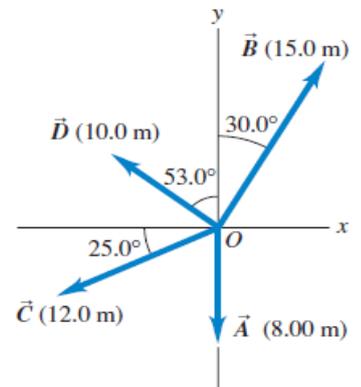


Homework Questions

Q1) According to the label on a bottle of salad dressing, the volume of the contents is 0.473 liter (L). Using only the conversions $1 \text{ L} = 1000 \text{ cm}^3$ and $1 \text{ in.} = 2.54 \text{ cm}$, express this volume in cubic inches.

Q2) With a wooden ruler you measure the length of a rectangular piece of sheet metal to be 12 mm. You use micrometer calipers to measure the width of the rectangle and obtain the value 5.98 mm. Give your answers to the following questions to the correct number of significant figures. (a) What is the area of the rectangle? (b) What is the ratio of the rectangle's width to its length? (c) What is the perimeter of the rectangle? (d) What is the difference between the length and width? (e) What is the ratio of the length to the width?

Q3) For the vectors \vec{A} and \vec{B} in Figure, use a scale drawing to find the magnitude and direction of (a) the vector sum $\vec{A} + \vec{B}$ and (b) the vector difference $\vec{A} - \vec{B}$. Use your answers to find the magnitude and direction of (c) $-\vec{A} - \vec{B}$ and (d) $\vec{B} - \vec{A}$.



Q4) Let the angle θ be the angle that the vector \vec{A} makes with the $+x$ -axis, measured counterclockwise from that axis. Find the angle θ for a vector that has the following components:

- (a) $A_x = 2.00 \text{ m}$, $A_y = -1.00 \text{ m}$; (b) $A_x = 2.00 \text{ m}$, $A_y = 1.00 \text{ m}$;
(c) $A_x = -2.00 \text{ m}$, $A_y = 1.00 \text{ m}$; (d) $A_x = -2.00 \text{ m}$, $A_y = -1.00 \text{ m}$.

Q5) (a) Find the scalar product of the two vectors \vec{A} and \vec{B} given in **Exercise 7**. (b) Find the angle between these two vectors.

Q6) Given two vectors $\vec{A} = -2.00\hat{i} + 3.00\hat{j} + 4.00\hat{k}$ and $\vec{B} = 3.00\hat{i} + 1.00\hat{j} - 3.00\hat{k}$, do the following. (a) Find the magnitude of each vector. (b) Write an expression for the vector difference $\vec{A} - \vec{B}$ using unit vectors. (c) Find the magnitude of the vector difference $\vec{A} - \vec{B}$. Is this the same as the magnitude of $\vec{B} - \vec{A}$? Explain.

Q7) As you eat your way through a bag of chocolate chip cookies, you observe that each cookie is a circular disk with a diameter of 8.50 ± 0.02 cm and a thickness of 0.050 ± 0.005 cm. (a) Find the average volume of a cookie and the uncertainty in the volume. (b) Find the ratio of the diameter to the thickness and the uncertainty in this ratio.

Q8) Two workers pull horizontally on a heavy box, but one pulls twice as hard as the other. The larger pull is directed at 25.0° west of north, and the resultant of these two pulls is 460.0 N directly northward. Use vector components to find the magnitude of each of these pulls and the direction of the smaller pull.

Q9) A spelunker is surveying a cave. She follows a passage 180 m straight west, then 210 m in a direction 45° east of south, and then 280 m at 30° east of north. After a fourth unmeasured displacement she finds herself back where she started. Use the method of components to determine the magnitude and direction of the fourth displacement. Draw the vector-addition diagram and show that it is in qualitative agreement with your numerical solution.