Using Mathematica's Around[ ] function for Uncertainties

In[170]:=
```
Clear["Global`*"]; SetDirectory[NotebookDirectory[]]; DateString[]
```

Out[170]=
```
Thu 19 Feb 2026 11:53:18
```

Consider this data from the Torsional Oscillator Experiment.

In[171]:=
```
{ω0, δω0} = {4.41458, 3 * 10 ^ (-5)};
{ωv, δωv} = {4.40803, 2 * 10 ^ (-5)};
{γ, δγ} = {0.4359, 1 * 10 ^ (-4)};
```

You can use the Around function to express the number with its uncertainty.

In[174]:=
```
Around[ω0, δω0]
```

Out[174]=
```
4.414580 ± 0.000030
```

Here is the function for computing Q

In[175]:=
```
Q[ω0_, γ_] := ω0 / γ
```

You can also use the 'Around' function to do calculations with uncertainty.

In[176]:=
```
Q[Around[ω0, δω0], Around[γ, δγ]]
```

Out[176]=
```
10.1275 ± 0.0023
```

Or, calculating the uncertainty the long way:

In[177]:=
$$Q[\omega 0, \gamma] * \text{Sqrt}\left[\left(\frac{\delta\omega 0}{\omega 0}\right)^2 + \left(\frac{\delta\gamma}{\gamma}\right)^2\right]$$

Out[177]=
```
0.00232437
```

This also works for messier equations, such as that for finding Q from the difference of the two frequencies as long as the uncertainties are all "small".

In[178]:=
```
Clear[Q1]
```
$$Q1[\omega 0\_, \omega v\_] := \frac{\omega 0}{2 \text{ Sqrt}[\omega 0^2 - \omega v^2]}$$

In[180]:=
```
Q1[ω0, ωv]
```

Out[180]=
```
9.18206
```

In[182]:=
```
myQ = Q1[Around[ω0, δω0], Around[ωv, δωv]]
```

Out[182]=

9.182 ± 0.025

You can extract parts of an Around object with the "Value" and "Uncertainty" keys:

In[183]:=
```
myQ
```

Out[183]=

9.182 ± 0.025

In[184]:=
```
myQ["Value"]
```

Out[184]=

9.18206

In[185]:=
```
myQ["Uncertainty"]
```

Out[185]=

0.0252794