

Column Vector Addition

ANSWERS



Section A The diagrams show the sum of two vectors. Write the resultant column vector.

Example:

<p>1.</p> $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$	<p>2.</p> $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$	<p>3.</p> $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$
<p>4.</p> $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$	<p>5.</p> $\begin{pmatrix} 4 \\ 1 \end{pmatrix}$	<p>6.</p> $\begin{pmatrix} 2 \\ 5 \end{pmatrix}$
<p>7.</p> $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$	<p>8.</p> $\begin{pmatrix} -4 \\ -2 \end{pmatrix}$	<p>9.</p> $\begin{pmatrix} -4 \\ -2 \end{pmatrix}$

Section B Draw a diagram to show the resultant of the two vectors.

Example:

<p>1.</p> $\begin{pmatrix} 3 \\ 1 \end{pmatrix} + \begin{pmatrix} 0 \\ 2 \end{pmatrix} = \begin{pmatrix} 3 \\ 3 \end{pmatrix}$	<p>2.</p> $\begin{pmatrix} 1 \\ 3 \end{pmatrix} + \begin{pmatrix} 1 \\ 1 \end{pmatrix} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$	<p>3.</p> $\begin{pmatrix} 0 \\ 2 \end{pmatrix} + \begin{pmatrix} 2 \\ 2 \end{pmatrix} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$
<p>4.</p> $\begin{pmatrix} 4 \\ 1 \end{pmatrix} + \begin{pmatrix} -3 \\ 2 \end{pmatrix} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$	<p>5.</p> $\begin{pmatrix} -2 \\ -2 \end{pmatrix} + \begin{pmatrix} 3 \\ -1 \end{pmatrix} = \begin{pmatrix} 1 \\ -3 \end{pmatrix}$	<p>6.</p> $\begin{pmatrix} 2 \\ -3 \end{pmatrix} + \begin{pmatrix} -2 \\ 1 \end{pmatrix} = \begin{pmatrix} 0 \\ -2 \end{pmatrix}$

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Section C Find the resultant vectors of these vector additions.

Example:	1. $\begin{pmatrix} 3 \\ 5 \end{pmatrix} + \begin{pmatrix} 4 \\ 3 \end{pmatrix} = \begin{pmatrix} 7 \\ 8 \end{pmatrix}$	2. $\begin{pmatrix} 3 \\ 4 \end{pmatrix} + \begin{pmatrix} 3 \\ 5 \end{pmatrix} = \begin{pmatrix} 6 \\ 9 \end{pmatrix}$	3. $\begin{pmatrix} 5 \\ 4 \end{pmatrix} + \begin{pmatrix} 3 \\ 3 \end{pmatrix} = \begin{pmatrix} 8 \\ 7 \end{pmatrix}$	
	4. $\begin{pmatrix} 5 \\ -4 \end{pmatrix} + \begin{pmatrix} -3 \\ 3 \end{pmatrix} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$	5. $\begin{pmatrix} -3 \\ 4 \end{pmatrix} + \begin{pmatrix} 3 \\ -5 \end{pmatrix} = \begin{pmatrix} 0 \\ -1 \end{pmatrix}$	6. $\begin{pmatrix} -5 \\ -3 \end{pmatrix} + \begin{pmatrix} -4 \\ -3 \end{pmatrix} = \begin{pmatrix} -9 \\ -6 \end{pmatrix}$	
	7. $\begin{pmatrix} 15 \\ 3 \end{pmatrix} + \begin{pmatrix} 4 \\ -13 \end{pmatrix} = \begin{pmatrix} 19 \\ -10 \end{pmatrix}$	8. $\begin{pmatrix} -15 \\ 8 \end{pmatrix} + \begin{pmatrix} 7 \\ 4 \end{pmatrix} = \begin{pmatrix} -8 \\ 12 \end{pmatrix}$	9. $\begin{pmatrix} -7 \\ -5 \end{pmatrix} + \begin{pmatrix} -8 \\ -13 \end{pmatrix} + \begin{pmatrix} 2 \\ 6 \end{pmatrix} = \begin{pmatrix} -13 \\ -12 \end{pmatrix}$	

Section D Multiplying a vector by a number gives a parallel vector. Write the parallel vector.

