Solving with Column Vectors Exercise

1 Given each of these vector equations, find the value of x.

a $2\begin{pmatrix} x \\ 4 \end{pmatrix} - 5\begin{pmatrix} x \\ -1 \end{pmatrix} = \begin{pmatrix} -21 \\ 13 \end{pmatrix}$

b $x\begin{pmatrix} 7 \\ -7 \end{pmatrix} + 2\begin{pmatrix} 5 \\ 3 \end{pmatrix} = \begin{pmatrix} 38 \\ -22 \end{pmatrix}$

c $4\begin{pmatrix} 0 \\ x \end{pmatrix} + 3\begin{pmatrix} x \\ -1 \end{pmatrix} = \begin{pmatrix} -9 \\ -15 \end{pmatrix}$

d $2\begin{pmatrix} x \\ 5 \end{pmatrix} - 3\begin{pmatrix} -3 \\ x \end{pmatrix} = \begin{pmatrix} 21 \\ -8 \end{pmatrix}$

2 Given each of these vector equations, find the value of x and y.

a $2\begin{pmatrix} 5 \\ x \end{pmatrix} + y\begin{pmatrix} -1 \\ 2 \end{pmatrix} = \begin{pmatrix} 6 \\ 2 \end{pmatrix}$

b $4\begin{pmatrix} x \\ -2 \end{pmatrix} - 2\begin{pmatrix} y \\ x \end{pmatrix} = \begin{pmatrix} 12 \\ -16 \end{pmatrix}$

c $4\begin{pmatrix} x \\ y \end{pmatrix} - 2\begin{pmatrix} 3 \\ x \end{pmatrix} = \begin{pmatrix} 26 \\ -44 \end{pmatrix}$

d $x\begin{pmatrix} -4 \\ 7 \end{pmatrix} + y\begin{pmatrix} -7 \\ 6 \end{pmatrix} = \begin{pmatrix} -43 \\ 44 \end{pmatrix}$

3 *[OCR GCSE (9-1) Nov 2018 6H Q20b]*

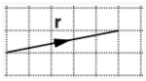
Given that $m\begin{pmatrix} 4 \\ 1 \end{pmatrix} + n\begin{pmatrix} 5 \\ 2 \end{pmatrix} = \begin{pmatrix} 12 \\ 6 \end{pmatrix}$

find the value of m and the value of n.

4 *[OCR GCSE June 2012 3H Q16b]*

Vector $\boldsymbol{p} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$ and vector $\boldsymbol{q} = \begin{pmatrix} -2 \\ 2 \end{pmatrix}$

The vector $\boldsymbol{r}$ is shown on the grid.



Given that $\boldsymbol{r} = j\boldsymbol{p} + k\boldsymbol{q}$, find the values of j and k.

5 *[OCR GCSE (9-1) June 2017 5H Q11c]*

$\boldsymbol{a} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$ $\boldsymbol{b} = \begin{pmatrix} -2 \\ 1 \end{pmatrix}$ $\boldsymbol{c} = \begin{pmatrix} -12 \\ 0 \end{pmatrix}$

Find the value of k so that
$k(\boldsymbol{a} - \boldsymbol{b}) = \boldsymbol{c}$

6 *[OCR GCSE (9-1) Nov 2019 6H Q9a]*

$\boldsymbol{a} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$ $\boldsymbol{b} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$

Find the values of k and n so that
$k(\boldsymbol{a} + \boldsymbol{b}) = \begin{pmatrix} 10 \\ n \end{pmatrix}$

7 *[Edexcel GCSE June 2022 3H Q13]*

$\boldsymbol{a}$ and $\boldsymbol{b}$ are vectors such that

$\boldsymbol{a} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$ $3\boldsymbol{a} - 2\boldsymbol{b} = \begin{pmatrix} 8 \\ -17 \end{pmatrix}$

Find $\boldsymbol{b}$ as a column vector

[Hint - Let $\boldsymbol{b} = \begin{pmatrix} x \\ y \end{pmatrix}$*]*

8 *[OCR GCSE Nov 2015 3H Q16]*

The point $(6,4)$, is translated to the point $(166, 74)$ using two translations.

The first translation is by the vector $h\begin{pmatrix} 3 \\ 2 \end{pmatrix}$

The second translation is by the vector $k\begin{pmatrix} 4 \\ -1 \end{pmatrix}$

Work out the values of h and k.

☠ Given each of these vector equations, find the value of x and y.
What do you notice?
Create some other systems that will have answers like these.
Is there a formula?

$x\begin{pmatrix} 2 \\ 3 \end{pmatrix} + y\begin{pmatrix} 1 \\ -1 \end{pmatrix} = \begin{pmatrix} 5 \\ 5 \end{pmatrix}$

$x\begin{pmatrix} 4 \\ 8 \end{pmatrix} + y\begin{pmatrix} 1 \\ -1 \end{pmatrix} = \begin{pmatrix} 12 \\ 12 \end{pmatrix}$

$x\begin{pmatrix} 6 \\ 9 \end{pmatrix} + y\begin{pmatrix} 1 \\ -1 \end{pmatrix} = \begin{pmatrix} 15 \\ 15 \end{pmatrix}$