**Mathematical Concepts and Vectors**

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Symbol</th>
<th>Exponent</th>
</tr>
</thead>
<tbody>
<tr>
<td>giga</td>
<td>G</td>
<td>$10^9$</td>
</tr>
<tr>
<td>mega</td>
<td>M</td>
<td>$10^6$</td>
</tr>
<tr>
<td>kilo</td>
<td>k</td>
<td>$10^3$</td>
</tr>
<tr>
<td>centi</td>
<td>c</td>
<td>$10^{-2}$</td>
</tr>
<tr>
<td>milli</td>
<td>m</td>
<td>$10^{-3}$</td>
</tr>
<tr>
<td>micro</td>
<td>μ</td>
<td>$10^{-6}$</td>
</tr>
<tr>
<td>nano</td>
<td>n</td>
<td>$10^{-9}$</td>
</tr>
</tbody>
</table>

1 in = 2.540 cm
1 m = 100 cm = 3.281 ft
1 mi = 5280 ft = 1609 m
1 hr = 3600 s
1 day = 86,400 s
1 year = 365.25 days

⇒ when converting between units, you multiply by conversion factors that equal 1

ex: $1.0 \frac{m}{s} = 1.0 \frac{m}{s} \left( \frac{1 \text{mi}}{1609 \text{m}} \right) \left( \frac{3600 \text{s}}{1 \text{hr}} \right) = 2.24 \frac{\text{mi}}{\text{hr}}$

**Trig Review:**

Pythagorean theorem: $a^2 + b^2 = c^2$

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\[
\sin = \frac{\text{opposite}}{\text{hypotenuse}} \quad \cos = \frac{\text{adjacent}}{\text{hypotenuse}} \quad \tan = \frac{\text{opposite}}{\text{adjacent}}
\]

**Adding Vectors Graphically:**

1) Draw the first vector to the correct length and in the correct direction.
2) Draw the second vector (correct length and direction) starting at the tip of the first
3) The resultant vector starts at the tail of the first vector and ends at the tip of the second

**Adding Vectors Analytically:**

1) Break each vector up into x- and y-components.
2) Add all x-components together to find $R_x$. Add all y-components together to find $R_y$.
3) Find the magnitude and direction of the resultant vector:

\[
R = \sqrt{R_x^2 + R_y^2}
\]

\[
\theta = \tan^{-1} \left( \frac{R_y}{R_x} \right)
\]

4) Check that the angle is in the correct quadrant (if not add 180°) and that your magnitude seems reasonable.