

Let's visualize some vectors.

Today's learning objective:

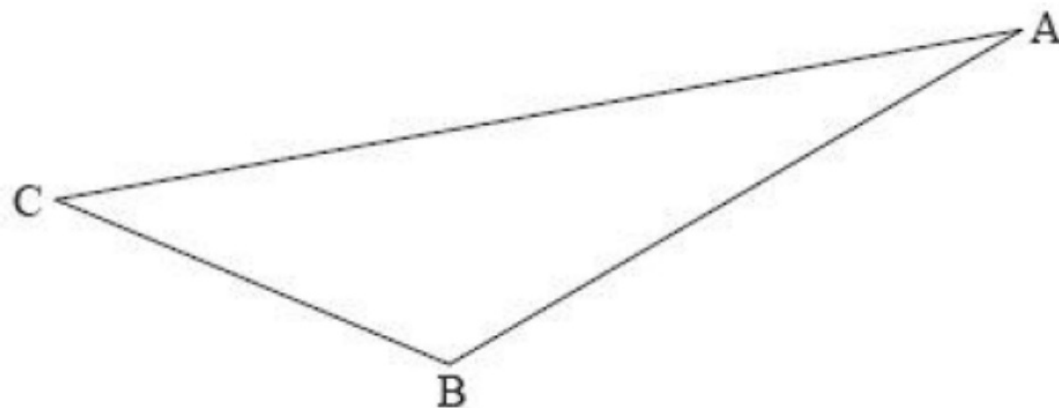
By the end of the class, I will be able to make vector calculations with quadrilaterals and triangles.

Today's language objective:

*I will sing a parallelogram song.

The following diagram shows the obtuse-angled triangle ABC such that

$$\vec{CB} = \begin{pmatrix} -3 \\ 0 \\ -4 \end{pmatrix} \text{ and } \vec{AC} = \begin{pmatrix} -2 \\ 2 \\ -6 \end{pmatrix}.$$



The point D is such that $\vec{CD} = \begin{pmatrix} -4 \\ 5 \\ p \end{pmatrix}$, where $p > 0$

(a) (i) Write down \vec{BA} .

(ii) Find \vec{BC} .

(b) (i) Find $\cos \hat{ABC}$.

(ii) Hence, find $\sin \hat{ABC}$.

(c) (i) Given that $|\vec{CD}| = \sqrt{50}$, show that

(ii) Hence, show that \vec{CD} is perpendicular to

The following diagram shows quadrilateral ABCD, with $\overline{AD} = \overline{BC}$, $\overline{AB} = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$ and $\overline{AC} = \begin{pmatrix} 4 \\ 4 \end{pmatrix}$.

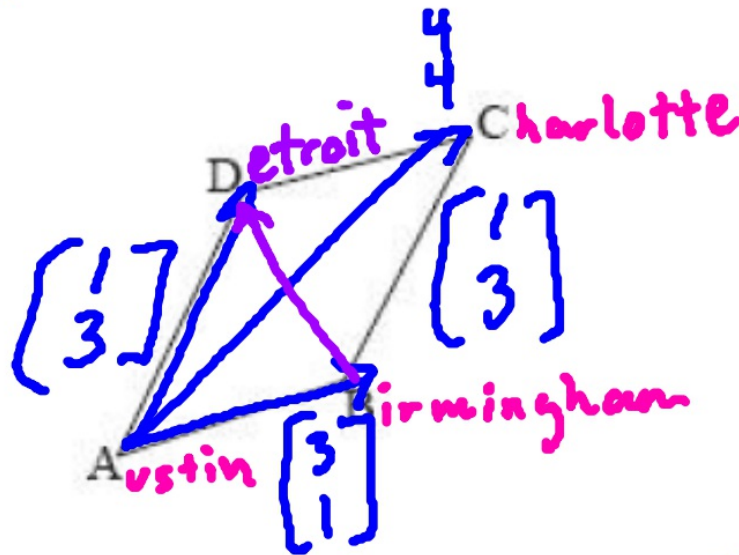


diagram not to scale

$$\cos \theta = \frac{v \cdot w}{|v||w|}$$

(6, 1)

