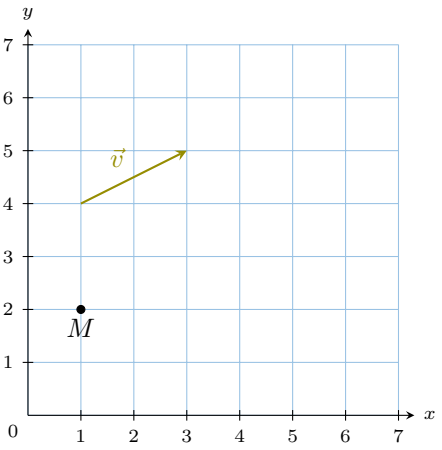
VECTORS

A DEFINITIONS

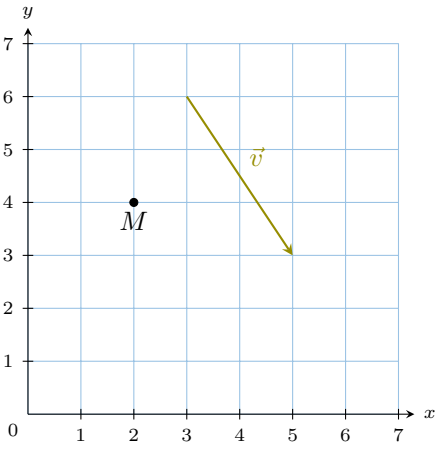
A.1 FINDING THE IMAGE OF A POINT

Ex 1: Find the coordinates of the image of point M under a translation by vector $\vec{v}$.



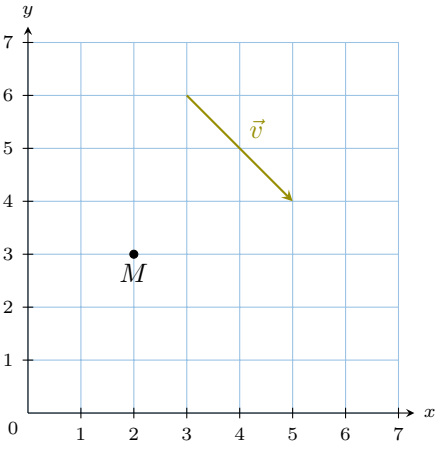
$M'(\square,\square)$

Ex 2: Find the coordinates of the image of point M under a translation by vector $\vec{v}$.



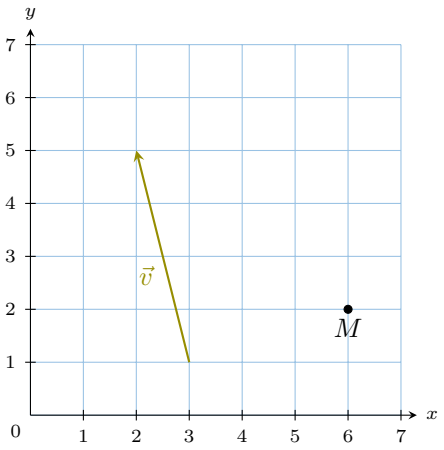
$M'(\square,\square)$

Ex 3: Find the coordinates of the image of point M under a translation by vector $\vec{v}$.



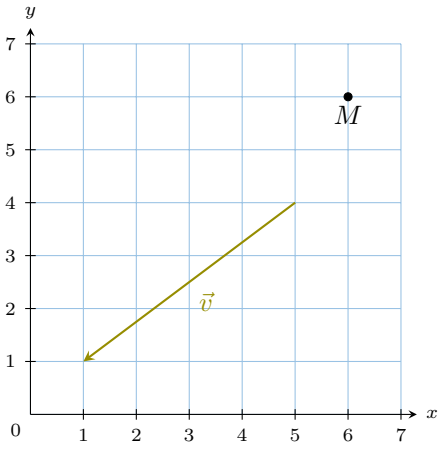
$M'(\square,\square)$

Ex 4: Find the coordinates of the image of point M under a translation by vector $\vec{v}$.



$M'(\square,\square)$

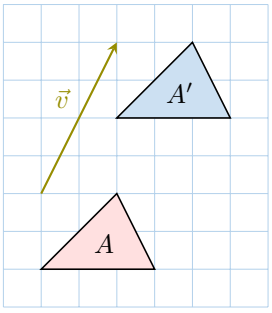
Ex 5: Find the coordinates of the image of point M under a translation by vector $\vec{v}$.



$M'(\square,\square)$

A.2 TRANSLATION OF FIGURES

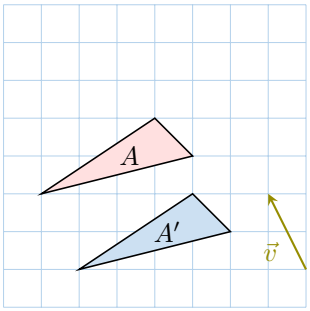
MCQ 6: Is the figure A' the image of figure A under a translation by vector $\vec{v}$?



☐ Yes

☐ No

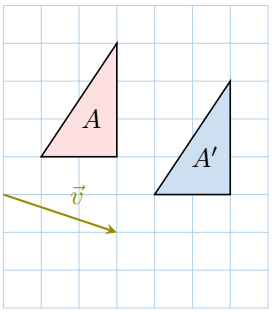
MCQ 7: Is the figure A' the image of figure A under a translation by vector $\vec{v}$?



☐ Yes

☐ No

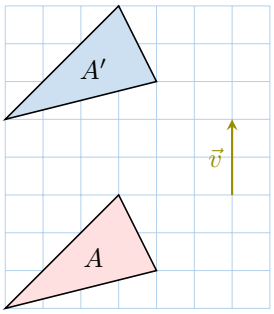
MCQ 8: Is the figure A' the image of figure A under a translation by vector $\vec{v}$?



☐ Yes

☐ No

MCQ 9: Is the figure A' the image of figure A under a translation by vector $\vec{v}$?

