Sample Calculation for Phys Lab 110, 114: Required Presentation for all calculations:

For a rectangle of wood , of area (A), and Length (L), as specified below, find the Width (W).
$L = (55.4 \pm 0.3)cm \quad A = (2045 \pm 22)cm$
Generally, we have
$L = \bar{L} \pm \Delta L \ \ and\ A = \bar{A} \pm \Delta A\ where\ \bar{L}\ ,\bar{A}\ are\ the\ best\ estimates, \Delta L, \Delta A\ are\ the\ uncertainties$
Therefore $\bar{L} = 55.4cm\ and\ \Delta L = 0.3cm \quad \bar{A} = 2045cm^2\ and\ \Delta A = 22cm^2$
Generally, we have: $A = L * W$
We need a Working Equation for what we are trying to find, which is W in this case. Therefore we must solve for W, and write the equation using the best estimates:
$\bar{W} = {\bar{A}}/{\bar{L}}$ The working equation for the uncertainty in this case is:$\Delta W = \bar{W}({\Delta A}/{\bar{A}} + \ {\Delta L}/{\bar{L}})$

[*Write the working equation for the best estimate*]
$\bar{W} = {\bar{A}}/{\bar{L}}$

[*Substitute the units only, then solve for the result units*]
$= \dfrac{cm^2}{cm} = cm$
[*Substitute the best estimates on the RHS to one sig fig, then solve to one sig fig for a rough value*]
$\approx \dfrac{2000}{60} \approx 30$
[*Substitute the best estimates on the RHS precisely, then solve precisely (keeping many sig figs)*]
$= \dfrac{2045}{55.4} = 36.913357$
[*Write the working equation for the uncertainty*]
$\Delta W = \bar{W}({\Delta A}/{\bar{A}} + \ {\Delta L}/{\bar{L}})$
[*Substitute the units only, then solve for the result units*]
$= cm\left(\dfrac{cm^2}{cm^2} + \dfrac{cm}{cm}\right) = cm$
[*Substitute the uncertainties on the RHS to one sig fig, then solve to one sig fig for a rough value*]
$\approx 40(\dfrac{20}{2000} + \dfrac{0.3}{60}) \approx 0.6$
[*Substitute the uncertainties on the RHS to two sig fig, then solve to two sig fig for a good value*]
$\approx 37(\dfrac{22}{2000} + \dfrac{0.3}{55}) \approx 0.61$

Now write the resultant value of $W = \bar{W} \pm \Delta W$ in proper final form. Follow these steps:
[*Write the form with space for the result and uncertainty, and put in the units*]
$W = (\qquad \pm \quad) \qquad cm$
[*N ow put in the uncertainty in the proper form, carrying the power of 10 outside the bracket*]
$W = (\qquad \pm 6.1)10^{-1}cm$
[*N ow divide the best estimate by the power of 10 outside the bracket , and truncate to one decimal place*]
$W = (\quad 369.1 \pm 6.1)10^{-1}cm$
[*The final result must have 2 sig figs in the uncertainty, and matching decimal places in the best estimate. No powers of ten or units may be inside the bracket*]