Example:	1. $\mathbf{a} = \begin{pmatrix} 3 \\ 5 \end{pmatrix}$ $2\mathbf{a} = 2 \begin{pmatrix} 3 \\ 5 \end{pmatrix} = \begin{pmatrix} 6 \\ 10 \end{pmatrix}$	2. $\mathbf{b} = \begin{pmatrix} 4 \\ 2 \end{pmatrix}$ $3\mathbf{b} = 3 \begin{pmatrix} 4 \\ 2 \end{pmatrix} = \begin{pmatrix} 12 \\ 6 \end{pmatrix}$	3. $\mathbf{c} = \begin{pmatrix} 5 \\ 7 \end{pmatrix}$ $2\mathbf{c} = \dots\dots \begin{pmatrix} 5 \\ 7 \end{pmatrix} = \begin{pmatrix} 10 \\ 14 \end{pmatrix}$	
	4. $\mathbf{d} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$ $4\mathbf{d} = \dots\dots \begin{pmatrix} -2 \\ 3 \end{pmatrix} = \begin{pmatrix} -8 \\ 12 \end{pmatrix}$	5. $\mathbf{e} = \begin{pmatrix} 8 \\ -1 \end{pmatrix}$ $5\mathbf{e} = \dots\dots \begin{pmatrix} 8 \\ -1 \end{pmatrix} = \begin{pmatrix} 40 \\ -5 \end{pmatrix}$	6. $\mathbf{f} = \begin{pmatrix} -4 \\ -6 \end{pmatrix}$ $1.5\mathbf{f} = \begin{pmatrix} -6 \\ -9 \end{pmatrix}$	
	7. $\mathbf{g} = \begin{pmatrix} 2 \\ 5 \end{pmatrix}$ $-\mathbf{g} = -1 \begin{pmatrix} 2 \\ 5 \end{pmatrix} = \begin{pmatrix} -2 \\ -5 \end{pmatrix}$	8. $\mathbf{h} = \begin{pmatrix} -3 \\ 6 \end{pmatrix}$ $-3\mathbf{h} = \begin{pmatrix} 9 \\ -18 \end{pmatrix}$	9. $\mathbf{k} = \begin{pmatrix} 8 \\ -6 \end{pmatrix}$ $-2.5\mathbf{k} = \begin{pmatrix} -20 \\ 15 \end{pmatrix}$	

Section E Subtracting a vector is the same as adding the negative vector. Draw a diagram to show the subtractions.

Example:	1. $\mathbf{a} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$ $\mathbf{a} - \mathbf{b} = \mathbf{a} + (-\mathbf{b}) = \begin{pmatrix} 3 \\ 2 \end{pmatrix} + \begin{pmatrix} -2 \\ -4 \end{pmatrix} = \begin{pmatrix} 1 \\ -2 \end{pmatrix}$	
	2. $\mathbf{a} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 0 \\ 3 \end{pmatrix}$ $\mathbf{a} - \mathbf{b} = \mathbf{a} + (-\mathbf{b}) = \begin{pmatrix} 4 \\ 1 \end{pmatrix} + \begin{pmatrix} 0 \\ -3 \end{pmatrix} = \begin{pmatrix} 4 \\ -2 \end{pmatrix}$	
3. $\mathbf{a} = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -2 \\ -3 \end{pmatrix}$ $\mathbf{a} - \mathbf{b} = \mathbf{a} + (-\mathbf{b}) = \begin{pmatrix} -4 \\ -2 \end{pmatrix} + \begin{pmatrix} 2 \\ 3 \end{pmatrix} = \begin{pmatrix} -2 \\ 1 \end{pmatrix}$		
4. $\mathbf{a} = \begin{pmatrix} 2 \\ -5 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 4 \\ -2 \end{pmatrix}$ $\mathbf{a} - \mathbf{b} = \mathbf{a} + (-\mathbf{b}) = \begin{pmatrix} 2 \\ -5 \end{pmatrix} + \begin{pmatrix} -4 \\ 2 \end{pmatrix} = \begin{pmatrix} -2 \\ -3 \end{pmatrix}$		

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Section F Find the answer to these vector subtractions.

