

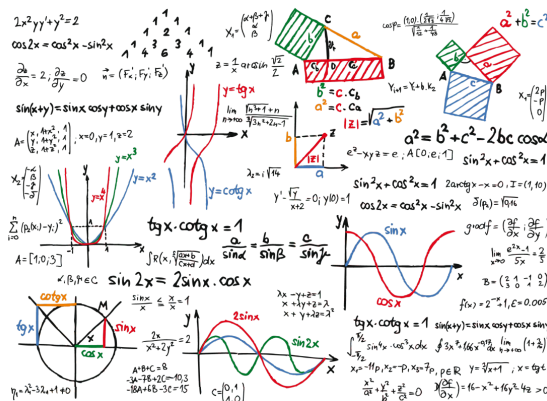


B1 - Mathematics

B-MAT-100

102architect

Home planning and homogeneous coordinates





102architect

binary name: 102architect
repository name: 102architect_\$ACADEMIC_YEAR
repository rights: ramassage-tek
language: C, C++, python3, perl, ruby, php or bash
compilation: when necessary, via Makefile, including re, clean and fclean rules



- Your repository must contain the totality of your source files, but no useless files (binary, temp files, obj files,...).
- All the bonus files (including a potential specific Makefile) should be in a directory named *bonus*.
- Error messages have to be written on the error output, and the program should then exit with the 84 error code (0 if there is no error).

You are working on a homeplanning software for an firm of architects. The software should allow a simplification of the plan drawing process, and integrate various features, such as scale management, changing the point of view, moving doors and windows along walls... You are in charge of the part concerning geometric transformations (rotation to change point of view, translation to move an object, scaling to zoom in and out, reflection and any combination of these transformations).

So, the goal of this project is to develop an application to compute points images in the plan after several transformations. To make it nice and clean, you chose to use homogeneous coordinates. How clever of you. O being the origin of both axis, here are the transformations to be implemented:

- Translation,
- Scaling,
- Rotation centered at O,
- Reflection over any axis that passes through O,
- Any combination of the previous transformations.



USAGE

```
Terminal
~/B-MAT-100> ./102architect -h
USAGE
  ./102architect x y transfo1 arg11 [arg12] [transfo2 arg12 [arg22]] ...

DESCRIPTION
  x   abscissa of the original point
  y   ordinate of the original point

  transfo arg1 [arg2]
  -t i j   translation along vector (i, j)
  -z m n   scaling by factors m (x-axis) and n (y-axis)
  -r d     rotation centered in 0 by a d degree angle
  -s d     reflection over the axis passing through 0 with an inclination
           angle of d degrees
```



The use of library including matrix calculus (such as numpy) is prohibited!

SUGGESTED BONUSES

- Additional transformations,
- Graphical interface showing the transformations applied on several points / figures.



EXAMPLES

```
Terminal
~/B-MAT-100> ./102architect 5 0 -t -1 1
Translation along vector (-1, 1)
1.00  0.00  -1.00
0.00  1.00   1.00
0.00  0.00   1.00
(5.00, 0.00) => (4.00, 1.00)
```

```
Terminal
~/B-MAT-100> ./102architect 2 2 -z -1 1
Scaling by factors -1 and 1
-1.00  0.00  0.00
0.00  1.00  0.00
0.00  0.00  1.00
(2.00, 2.00) => (-2.00, 2.00)
```

```
Terminal
~/B-MAT-100> ./102architect 1 0 -r 90
Rotation by a 90 degree angle
0.00  -1.00  0.00
1.00  0.00  0.00
0.00  0.00  1.00
(1.00, 0.00) => (0.00, 1.00)
```

```
Terminal
~/B-MAT-100> ./102architect 3 -1 -s 270
Reflection over an axis with an inclination angle of 270 degrees
-1.00  0.00  0.00
0.00  1.00  0.00
0.00  0.00  1.00
(3.00, -1.00) => (-3.00, -1.00)
```

```
Terminal
~/B-MAT-100> ./102architect 1 2 -t 2 3 -z 1 -2 -r 45 -s 30
Translation along vector (2, 3)
Scaling by factors 1 and -2
Rotation by a 45 degree angle
Reflection over an axis with an inclination angle of 30 degrees
0.97  -0.52  0.38
0.26  1.93  6.31
0.00  0.00  1.00
(1.00, 2.00) => (0.31, 10.44)
```