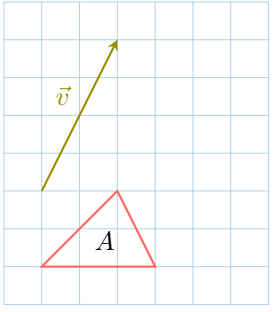


☐ Yes

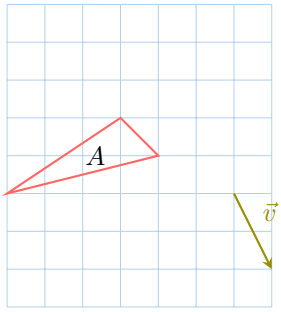
☐ No

A.3 DRAWING IMAGES FIGURES

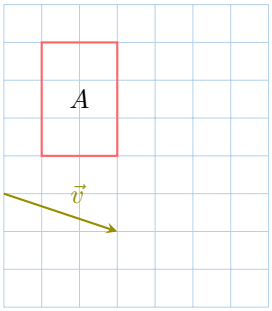
Ex 10: Draw the figure A', the image of figure A under a translation by vector $\vec{v}$.



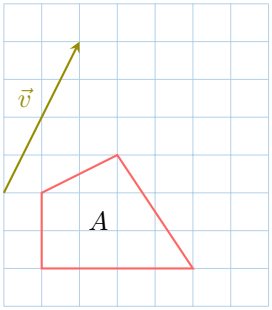
Ex 11: Draw the figure A', the image of figure A under a translation by vector $\vec{v}$.



Ex 12: Draw the figure A', the image of figure A under a translation by vector $\vec{v}$.

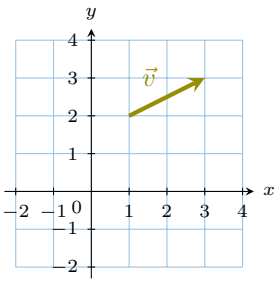


Ex 13: Draw the figure A', the image of figure A under a translation by vector $\vec{v}$.



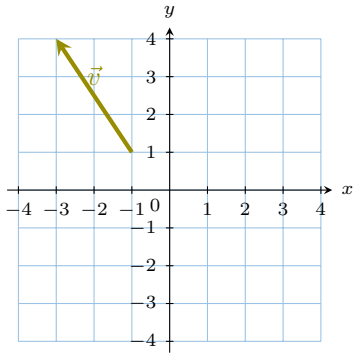
A.4 FINDING COMPONENTS OF A VECTOR

Ex 14: Find the components of the vector $\vec{v}$.



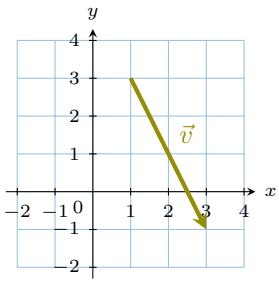
$\vec{v} =$ ( )

Ex 15: Find the components of the vector $\vec{v}$.



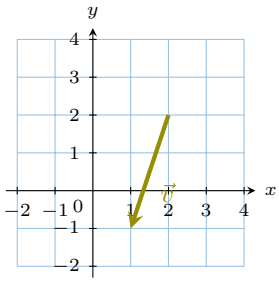
$\vec{v} = \begin{pmatrix} \square \\ \square \end{pmatrix}$

Ex 16: Find the components of the vector $\vec{v}$.



$\vec{v} = \begin{pmatrix} \square \\ \square \end{pmatrix}$

Ex 17: Find the components of the vector $\vec{v}$.



$\vec{v} = \begin{pmatrix} \square \\ \square \end{pmatrix}$

A.5 REPRESENTING VECTORS ON A GRID

Ex 18: Draw the arrows diagram of the vector $\vec{v} = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$.

Ex 19: Draw the arrows diagram of the vector $\vec{u} = \begin{pmatrix} -2 \\ 4 \end{pmatrix}$.

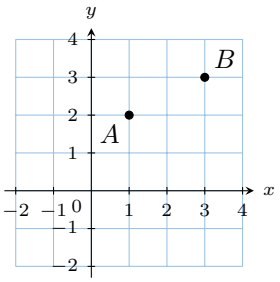
Ex 20: Draw the arrows diagram of the vector $\vec{w} = \begin{pmatrix} 1 \\ -3 \end{pmatrix}$.

Ex 21: Draw the arrows diagram of the vector $\vec{z} = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$.

B TWO POINT NOTATION

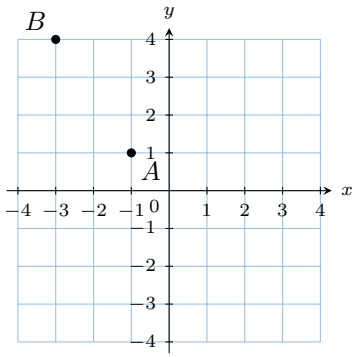
B.1 FINDING COMPONENTS OF A VECTOR

Ex 22: Find the components of the vector $\overrightarrow{AB}$.



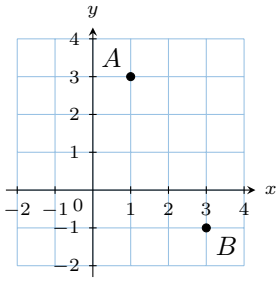
$\overrightarrow{AB} = \begin{pmatrix} \square \\ \square \end{pmatrix}$

Ex 23: Find the components of the vector $\overrightarrow{AB}$.



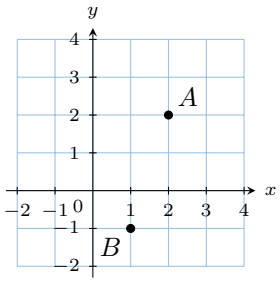
$\overrightarrow{AB} = \begin{pmatrix} \square \\ \square \end{pmatrix}$

Ex 24: Find the components of the vector $\overrightarrow{AB}$.



$\overrightarrow{AB} =$ ( )

Ex 25: Find the components of the vector $\overrightarrow{AB}$.



$\overrightarrow{AB} =$ ( )

B.2 FINDING THE VECTOR COMPONENTS

Ex 26: For $A(1,2)$ and $B(3,3)$, find the components of the vector $\overrightarrow{AB}$.

$\overrightarrow{AB} =$ ( )

Ex 27: For $E(0,\,5)$ and $F(4,\,2)$, find the components of the vector $\overrightarrow{EF}$.

$\overrightarrow{EF} =$ ( )

Ex 28: For $B(-2,\,0)$ and $C(3,\,4)$, find the components of the vector $\overrightarrow{BC}$.

