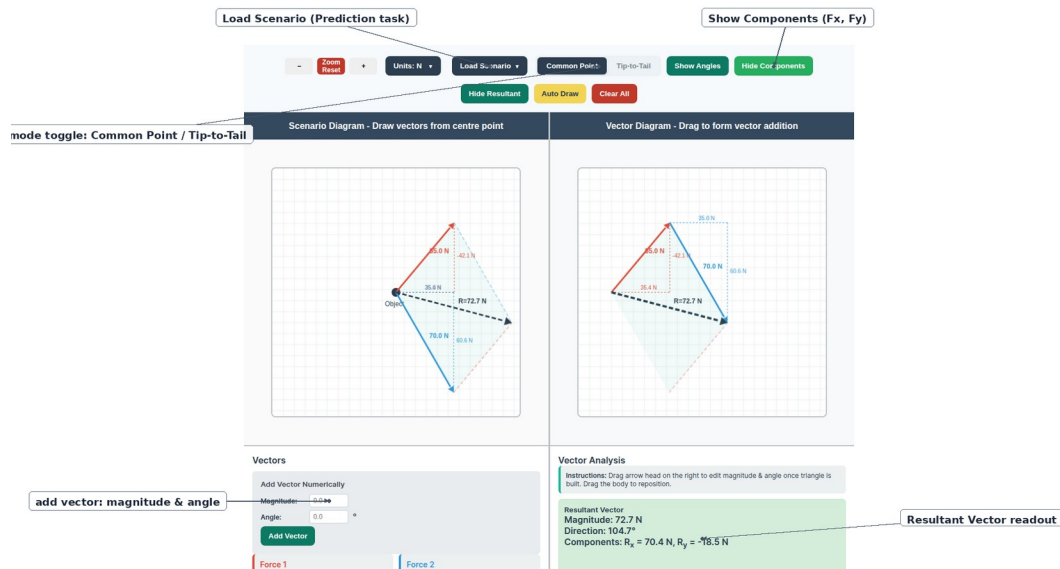


Vector Physics

Combining and Resolving Force Vectors

Aim:

You are investigating how the size and direction of two or more vectors combine to give a single resultant vector.



Prediction:

Open Load Scenario, choose Resultant Force, and click Hide Resultant so the resultant is hidden. Read the two force values given in the scenario description, then use a scale diagram or trigonometry on paper to predict the resultant's magnitude and direction.

predicted magnitude: N predicted direction: °

Now click Show Resultant and record the actual values, then compare.

actual magnitude: N actual direction: °

Method:

1. Click **Clear All** and set the mode toggle to **Common Point**. Using the **Magnitude** and **Angle** boxes under Add Vector Numerically, add two vectors of your own choice, then turn on **Show Components**.
2. Record each vector's magnitude, angle, Fx and Fy in Table 1 as Set 1. Then read the Resultant Vector box (magnitude, direction, Rx and Ry) and record it in Table 2 for Set 1.
3. Click Clear All and repeat for a second set of two vectors (Set 2), then a third set of three vectors (Set 3).
4. For Set 3, switch the mode toggle to **Tip-to-Tail** and press **Auto Draw**. Note what happens to the Resultant Vector box.

Results — vectors you added:

Set	vector	magnitude / N	angle / °	F _x / N	F _y / N

Results — resultant:

Set	magnitude / N	direction / °	R _x / N	R _y / N

Analysis:

For Set 1, add together the horizontal component (F_x) of each vector in Table 1 and compare your total with R_x in Table 2. Then use R_x and R_y to calculate the resultant's magnitude with Pythagoras' theorem, $\text{magnitude} = \sqrt{R_x^2 + R_y^2}$, and compare with the Magnitude the sim gives directly. Repeat both checks for Set 2.

.....

.....

.....

.....

In Set 3, compare the magnitude and direction you found in Common Point mode with the value found in Tip-to-Tail mode using Auto Draw. What do you notice? Why do you think this stays the same no matter what order the vectors are drawn tip-to-tail?

.....

.....

.....