
Geometry

Finding angles and distances, affine transformations

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Right- and left-handed coordinates

Mathematics use *right-handed coordinates*

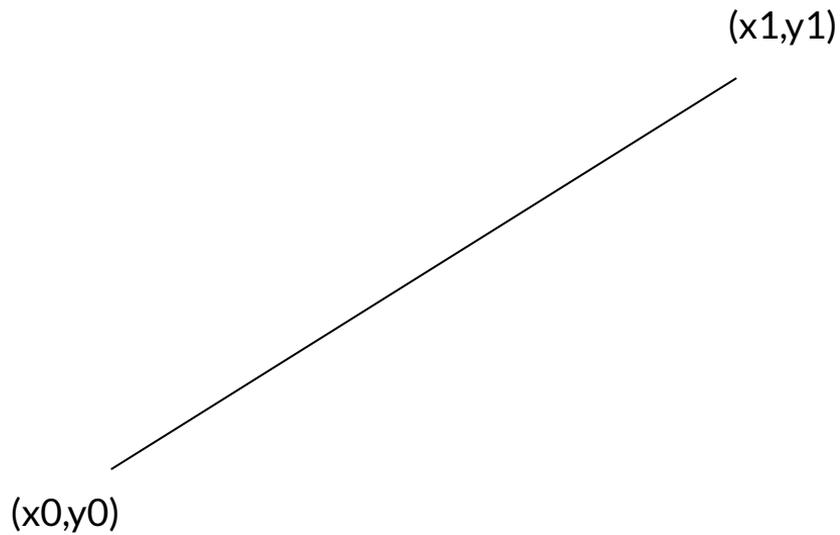
Processing coordinates are *left-handed*