$\overrightarrow{BC} =$ ( )

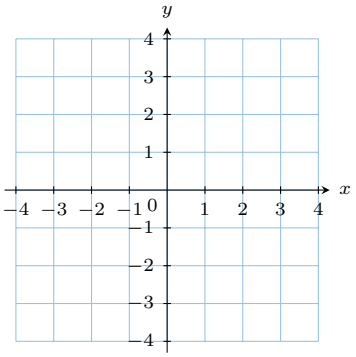
Ex 29: For $B(3,\,3)$ and $A(1,\,2)$, find the components of the vector $\overrightarrow{BA}$.

$\overrightarrow{BA} =$ ( )

B.3 PLACING A POINT USING A VECTOR

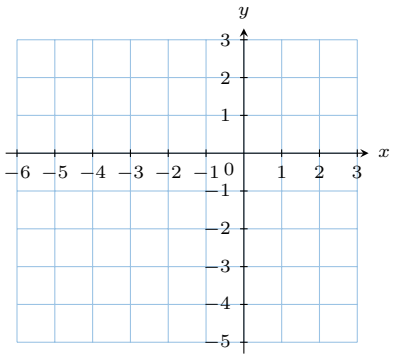
Ex 30:

1. Plot the point $A(-4,1)$.
2. Plot the point B such that $\overrightarrow{AB} = \begin{pmatrix}2\\3\end{pmatrix}$.



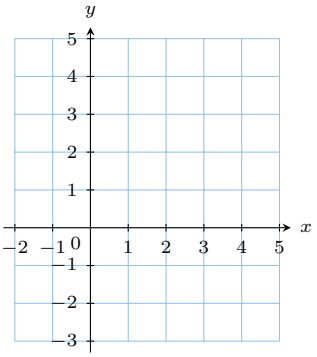
Ex 31:

1. Plot the point $C(1,-3)$.
2. Plot the point D such that $\overrightarrow{CD} = \begin{pmatrix}-5\\2\end{pmatrix}$.



Ex 32:

1. Plot the point $E(0,2)$.
2. Plot the point F such that $\overrightarrow{EF} = \begin{pmatrix}3\\-4\end{pmatrix}$.



B.4 FINDING THE VECTOR COMPONENTS IN 3D

Ex 33: For $A(1,1,1)$ and $B(2,3,4)$, find the components of the vector $\overrightarrow{AB}$.

$\overrightarrow{AB} =$ ( )

Ex 34: For $A(4,2,3)$ and $B(1,4,3)$, find the components of the vector $\overrightarrow{AB}$.

$$\overrightarrow{AB} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

Ex 35: For $A(4,4,4)$ and $B(1,3,0)$, find the components of the vector $\overrightarrow{AB}$.

$$\overrightarrow{AB} = \begin{pmatrix} \square \\ \square \\ \square \end{pmatrix}$$

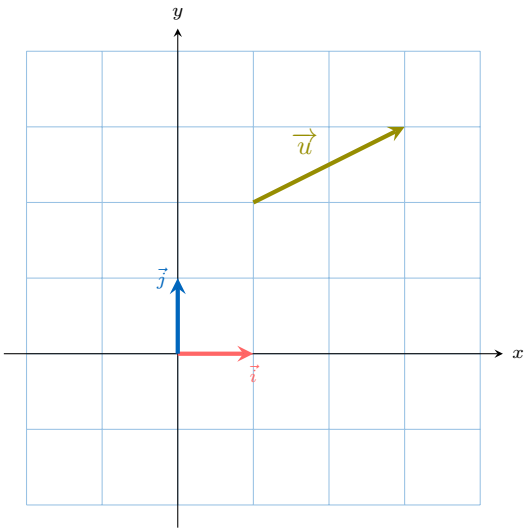
Ex 36: For $A(2,0,-3)$ and $B(0,3,1)$, find the components of the vector $\overrightarrow{AB}$.

$$\overrightarrow{AB} = \begin{pmatrix} \square \\ \square \\ \square \end{pmatrix}$$

C BASE VECTORS

C.1 DECOMPOSING A VECTOR

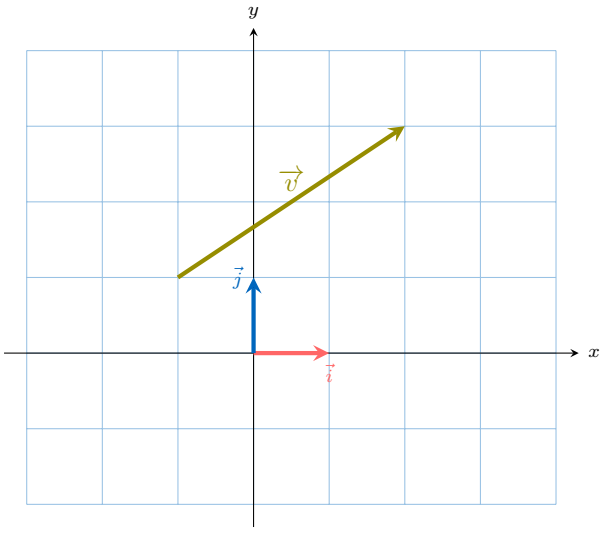
Ex 37:



Write in unit vector form:

$\vec{u} = \square\vec{i} + \square\vec{j}$

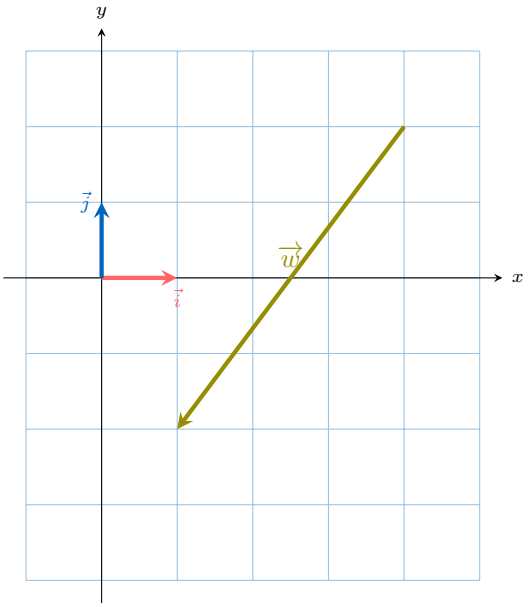
Ex 38:



Write in unit vector form:

