\[ \vec{N} = 5\text{m} @ 35^\circ \]
\[ \vec{K} = 7\text{m} @ 22^\circ \]
\[ \vec{N} + \vec{K} = ? \]

Two vectors, \( \vec{A} \) and \( \vec{B} \) have maximum magnitude 4 and 5, and unknown direction.

What is the maximum possible value of \( \vec{A} + \vec{B} \)?

Minimum?

A ball is launched off a cliff. When is the \( y \)-component of velocity the largest?

A ball rolls off the edge of a table at a rate of 8 m/s. How tall is the table if it lands 2.5 m away on the floor?

What is the final velocity hitting the floor?

A ball is launched with velocity \( V \) at an angle \( \theta \) from a height \( h \). In terms of \( V, \theta, \) and \( h \):

* What is the velocity at the ball's highest point?

* How much time does the ball spend in the air?

A baseball player hits a ball at a 45° angle to make a home run. If the field is 120 m and the back fence is 2 m above bat height, what speed must the ball come off the bat?
1. \[ \tan \theta = \frac{5.49}{10.6} \]
2. \[ R = \sqrt{10.6^2 + 5.49^2} \]
   \[ R = 11.9 \text{ m} \]
3. \[ \theta = \tan^{-1} \left( \frac{5.49}{10.6} \right) \]
   \[ \theta = 27.38^\circ \]
4. In this case at the end of its flight, if ball was launched from land on the ground, then
   \[ V_y = -V_y \]
5. \[ V_x = 8 \text{ m/s} \]
6. \[ V_x = \frac{dx}{dt} \]
   \[ dx = 2.5 \text{ m} \]
   \[ t = \frac{2.5}{8} \]
   \[ t = 0.313 \text{ s} \]
7. \[ dy = \frac{1}{2} a t^2 \]
   \[ dy = \frac{1}{2} (-9.8 \text{ m/s}^2) (0.313)^2 \]
   \[ dy = 0.48 \text{ m} \]
8. \[ V = \sqrt{8.57^2 + 3.07^2} \]
   \[ V = 9.17 \text{ m/s} \]
9. \[ \theta = \tan^{-1} \left( \frac{3.07}{8.57} \right) \]
   \[ \theta = 21^\circ \text{ below } N \]
10. \[ \mathbf{\text{on back}} \]
\[ a) \quad V \\
\]

\[ b) \quad \begin{align*}
V_y &= V_i t + \frac{1}{2} a t^2 \\
\Delta y &= \frac{V_i t^2}{2} + \frac{1}{2} a t^2
\end{align*} \]

\[ t = \sqrt{\frac{2 \Delta y}{a}} \]

\[ t = \sqrt{\frac{2(h)}{g}} \]

\[ \Delta x = V \cos 45 \]

\[ \Delta x = 120 \]

\[ t = \frac{120}{V \cos 45} \]

\[ \Delta y = V_i t + \frac{1}{2} a t^2 \]

\[ r = (V \sin 45 \left( \frac{120}{V \cos 45} \right) + \frac{1}{2} (-9.8) (\frac{120}{V \cos 45})^2 \]

\[ r = 120 + \frac{(-4.9)(14400)}{V^2 (\cos 45)^2} \]

\[ -18 = \frac{14400}{V^2} \]

\[ \sqrt{V^2} = \sqrt{\frac{14400}{-18}} \]

\[ V = 34.6 \text{ m/s} \]