

## Question 1

In the lecture videos you saw that vectors are linearly dependent if it is possible to write one vector as a linear combination of the others. For example, the vectors  $a$ ,  $b$  and  $c$  are linearly dependent if  $a = q_1b + q_2c$  where  $q_1$  and  $q_2$  are scalars.

Are the following vectors linearly dependent?

$$a = \begin{bmatrix} 1 \\ 1 \end{bmatrix} \text{ and } b = \begin{bmatrix} 2 \\ 2 \end{bmatrix}$$

### Answer

Yes. Vectors are linearly independent if  $b_3 \neq a_1b_1 + a_2b_2$

In other words, if some scalar exists to make the vectors equivalent, they are not linearly independent.

In our case:  $a = \frac{1}{2}b$  which means the vectors are linearly dependent and NOT linearly independent.

## Question 2

Are the following vectors linearly independent?

$$a = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} \quad b = \begin{bmatrix} 2 \\ -1 \\ 1 \end{bmatrix} \quad c = \begin{bmatrix} -3 \\ 1 \\ -2 \end{bmatrix}$$

### Answer

No.  $a = -b - c$  which makes these vectors linearly dependent.