$\vec{v} = \square\vec{i} + \square\vec{j}$

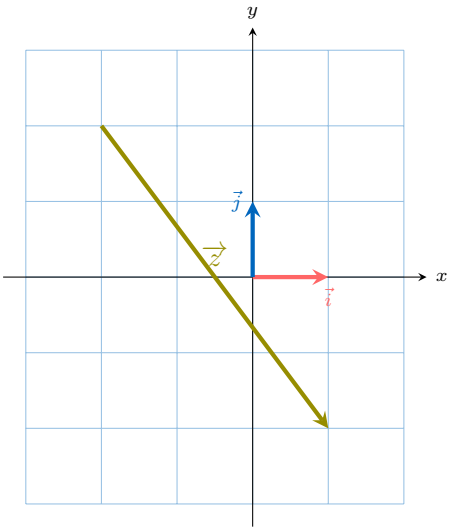
Ex 39:



Write in unit vector form:

$\vec{w} = \square\vec{i} + \square\vec{j}$

Ex 40:



Write in unit vector form:

$\vec{z} = \square\vec{i} + \square\vec{j}$

C.2 CONVERTING COMPONENT FORM TO UNIT VECTOR FORM

Ex 41: Write in unit vector form:

$$\begin{pmatrix} 2 \\ 1 \end{pmatrix} = \square\vec{i} + \square\vec{j}$$

Ex 42: Write in unit vector form:

$$\begin{pmatrix} 3 \\ -2 \end{pmatrix} = \square\vec{i} - \square\vec{j}$$

Ex 43: Write in unit vector form:

$$\begin{pmatrix} -2 \\ 3 \end{pmatrix} = \square\,\vec{i} + \square\,\vec{j}$$

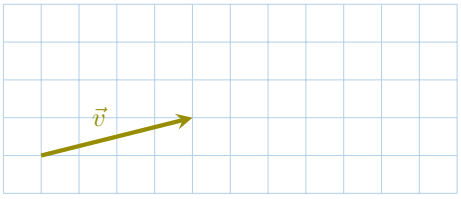
Ex 44: Write in unit vector form:

$$\begin{pmatrix} -3 \\ -1 \end{pmatrix} = \square\,\vec{i} - \square\,\vec{j}$$

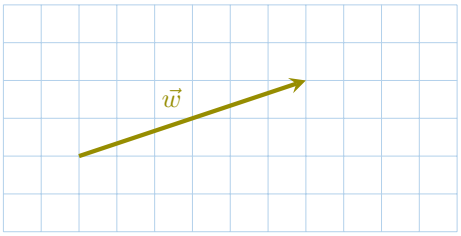
D EQUALITY BETWEEN VECTORS

D.1 DRAWING EQUAL VECTORS

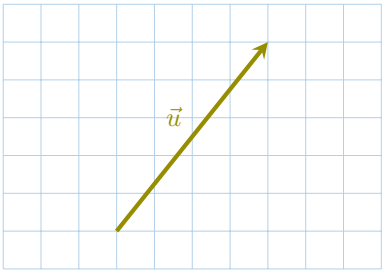
Ex 45: Draw a vector equal to $\vec{v}$.



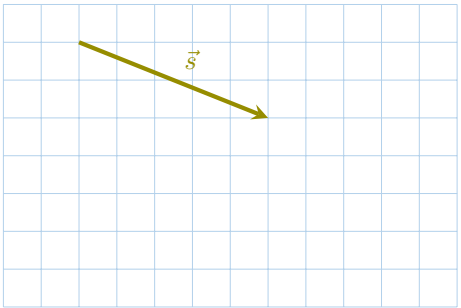
Ex 46: Draw a vector equal to $\vec{w}$.



Ex 47: Draw a vector equal to $\vec{u}$.



Ex 48: Draw a vector equal to $\vec{s}$.



D.2 FINDING THE COORDINATES OF A POINT WITH A GIVEN VECTOR

Ex 49: Let $A(2,3)$, $B(5,7)$, and $C(1,-2)$.
Find the coordinates of the point D such that $\overrightarrow{AB} = \overrightarrow{CD}$.

$$D = (\square, \square)$$

Ex 50: Let $A(0,0)$, $B(4,3)$, and $C(2,1)$.
Find the coordinates of the point D such that $\overrightarrow{AB} = \overrightarrow{CD}$.

$$D = (\square, \square)$$

Ex 51: Let $A(-1,2)$, $B(1,5)$, and $C(3,-1)$.
Find the coordinates of the point D such that $\overrightarrow{AB} = \overrightarrow{CD}$.

$$D = (\square, \square)$$

D.3 SOLVING VECTOR EQUATIONS

Ex 52: Determine the values of x and y for the following vector equality:

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$$

$$x = \square \text{ and } y = \square$$

Ex 53: Determine the values of x and y for the following vector equality:

$$x\,\vec{i} + y\,\vec{j} = -2\,\vec{i} + \vec{j}$$

$$x = \square \text{ and } y = \square$$

Ex 54: Determine the values of x and y for the following vector equality:

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

$$x = \square \text{ and } y = \square$$

Ex 55: Determine the values of x and y for the following vector equality:

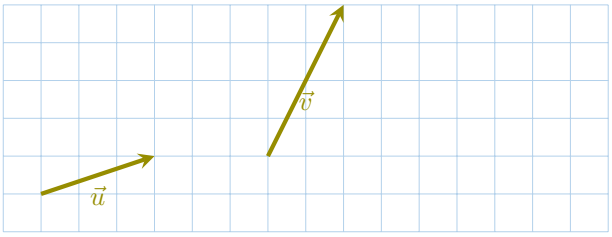
$$x\,\vec{i} + y\,\vec{j} = 2y\,\vec{i} + 3\,\vec{j}$$

$$x = \square \text{ and } y = \square$$

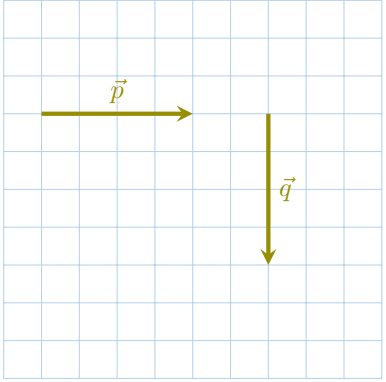
E VECTOR ADDITION AND SUBTRACTION

E.1 DRAWING THE SUM OF TWO VECTORS

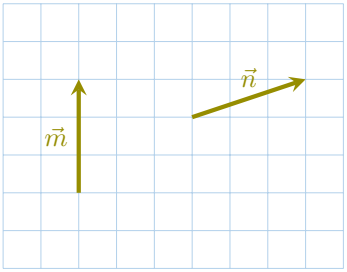
Ex 56: Draw the arrows diagram of the vector $\vec{u} + \vec{v}$.



