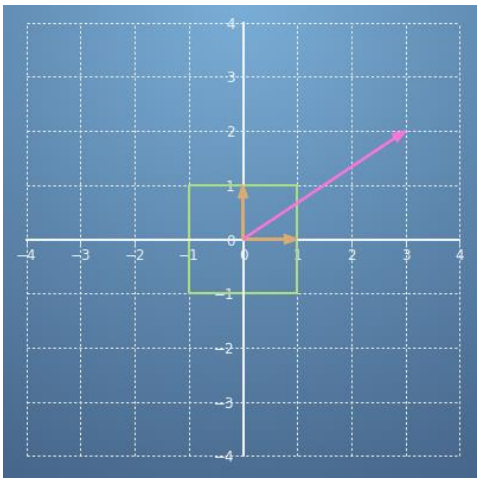
Using matrices to make transformations

TOTAL POINTS 6

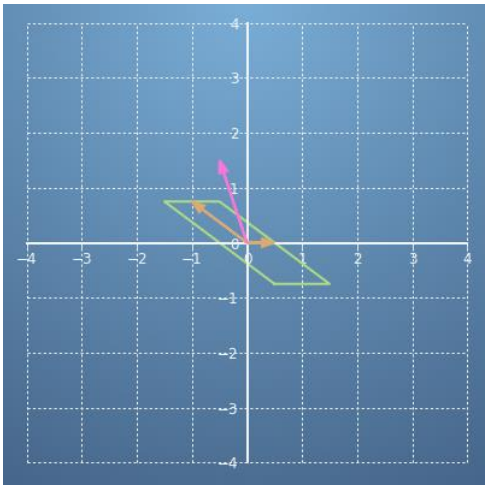
1.Question 1

Matrices make transformations on vectors, potentially changing their magnitude and direction.

If we have two unit vectors (in orange) and another vector, r=[3 2] (in pink), before any transformations - these look like this:



Take the matrix, *A*=[1/20 −13/4], see how it transforms the unit vectors and the vector, r,



What new vector, r′, does *A* transform r to? Specifically, what does the following equal?

- [3/2 −1/2]
- [−1/2 3/2]

- [−3/2 3/2]
- [3/2 −3/4]

1 / 1 point

2.Question 2
Let's use the same matrix, *A*=[1/20−13/4], from the previous question.

Type an expression for the vector,

s=*A*[−24].

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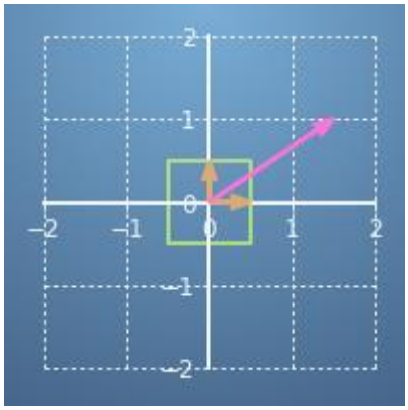
# Replace a and b with the correct values below:
s = [-5, 3]
```

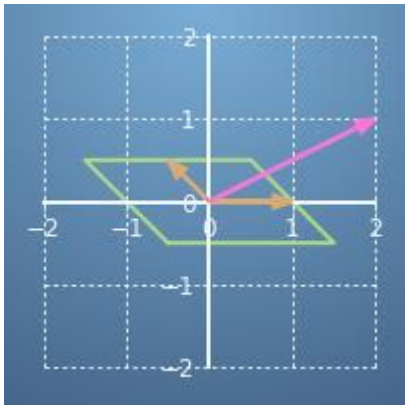
RunReset
[-5, 3]

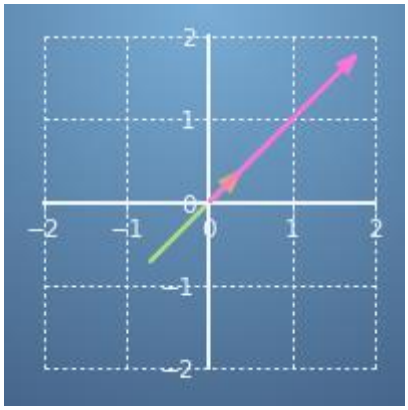
1 / 1 point

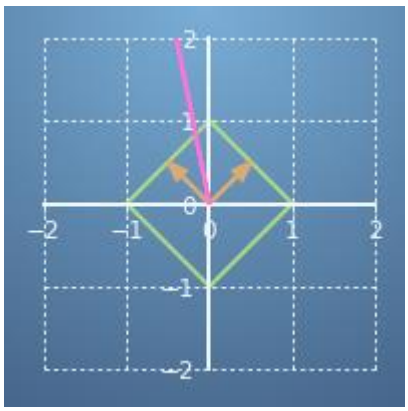
3.Question 3
Select the transformation which best corresponds to the matrix,

***M*=[−1/2 1/2 1/2 1/2].**









1 / 1 point

4.Question 4

A digital image can be stored by putting lots of coloured pixels at their particular coordinates on a grid.

If we apply a matrix transformation to the coordinates of each of the pixels in an image, we transform the image as a whole.

Given a starting image (such as this one of "The Ambassadors" [1533] by Hans Holbein the Younger),

which is made up of 400×400 pixels, if we apply the same transformation to each of those 160,000 pixels, the transformed image becomes:

Pick a matrix that could correspond to the transformation.

- [sqrt(3)/2 -1/2
  1/2 sqrt(3)/2]

1 / 1 point

5.Question 5

At the bottom of the "The Ambassadors", in the middle of the floor, there is a skull that Holbein has already applied a matrix transformation to!

To undo the transformation, build a matrix which is firstly a shear in the y direction followed by a scaling in y direction. I.e., multiply the matrices,

***M*=[1008][1−1/201]**

```
# Replace a, b, c and d with the correct values below:
M = [[1, 0],
    [-4, 8]]
```

RunReset
[[1, 0], [-4, 8]]

1 / 1 point

6.Question 6

Use your answer from the previous question to transform the skull back to normal. Change the values of the matrix and press *Go!* to score on this question.

You can also use this example to experiment with other matrix transformations. Try some of the ones in this quiz. Have a play!

Ans. [[1, 0], [-4, 8]]