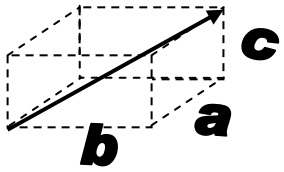
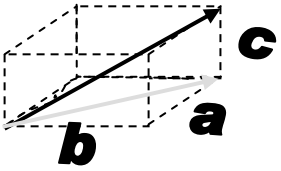
3-D Vectors!

So far we've found the length of a vector $\vec{v} = a\vec{i} + b\vec{j}$ using the Pythagorean Theorem, $\left\|\vec{v}\right\| = \sqrt{a^2 + b^2}$. In other words we found the length when $\vec{v}$ is 2-dimensional. But we live in a 3-dimensional world. So, can we come up with a formula to find $\left\|\vec{v}\right\|$ when $\vec{v} = a\vec{i} + b\vec{j} + c\vec{k}$ (3-dimensional)?

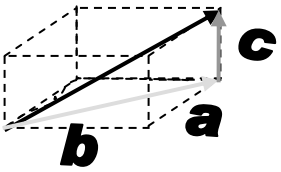


1. Look at the bottom of the box.
   What is the length of the light gray vector?



2. Look at the edge of the box.
   What is the length of the dark gray vector? (The length is a variable.)

   Look at the triangle formed by the black vector, light gray vector and the dark gray vector. Do you believe that it's a right triangle?



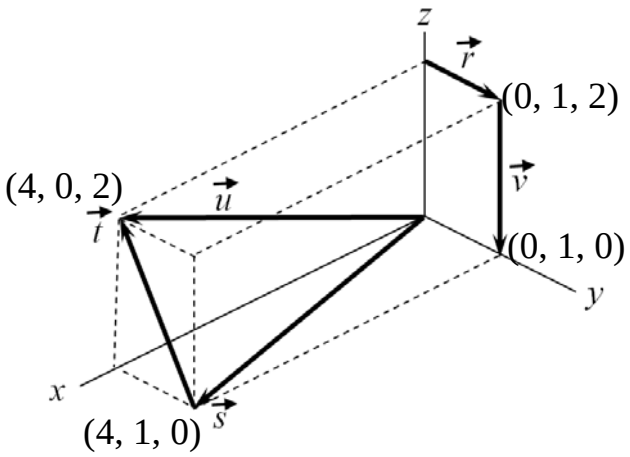
3. Now that you know the length of the light vector (problem #1) and the length of the dark gray vector (problem #2), what is the length of the black (3-dimensional) vector?
   Hint: Use the Pythagorean Theorem since the three vectors form a right triangle.

To summarize:

When you have a 3-dimensional vector, $\vec{v} = a\vec{i} + b\vec{j} + c\vec{k}$, you can find its length, $\left\|\vec{v}\right\|$, by:

$\left\|\vec{v}\right\|$ = _____

1. Find the vectors below and their magnitudes.



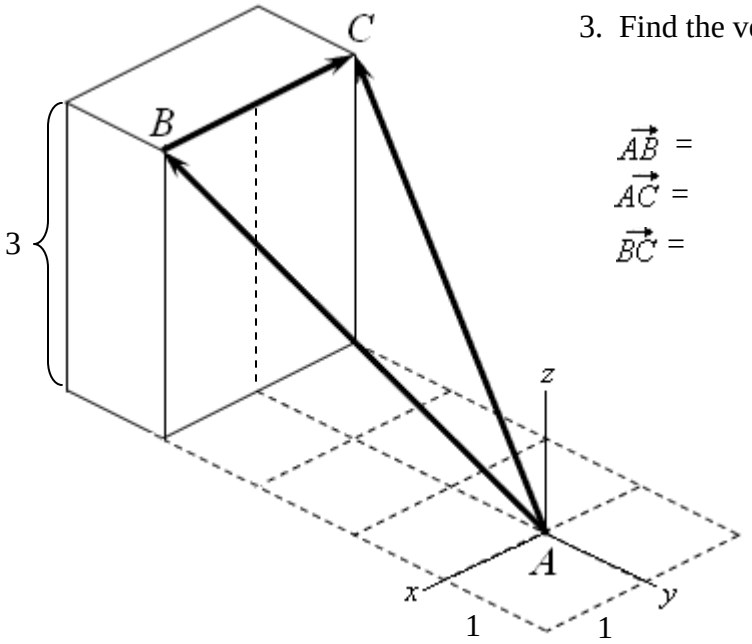
$\vec{r}$ = $\|\vec{r}\|$ =

$\vec{s}$ = $\|\vec{s}\|$ =

$\vec{t}$ = $\|\vec{t}\|$ =

$\vec{u}$ = $\|\vec{u}\|$ =

$\vec{v}$ = $\|\vec{v}\|$ =



3. Find the vectors and their magnitudes.

$\vec{AB}$ = $\|\vec{AB}\|$ =

$\vec{AC}$ = $\|\vec{AC}\|$ =

$\vec{BC}$ = $\|\vec{BC}\|$ =

2. Find the vectors $\vec{AB}$, $\vec{BC}$, $\vec{CD}$, $\vec{DA}$, $\vec{AH}$, $\vec{HE}$, $\vec{EF}$, $\vec{FG}$, $\vec{GB}$, $\vec{BE}$, and $\vec{AF}$ and their magnitudes.