Ex 57: Draw the arrows diagram of the vector $\vec{p} + \vec{q}$.



Ex 58: Draw the arrows diagram of the vector $\vec{m} + \vec{n}$.



E.2 CALCULATING THE SUM OF VECTORS

Ex 59: Calculate the sum of the vectors $\vec{a} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$ and $\vec{b} = \begin{pmatrix} -5 \\ 4 \end{pmatrix}$.

$$\vec{a} + \vec{b} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

Ex 60: Calculate the sum of the vectors $\vec{u} = \begin{pmatrix} 4 \\ 2 \end{pmatrix}$ and $\vec{v} = \begin{pmatrix} -1 \\ 5 \end{pmatrix}$.

$$\vec{u} + \vec{v} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

Ex 61: Calculate the sum of the vectors $\vec{p} = \begin{pmatrix} -3 \\ 6 \end{pmatrix}$ and $\vec{q} = \begin{pmatrix} 8 \\ -4 \end{pmatrix}$.

$$\vec{p} + \vec{q} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

Ex 62: Calculate the sum of the vectors $\vec{m} = \begin{pmatrix} 0 \\ -7 \end{pmatrix}$ and $\vec{n} = \begin{pmatrix} 5 \\ 3 \end{pmatrix}$.

$$\vec{m} + \vec{n} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

E.3 RECOGNIZING SUMS OF VECTORS

MCQ 63: Calculate the sum of vectors: $\overrightarrow{AB} + \overrightarrow{BC}$.

- ☐ $\overrightarrow{CA}$
- ☐ $\overrightarrow{AC}$
- ☐ $\overrightarrow{BA}$
- ☐ $\overrightarrow{CB}$

MCQ 64: Calculate the sum of vectors: $\overrightarrow{BC} + \overrightarrow{AB}$.

- ☐ $\overrightarrow{CB}$
- ☐ $\overrightarrow{BA}$
- ☐ $\overrightarrow{0}$
- ☐ $\overrightarrow{AC}$

MCQ 65: Calculate the sum of vectors: $\overrightarrow{AB} + \overrightarrow{BA}$.

- ☐ $\overrightarrow{BA}$
- ☐ $\overrightarrow{AB}$
- ☐ $\overrightarrow{0}$

MCQ 66: Calculate the sum of vectors: $\overrightarrow{EA} + \overrightarrow{AB} + \overrightarrow{BC}$.

- ☐ $\overrightarrow{CE}$
- ☐ $\overrightarrow{0}$
- ☐ $\overrightarrow{AC}$
- ☐ $\overrightarrow{EC}$

MCQ 67: Calculate the sum of vectors: $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CD}$.

- ☐ $\overrightarrow{AD}$
- ☐ $\overrightarrow{DA}$
- ☐ $\overrightarrow{BD}$
- ☐ $\overrightarrow{0}$

E.4 CALCULATING THE SUM OF VECTORS IN 3D

Ex 68: Calculate the sum of the vectors $\vec{a} = \begin{pmatrix} 2 \\ -3 \\ 0 \end{pmatrix}$ and $\vec{b} = \begin{pmatrix} -5 \\ 4 \\ 2 \end{pmatrix}$.

$$\vec{a} + \vec{b} = \begin{pmatrix} \square \\ \square \\ \square \end{pmatrix}$$

Ex 69: Calculate the sum of the vectors $\vec{u} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$ and $\vec{v} = \begin{pmatrix} 4 \\ 5 \\ 6 \end{pmatrix}$.

$$\vec{u} + \vec{v} = \begin{pmatrix} \square \\ \square \\ \square \end{pmatrix}$$

Ex 70: Calculate the sum of the vectors $\vec{m} = \begin{pmatrix} -1 \\ 0 \\ 5 \end{pmatrix}$ and $\vec{n} = \begin{pmatrix} 3 \\ -2 \\ -4 \end{pmatrix}$.

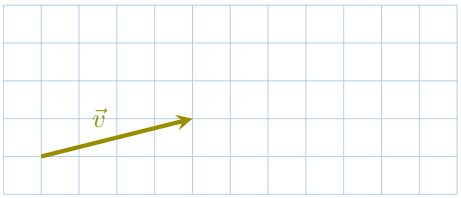
$$\vec{m} + \vec{n} = \begin{pmatrix} \square \\ \square \\ \square \end{pmatrix}$$

Ex 71: Calculate the sum of the vectors $\vec{p} = \begin{pmatrix} 10 \\ -8 \\ 6 \end{pmatrix}$ and $\vec{q} = \begin{pmatrix} -2 \\ 8 \\ -3 \end{pmatrix}$.

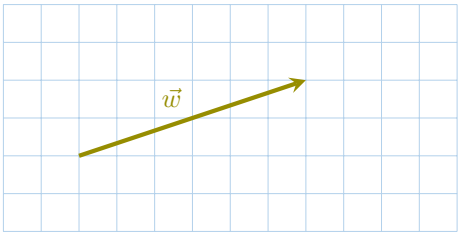
$$\vec{p} + \vec{q} = \begin{pmatrix} \square \\ \square \\ \square \end{pmatrix}$$

E.5 DRAWING THE NEGATIVE OF A VECTOR

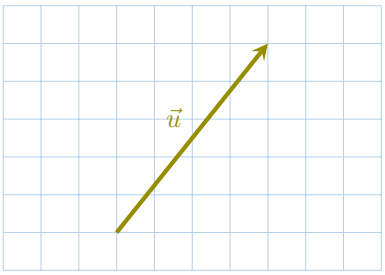
Ex 72: Draw the negative vector of $\vec{v}$.



Ex 73: Draw the negative vector of $\vec{w}$.



Ex 74: Draw the negative vector of $\vec{u}$.



