Sine and cosine



$x = \cos \alpha$

$y = \sin \alpha$

Affine transformations

Translation (T) – *translate()*

Rotation (R) – *rotate()*

Scaling (S) – *scale()*

Progressive, you can keep doing them after another many times

They are automatically reset at the beginning of each *draw()*

Transformation stack

pushMatrix() – save the current transformation (ie. situation)

popMatrix() – restore the previously stored one

You can do multiple *pushMatrix()* calls after another if needed, but the depth of the stack is quite limited

Always have the same amount of push and pop

(What is a *stack*? What about *matrix*?)

Matrices, vectors and more

Enough for today, but here's more if interested:

- https://www.mathsisfun.com/algebra/matrix-introduction.html
- https://www.mathsisfun.com/algebra/matrix-transform.html
- http://bestmaths.net/online/index.php/year-levels/year-10/year-10-topics/matrices-and-transformations/