Propagation of errors is done as follows. If you have two quantities $x$ and $y$, each with associated statistical errors $\sigma_x$ and $\sigma_y$ respectively, then the errors propagate to the sum and difference as the sum of the error, whereas they propagate to the product and quotient as percent errors. That is,

\[
\begin{align*}
\sigma_{x+y} &= \sigma_x + \sigma_y, \\
\sigma_{x-y} &= \sigma_x + \sigma_y,
\end{align*}
\]

whereas

\[
\begin{align*}
\frac{\sigma_{xy}}{xy} &= \frac{\sigma_x}{x} + \frac{\sigma_y}{y}, \\
\frac{\sigma_{x/y}}{x/y} &= \frac{\sigma_x}{x} + \frac{\sigma_y}{y}.
\end{align*}
\]

(Note - These formulas can easily be calculated using calculus, using the differential as the associated error of a quantity. From that point of view, the above formulas are simply equivalent to the chain rule. If you do not know calculus, just ignore this comment.) Below some examples are given for error propagation.

Applying these rules to special cases, for our first example we take a case of trajectory motion. Suppose we have measured the distance $x$ that a projectile travels, using several trials and we calculated the average $\bar{x}$ and the standard deviation $\sigma_x$ for these trials. Suppose we know the time of flight, by knowing the height (assume we know it precisely, with no associated error) from which the projectile drops. Then using the product relation above, we could find the standard deviation associated with the velocity derived from $v = \frac{x}{t}$, by using the propagation of products;

\[
\sigma_v = v\left(\frac{\sigma_x}{x} + \frac{\sigma_t}{t}\right) = v\frac{\sigma_x}{\bar{x}},
\]

where the last step follows because $\sigma_t = 0$. Then using $\bar{x} = vt$ we get

\[
\sigma_v = \frac{1}{t}\sigma_x.
\]

For our second example, suppose we are measuring the time it takes for a cart to roll down an inclined plane, and we know the length and the angle of the inclined plane. We then calculate the acceleration using $s = \frac{1}{2}at^2$ where $s$ is the distance traveled. Using the formula above for propagation of errors for a product, and that we have no errors associated with the distance, we get

\[
\sigma_a = 2\frac{a}{t}\sigma_t = 4\frac{s}{t^3}\sigma_t,
\]

where in the last step, the relation $s = \frac{1}{2}at^2$ was used.