E.6 CALCULATING THE NEGATIVE OF A VECTOR

Ex 75: Calculate the negative of the vector $\vec{a} = \begin{pmatrix} 4 \\ -7 \end{pmatrix}$.

$$-\vec{a} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

Ex 76: Calculate the negative of the vector $\vec{b} = \begin{pmatrix} -3 \\ 5 \end{pmatrix}$.

$$-\vec{b} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

Ex 77: Calculate the negative of the vector $\vec{u} = \begin{pmatrix} 6 \\ 2 \end{pmatrix}$.

$$-\vec{u} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

Ex 78: Calculate the negative of the vector $\vec{p} = \begin{pmatrix} 0 \\ -8 \end{pmatrix}$.

$$-\vec{p} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

E.7 CALCULATING THE DIFFERENCE OF VECTORS

Ex 79: Calculate the difference of the vectors $\vec{a} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$ and $\vec{b} = \begin{pmatrix} -5 \\ 4 \end{pmatrix}$.

$$\vec{a} - \vec{b} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

Ex 80: Calculate the difference of the vectors $\vec{u} = \begin{pmatrix} 4 \\ 2 \end{pmatrix}$ and $\vec{v} = \begin{pmatrix} -1 \\ 5 \end{pmatrix}$.

$$\vec{u} - \vec{v} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

Ex 81: Calculate the difference of the vectors $\vec{p} = \begin{pmatrix} -3 \\ 6 \end{pmatrix}$ and $\vec{q} = \begin{pmatrix} 8 \\ -4 \end{pmatrix}$.

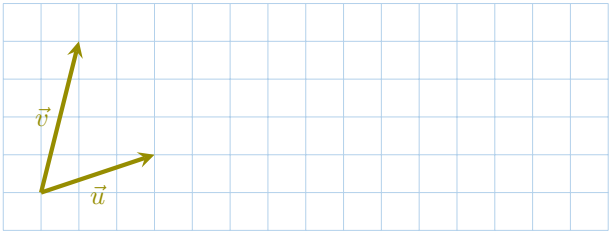
$$\vec{p} - \vec{q} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

Ex 82: Calculate the difference of the vectors $\vec{m} = \begin{pmatrix} 0 \\ -7 \end{pmatrix}$ and $\vec{n} = \begin{pmatrix} 5 \\ 3 \end{pmatrix}$.

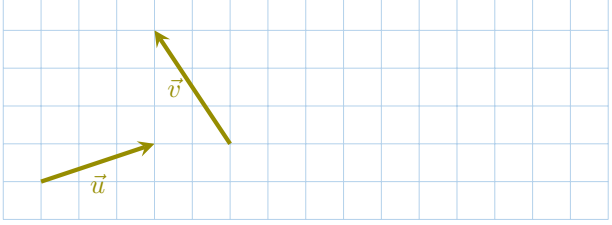
$$\vec{m} - \vec{n} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

E.8 DRAWING THE SUBTRACTION OF TWO VECTORS

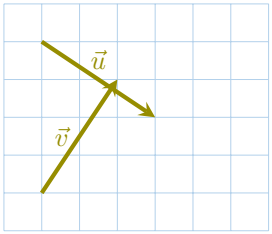
Ex 83: Draw the vector of $\vec{u} - \vec{v}$. (Do that on your graph paper.)



Ex 84: Draw the vector of $\vec{u} - \vec{v}$. (Do that on your graph paper.)



Ex 85: Draw the vector of $\vec{u}-\vec{v}$. (Do that on your graph paper.)



E.9 CALCULATING THE DIFFERENCE OF VECTORS IN 3D

Ex 86: Calculate the difference of the vectors $\vec{a}=\begin{pmatrix}1\\5\\-2\end{pmatrix}$ and $\vec{b}=\begin{pmatrix}3\\2\\4\end{pmatrix}$.

$$\vec{a}-\vec{b}=\begin{pmatrix}\square\\\square\\\square\end{pmatrix}$$

Ex 87: Calculate the difference of the vectors $\vec{c}=\begin{pmatrix}-6\\7\\-1\end{pmatrix}$ and $\vec{d}=\begin{pmatrix}-2\\-3\\5\end{pmatrix}$.

$$\vec{c}-\vec{d}=\begin{pmatrix}\square\\\square\\\square\end{pmatrix}$$

Ex 88: Calculate the difference of the vectors $\vec{e}=\begin{pmatrix}0\\-4\\1\end{pmatrix}$ and $\vec{f}=\begin{pmatrix}5\\0\\-3\end{pmatrix}$.

$$\vec{e}-\vec{f}=\begin{pmatrix}\square\\\square\\\square\end{pmatrix}$$

F SCALAR MULTIPLICATION

F.1 MULTIPLYING A VECTOR BY A SCALAR

Ex 89: Calculate the product of the vector $\vec{b}=\begin{pmatrix}-5\\4\end{pmatrix}$ by 3.

$$3\vec{b}=\begin{pmatrix}\square\\\square\end{pmatrix}$$

Ex 90: Calculate the product of the vector $\vec{u}=\begin{pmatrix}0\\6\end{pmatrix}$ by -2.

$$-2\vec{u}=\begin{pmatrix}\square\\\square\end{pmatrix}$$

Ex 91: Calculate the product of the vector $\vec{a}=\begin{pmatrix}2\\-3\end{pmatrix}$ by -4.

$$-4\vec{a}=\begin{pmatrix}\square\\\square\end{pmatrix}$$

Ex 92: Calculate the product of the vector $\vec{p}=\begin{pmatrix}7\\-1\end{pmatrix}$ by 0.5.

$$\frac{1}{2}\vec{p}=\begin{pmatrix}\square\\\square\end{pmatrix}$$

F.2 CALCULATING LINEAR COMBINATIONS OF VECTORS

Ex 93: Calculate $3\vec{a}-\vec{b}$ where $\vec{a}=\begin{pmatrix}2\\-3\end{pmatrix}$ and $\vec{b}=\begin{pmatrix}-5\\4\end{pmatrix}$.

$$3\vec{a}-\vec{b}=\begin{pmatrix}\square\\\square\end{pmatrix}$$

Ex 94: Calculate $2\left(\vec{u}+2\vec{v}\right)$ where $\vec{u}=\begin{pmatrix}1\\-2\end{pmatrix}$ and $\vec{v}=\begin{pmatrix}3\\5\end{pmatrix}$.

$$2\left(\vec{u}+2\vec{v}\right)=\begin{pmatrix}\square\\\square\end{pmatrix}$$

Ex 95: Calculate $4\vec{p}-2\vec{q}$ where $\vec{p}=\begin{pmatrix}-1\\3\end{pmatrix}$ and $\vec{q}=\begin{pmatrix}2\\-5\end{pmatrix}$.

