

## Lesson 12 – Column Vectors

### Starter

Work out:

1)  $1\frac{2}{3} + 2\frac{1}{5}$

2)  $4 - -5$

3)  $\frac{3}{4} - \frac{2}{5}$

4)  $144 + 13 + 27 + 6$

5)  $\frac{2}{3} + \frac{4}{5} - \frac{1}{2}$

### Starter Answers

1)  $\frac{58}{15}$

2) 9

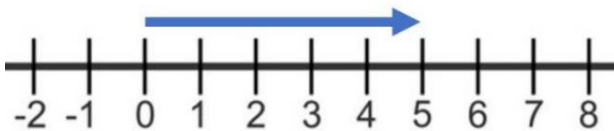
3)  $\frac{7}{20}$

4) 190

5)  $\frac{29}{30}$

We have already seen that we can represent a number as a **vector** on a **one-dimensional** number line.

Remember that a vector has a **size** (length) and a **direction**.



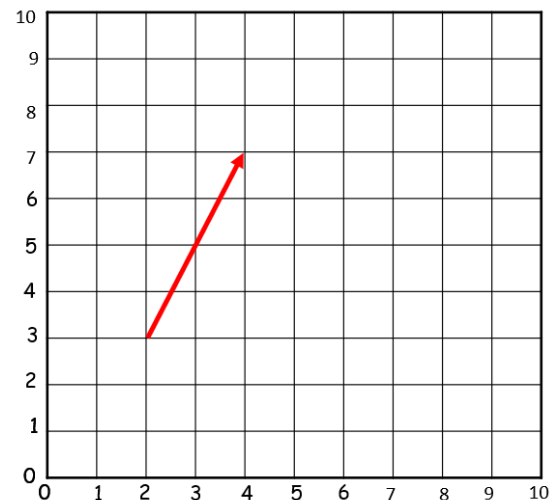
This vector represents the number 5. It has a length of 5 and is pointing in the positive direction.

### What about if we have a vector in two-dimensions?

If we have a vector in two dimensions, then we can't use just one number to describe it since it is not just pointing in the negative or positive direction.

This time, we describe it using **two numbers**: a number to tell you how far **left** or **right** the vector travels, another to describe how far **up** and **down** the vector travels.

The vector in the diagram on the right travels 2 squares across and 4 squares up.



We can represent this using a **column vector**.

$$\begin{pmatrix} 2 \\ 4 \end{pmatrix}$$

This number tells you how far left or right to travel. A positive number shows you move in the positive direction (right) and a negative number shows you move in the negative direction (left)

This number tells you how far up or down to travel. A positive number shows you move in the positive direction (up) and a negative number shows you move in the negative direction (down)

### **Example 1**

Write down the vector that would go with each of these instructions.

1) Travel 3 right and 2 up

$$\begin{pmatrix} 3 \\ 2 \end{pmatrix} \quad \begin{array}{l} 3 \text{ right means } 3 \text{ in the positive direction} \\ 2 \text{ up means } 2 \text{ in the positive direction} \end{array}$$

2) Travel 3 left and 2 down

$$\begin{pmatrix} -3 \\ -2 \end{pmatrix} \quad \begin{array}{l} 3 \text{ left means } 3 \text{ in the negative direction} \\ 2 \text{ down means } 2 \text{ in the negative direction} \end{array}$$

3) Travel 4 right and 5 down

$$\begin{pmatrix} 4 \\ -5 \end{pmatrix} \quad \begin{array}{l} 4 \text{ right means } 4 \text{ in the positive direction} \\ 5 \text{ down means } 5 \text{ in the negative direction} \end{array}$$

4) Travel 5 up

$$\begin{pmatrix} 0 \\ 5 \end{pmatrix} \quad \begin{array}{l} \text{We are not travelling right or left} \\ 5 \text{ up means } 5 \text{ in the positive direction} \end{array}$$

5) Travel 6 left

$$\begin{pmatrix} -6 \\ 0 \end{pmatrix} \quad \begin{array}{l} 6 \text{ left means } 6 \text{ in the negative direction} \\ \text{We are not travelling up or down} \end{array}$$

### **Example 2**

Write down the instructions that would go with each of these vectors

1)  $\begin{pmatrix} 2 \\ 7 \end{pmatrix}$

2)  $\begin{pmatrix} -9 \\ 0 \end{pmatrix}$

3)  $\begin{pmatrix} -8 \\ -1 \end{pmatrix}$

4)  $\begin{pmatrix} 5 \\ -2 \end{pmatrix}$

5)  $\begin{pmatrix} 0 \\ 3 \end{pmatrix}$

### **Answers**

1) 2 right, 7 up

2) 9 left

3) 8 left, 1 down

4) 5 right, 2 down

5) 3 up