Example:	1. $\begin{pmatrix} 6 \\ 5 \end{pmatrix} - \begin{pmatrix} 4 \\ 3 \end{pmatrix} = \begin{pmatrix} 2 \\ 2 \end{pmatrix}$	2. $\begin{pmatrix} 7 \\ 4 \end{pmatrix} - \begin{pmatrix} 2 \\ 1 \end{pmatrix} = \begin{pmatrix} 5 \\ 3 \end{pmatrix}$	3. $\begin{pmatrix} 4 \\ 8 \end{pmatrix} - \begin{pmatrix} 5 \\ 3 \end{pmatrix} = \begin{pmatrix} -1 \\ 5 \end{pmatrix}$
	4. $\begin{pmatrix} 9 \\ 4 \end{pmatrix} - \begin{pmatrix} 5 \\ 7 \end{pmatrix} = \begin{pmatrix} 4 \\ -3 \end{pmatrix}$	5. $\begin{pmatrix} 7 \\ -4 \end{pmatrix} - \begin{pmatrix} -2 \\ 6 \end{pmatrix} = \begin{pmatrix} 9 \\ -10 \end{pmatrix}$	6. $\begin{pmatrix} -5 \\ 7 \end{pmatrix} - \begin{pmatrix} -3 \\ -8 \end{pmatrix} = \begin{pmatrix} -2 \\ 15 \end{pmatrix}$

Section G Use the column vectors to find the answers to the mixed questions.

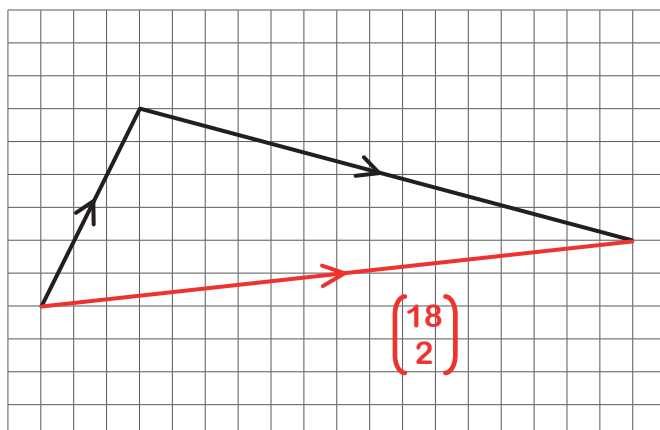
$$a = \begin{pmatrix} 2 \\ 3 \end{pmatrix} \quad b = \begin{pmatrix} -3 \\ 4 \end{pmatrix} \quad c = \begin{pmatrix} 1 \\ -5 \end{pmatrix} \quad d = \begin{pmatrix} -4 \\ -6 \end{pmatrix} \quad e = \begin{pmatrix} 8 \\ -14 \end{pmatrix}$$

Example:	1. $a + b + c$ $\begin{pmatrix} 6 \\ 5 \end{pmatrix}$	2. $c - d$ $\begin{pmatrix} 5 \\ 1 \end{pmatrix}$	3. $2a + e$ $\begin{pmatrix} 4 \\ 6 \end{pmatrix} + \begin{pmatrix} 8 \\ -14 \end{pmatrix} = \begin{pmatrix} 12 \\ -8 \end{pmatrix}$
	4. $3b + 2d$ $\begin{pmatrix} -9 \\ 12 \end{pmatrix} + \begin{pmatrix} -8 \\ -12 \end{pmatrix} = \begin{pmatrix} -17 \\ 0 \end{pmatrix}$	5. $4c - a$ $\begin{pmatrix} 4 \\ -20 \end{pmatrix} - \begin{pmatrix} 2 \\ 3 \end{pmatrix} = \begin{pmatrix} 2 \\ -23 \end{pmatrix}$	6. $0.5e + 3b$ $\begin{pmatrix} 4 \\ -7 \end{pmatrix} + \begin{pmatrix} -9 \\ 12 \end{pmatrix} = \begin{pmatrix} -5 \\ 5 \end{pmatrix}$
7. $5a - c + 1.5d$ $\begin{pmatrix} 10 \\ 15 \end{pmatrix} - \begin{pmatrix} 1 \\ -5 \end{pmatrix} + \begin{pmatrix} -6 \\ -9 \end{pmatrix} = \begin{pmatrix} 3 \\ 11 \end{pmatrix}$	8. $10d + 5b - 3e$ $\begin{pmatrix} -40 \\ -60 \end{pmatrix} + \begin{pmatrix} -15 \\ 20 \end{pmatrix} - \begin{pmatrix} 24 \\ -42 \end{pmatrix} = \begin{pmatrix} -79 \\ 2 \end{pmatrix}$	9. $a + b + c - d - e$ $\begin{pmatrix} -4 \\ 22 \end{pmatrix}$	

Section H Spot the mistakes and correct the answer.

Archie needed to draw a diagram to show the resultant of $3b + a$ when $a = \begin{pmatrix} 5 \\ -2 \end{pmatrix}$ and $b = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$.

This is his diagram.



Explain Archie's mistake and draw a correct diagram below.

