

# TBAG Exercise 7

## p5 dot product & cross product

The dot product in p5 is called with the function `dot()` and calculates the dot product of two Vectors.

Example from p5 reference:

```
let v1 = createVector(1, 2, 3);  
let v2 = createVector(2, 3, 4);
```

```
print(v1.dot(v2)); // Prints "20"
```

cross product in p5:

- `cross()` -> Calculates and returns a vector composed of the cross product between two vectors

Example

```
let v1 = createVector(1, 2, 3);  
let v2 = createVector(1, 2, 3);
```

```
v1.cross(v2); // v's components are [0, 0, 0]
```

A possible application for the dot product could be in a video game context. If we calculate the dot product of two vectors that represent the view direction of two entities (A & B) we could check whether point B is in the field of view of point A.

Another application might be in relation to gravity and the velocity of an object. By calculating the dot product between the movement direction and gravity we can calculate the time when the object would reach the threshold of going upwards to going downwards.

## TBAG Exercise 7.1

Dot product

$$\vec{a} = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} \quad \vec{b} = \begin{pmatrix} 2 \\ 0 \\ 0 \end{pmatrix}$$
$$\vec{a} \cdot \vec{b} = (0 \cdot 2 + 0 \cdot 0 + 1 \cdot 0)$$
$$= 0 //$$

Cross product

$$\vec{a} \times \vec{b} = \begin{vmatrix} 0 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 0 \end{vmatrix}$$
$$\begin{vmatrix} 0 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 0 \end{vmatrix} = \begin{vmatrix} 0 \cdot 0 - 1 \cdot 0 \\ 1 \cdot 2 - 0 \cdot 0 \\ 0 \cdot 0 - 0 \cdot 2 \end{vmatrix} = \begin{pmatrix} 0 \\ 2 \\ 0 \end{pmatrix} //$$

## TBAG Exercise 7.3

<https://editor.p5js.org/zebrathy/sketches/sijLK2yHA>