Possible trouble with calculations

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

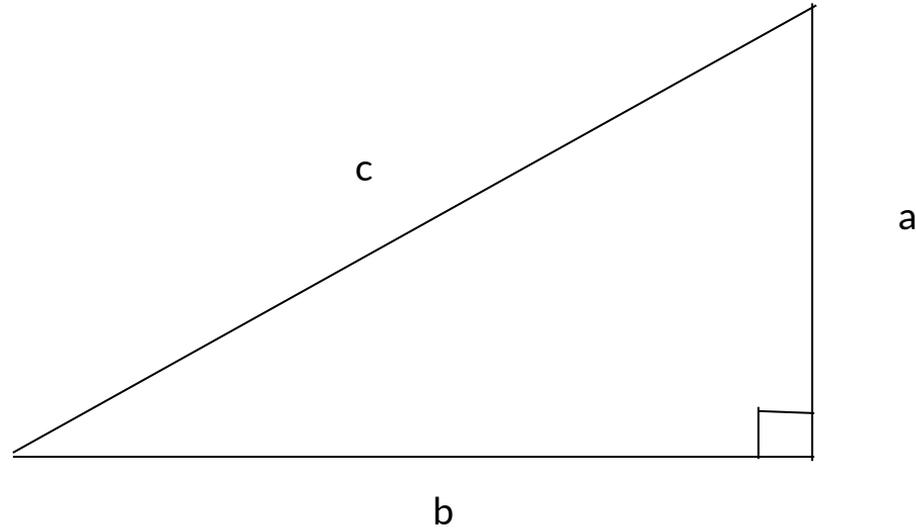
Rotation rule: grabbing and thumb

Distance



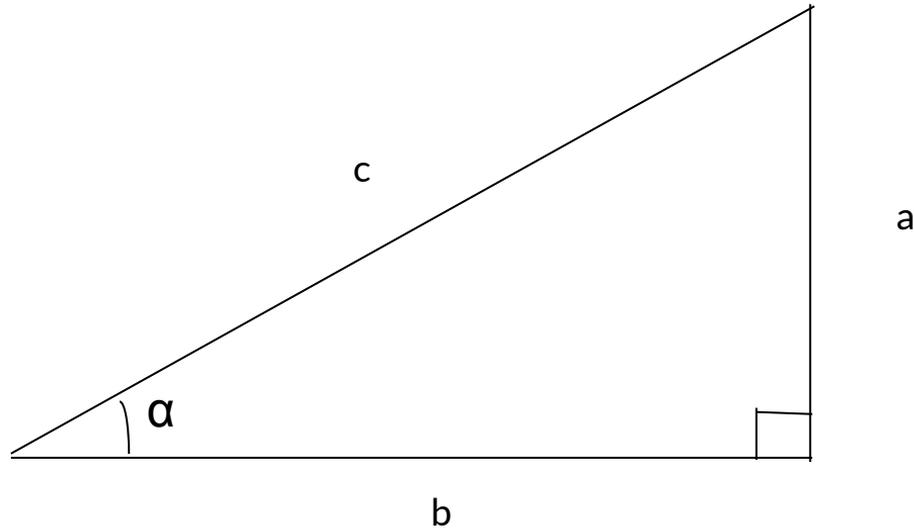
There is *dist()* for this

Pythagorean theorem



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

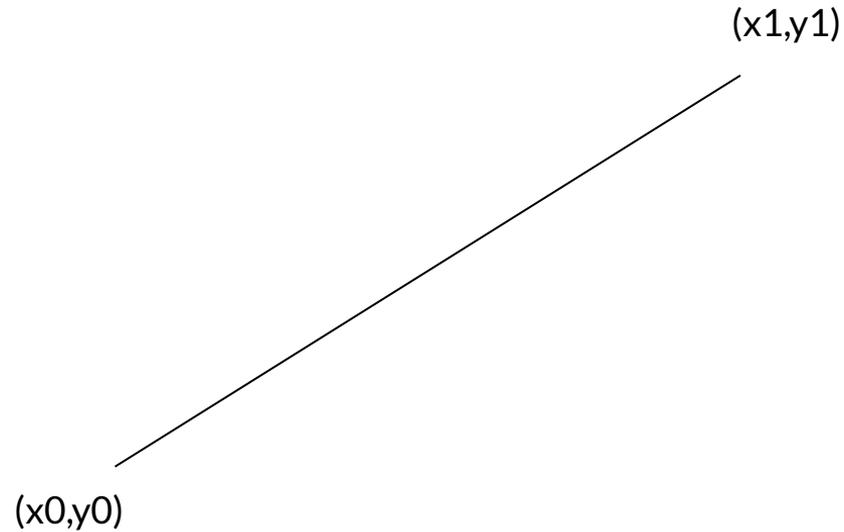
Angles



$$\tan \alpha = a/b$$

$$\alpha = \arctan a/b$$

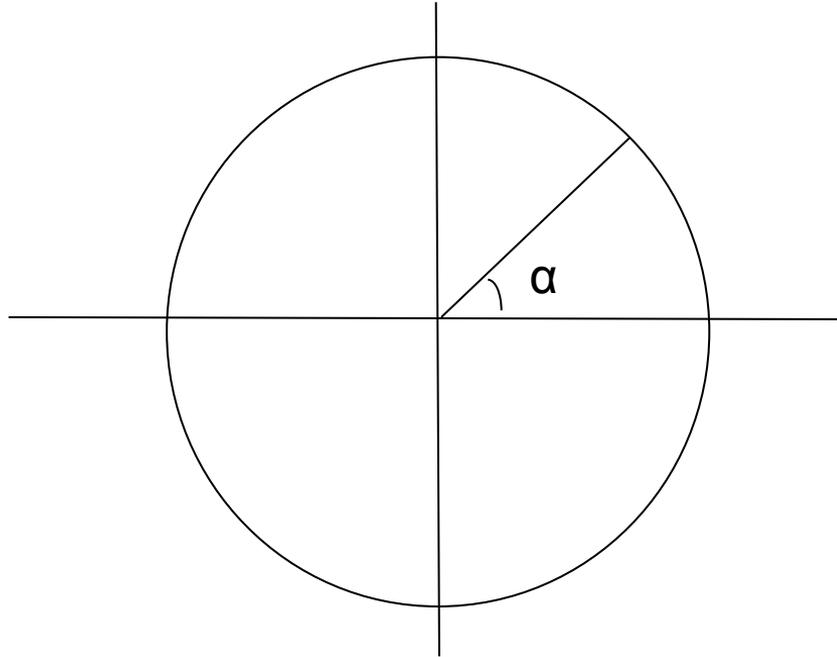
Direction



$$dx = x_1 - x_0, dy = y_1 - y_0$$

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*?)