$$4\vec{p}-2\vec{q}=\begin{pmatrix}\square\\\square\end{pmatrix}$$

Ex 96: Calculate $-3\vec{u}+5\vec{v}$ where $\vec{u}=\begin{pmatrix}2\\0\end{pmatrix}$ and $\vec{v}=\begin{pmatrix}-1\\4\end{pmatrix}$.

$$-3\vec{u}+5\vec{v}=\begin{pmatrix}\square\\\square\end{pmatrix}$$

F.3 DETERMINING THE IMAGE OF A POINT UNDER A HOMOTHETY

Ex 97: Let $O(0,0)$ and $M(3,-2)$. The point M' is the image of M by the homothety of center O and ratio $k=2$ so that $2\,\overrightarrow{OM}=\overrightarrow{OM'}$.
Find the coordinates of M'.

$$M'=(\square,\square)$$

Ex 98: Let $A(2,-1)$ and $M(3,1)$. The point M' is the image of M by the homothety of center A and ratio $k=-2$ so that $\overrightarrow{AM'}=-2\,\overrightarrow{AM}$.
Find the coordinates of M'.

$$M'=(\square,\square)$$

Ex 99: Let $A(2,-1)$ and $M(3,1)$. The point M' is the image of M by the homothety of center A and ratio $k=3$, so that $\overrightarrow{AM'}=3\,\overrightarrow{AM}$.
Find the coordinates of M'.

$$M'=(\square,\square)$$

F.4 CALCULATING LINEAR COMBINATIONS OF VECTORS IN 3D

Ex 100: Calculate $3\vec{a} - \vec{b}$ where $\vec{a} = \begin{pmatrix} 2 \\ -3 \\ 1 \end{pmatrix}$ and $\vec{b} = \begin{pmatrix} -5 \\ 4 \\ -2 \end{pmatrix}$.

$$3\vec{a} - \vec{b} = \begin{pmatrix} \square \\ \square \\ \square \end{pmatrix}$$

Ex 101: Calculate $2\vec{u} + 4\vec{v}$ where $\vec{u} = \begin{pmatrix} 1 \\ 0 \\ -5 \end{pmatrix}$ and $\vec{v} = \begin{pmatrix} 3 \\ -2 \\ 2 \end{pmatrix}$.

$$2\vec{u} + 4\vec{v} = \begin{pmatrix} \square \\ \square \\ \square \end{pmatrix}$$

Ex 102: Calculate $5\vec{p} - 2\vec{q}$ where $\vec{p} = \begin{pmatrix} -1 \\ 2 \\ -2 \end{pmatrix}$ and $\vec{q} = \begin{pmatrix} 4 \\ -3 \\ 0 \end{pmatrix}$.

$$5\vec{p} - 2\vec{q} = \begin{pmatrix} \square \\ \square \\ \square \end{pmatrix}$$

G MAGNITUDE AND UNIT VECTORS

G.1 CALCULATING THE LENGTH OF A VECTOR

Ex 103: Calculate the length of $\overrightarrow{v} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$

$\|\overrightarrow{v}\| = \square$ units

Ex 104: Calculate the length of $\overrightarrow{p} = \begin{pmatrix} 0 \\ -5 \end{pmatrix}$

$\|\overrightarrow{p}\| = \square$ units

Ex 105: Calculate the length of $\overrightarrow{u} = \begin{pmatrix} -6 \\ 2 \end{pmatrix}$

$\|\overrightarrow{u}\| = \square$ units

Ex 106: Calculate the length of $\overrightarrow{q} = \begin{pmatrix} 1 \\ -1 \end{pmatrix}$

$\|\overrightarrow{q}\| = \square$ units

G.2 CALCULATING THE DISTANCE BETWEEN TWO POINTS

Ex 107: Let $A(2, 3)$ and $B(7, -1)$.

1. Calculate the vector $\overrightarrow{AB}$.

$$\overrightarrow{AB} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

2. Calculate the distance AB.

$AB = \square$ units

Ex 108: Let $A(-2, 5)$ and $B(4, 2)$.

1. Calculate the vector $\overrightarrow{AB}$.

$$\overrightarrow{AB} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

2. Calculate the distance AB.

$AB = \square$ units

Ex 109: Let $A(0, -2)$ and $B(-3, 6)$.

1. Calculate the vector $\overrightarrow{AB}$.

$$\overrightarrow{AB} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

2. Calculate the distance AB.

$AB = \square$ units

G.3 USING COORDINATES TO DETERMINE TRIANGLE TYPES

Ex 110: Let $A(0, 0)$, $B(6, 0)$, and $C(6, 8)$.

1. Calculate the lengths AB, BC, and CA.
   - $AB = \square$
   - $BC = \square$
   - $CA = \square$
2. Calculate the perimeter of triangle ABC.

Perimeter $= \square$ units

Ex 111: Let $A(0, 0)$, $B(4, 0)$, and $C(2, 4)$.

1. Calculate the lengths AB, BC, and CA.
   - $AB = \square$
   - $BC = \square$

- $CA =$ ☐

2. Is the triangle ABC isosceles?

☐ Yes
☐ No

Ex 112: Let $A(0,0)$, $B(2,2\sqrt{3})$, and $C(4,0)$.

1. Calculate the lengths AB, BC, and CA.
   - $AB =$ ☐
   - $BC =$ ☐
   - $CA =$ ☐
2. Is the triangle ABC equilateral?

☐ Yes
☐ No

G.4 CALCULATING THE LENGTH OF A VECTOR IN 3D

Ex 113: Calculate the length of $\overrightarrow{v} = \begin{pmatrix} 2 \\ 3 \\ 6 \end{pmatrix}$

$\|\overrightarrow{v}\| =$ ☐ units

Ex 114: Calculate the length of $\overrightarrow{u} = \begin{pmatrix} 4 \\ 0 \\ -3 \end{pmatrix}$

$\|\overrightarrow{u}\| =$ ☐ units

Ex 115: Calculate the length of $\overrightarrow{w} = \begin{pmatrix} 1 \\ -2 \\ 5 \end{pmatrix}$

$\|\overrightarrow{w}\| =$ ☐ units

G.5 NORMALIZING A VECTOR

Ex 116: Normalize the vector $\overrightarrow{v} = \begin{pmatrix} 1 \\ -1 \end{pmatrix}$.