(a) Find \overline{BC} . $\begin{bmatrix} 1 \\ 3 \end{bmatrix} = C - B$

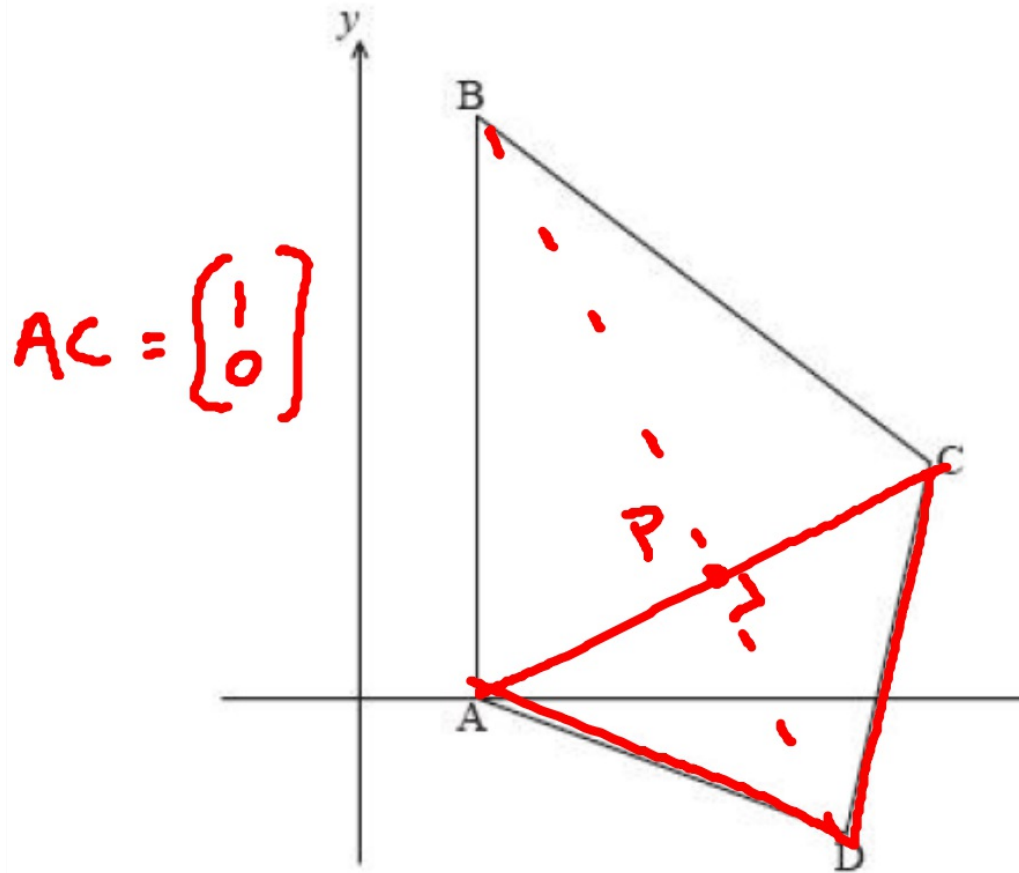
(b) Show that $\overline{BD} = \begin{pmatrix} -4 \\ 2 \end{pmatrix}$. $\begin{matrix} -4 \\ -4 \end{matrix}$

(c) Show that vectors \overline{BD} and \overline{CA} are perpendicular.

$$8 - 8 = 0$$

(Total)

Diagram shows quadrilateral ABCD with vertices A(1, 0), B(1, 5), C(5, 2) and D(4, -1).



(iii) Show that \overrightarrow{AC} is perpendicular to \overrightarrow{BD} .

The line (AC) has equation $r = u + sv$.

- (b) (i) Write down vector u and vector v .
(ii) Find a vector equation for the line (BD).

The lines (AC) and (BD) intersect at the point $P(3, k)$.

- (c) Show that $k = 1$.
(d) **Hence** find the area of triangle ACD.

diagram not to scale

(i) Show that $\overrightarrow{AC} = \begin{pmatrix} 4 \\ 2 \end{pmatrix}$.

i) Find \overrightarrow{BD} .