Ex 117: Normalize the vector $\overrightarrow{u} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$.

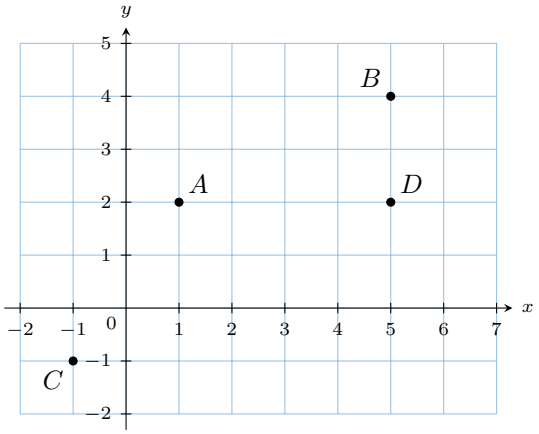
Ex 118: Normalize the vector $\overrightarrow{w} = \begin{pmatrix} -5 \\ 2 \end{pmatrix}$.

Ex 119: Normalize the vector $\overrightarrow{p} = \begin{pmatrix} 0 \\ -7 \end{pmatrix}$.

H PARALLEL VECTORS

H.1 TESTING PARALLELISM/ALIGNMENT USING VECTORS

Ex 120:



Let $A(1,2)$, $B(5,4)$, $C(-1,-1)$, and $D(5,2)$.

1. Calculate the vector $\overrightarrow{AB}$.

$$\overrightarrow{AB} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

2. Calculate the vector $\overrightarrow{CD}$.

$$\overrightarrow{CD} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

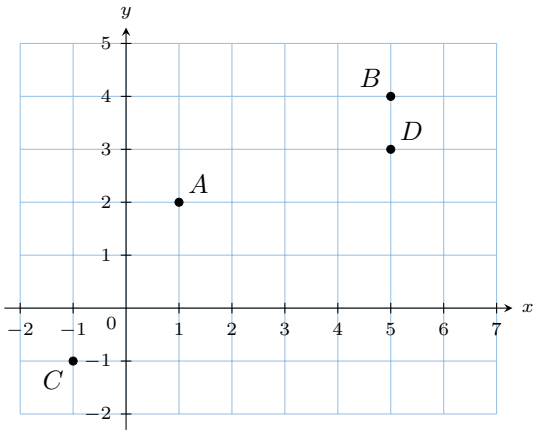
3. Calculate the determinant $\det(\overrightarrow{AB}, \overrightarrow{CD})$.

$$\det(\overrightarrow{AB}, \overrightarrow{CD}) = \square$$

4. Are the lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ parallel?

☐ Yes
☐ No

Ex 121:



Let $A(1,2)$, $B(5,4)$, $C(-1,-1)$, and $D(5,3)$.

1. Calculate the vector $\overrightarrow{AB}$.

$$\overrightarrow{AB} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

2. Calculate the vector $\overrightarrow{CD}$.

$$\overrightarrow{CD} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

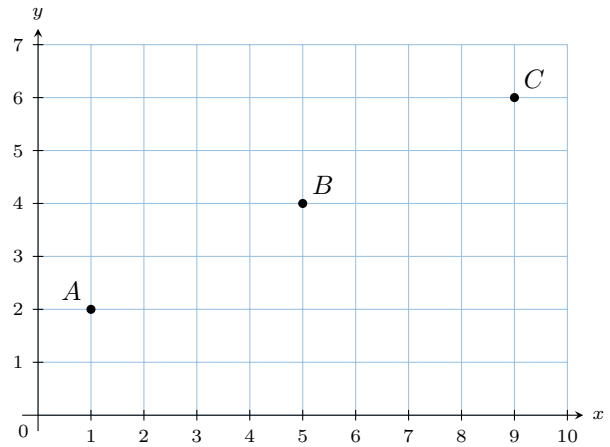
3. Calculate the determinant $\det(\overrightarrow{AB}, \overrightarrow{CD})$.

$$\det(\overrightarrow{AB}, \overrightarrow{CD}) = \square$$

4. Are the lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ parallel?

☐ Yes
☐ No

Ex 122:



Let $A(1,2)$, $B(5,4)$, and $C(9,6)$.

1. Calculate the vector $\overrightarrow{AB}$.

$$\overrightarrow{AB} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

2. Calculate the vector $\overrightarrow{AC}$.

$$\overrightarrow{AC} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

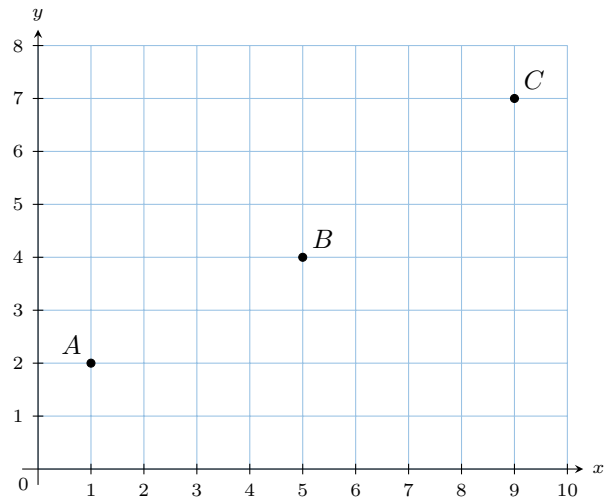
3. Calculate the determinant $\det(\overrightarrow{AB}, \overrightarrow{AC})$.

$$\det(\overrightarrow{AB}, \overrightarrow{AC}) = \square$$

4. Are the points A, B, and C aligned?

☐ Yes
☐ No

Ex 123:



Let $A(1,2)$, $B(5,4)$, and $C(9,7)$.

1. Calculate the vector $\overrightarrow{AB}$.

$$\overrightarrow{AB} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

2. Calculate the vector $\overrightarrow{AC}$.

$$\overrightarrow{AC} = \begin{pmatrix} \square \\ \square \end{pmatrix}$$

3. Calculate the determinant $\det(\overrightarrow{AB}, \overrightarrow{AC})$.

$$\det(\overrightarrow{AB}, \overrightarrow{AC}) = \square$$

4. Are the points A, B, and C aligned?

☐ Yes
☐ No