Example #1:

0.40 mol of $PCl_5(g)$ is placed in a 15.0 L flask and allowed to equilibriate (allowed to reach equilibrium) according to this equilbrium reaction:

$$PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$$

At equlibrium, the concentration of $Cl_2(g)$ is found to be 0.01 mol/L. Use this information to determine k_{eq} for this reaction. (Hint: What this means is find all final concentrations and then use this to determine k_{eq})

	PCl_5 $\rightleftharpoons$	PCl_3 +	Cl_2
Initial [ ]			
Initial Amount	0.40 mol	$\emptyset$	$\emptyset$
Final Amount	0.40 - 0.15 = 0.25 mol (3)	(2) 0.15 mol	(1) 0.15 mol
Final [ ]	(4) 0.016 mol/L	(5) 0.01 mol/L	0.01 mol/L

15 L flask

(1) n = CV
n = 0.01 mol/L x 15 L
n = 0.15 mol

(2) $0.15 \text{ mol } Cl_2 \text{ x } \frac{1 \text{ mol } PCl_3}{1 \text{ mol } Cl_2} = 0.15 \text{ mol } PCl_3$

(3) $0.15 \text{ mol } Cl_2 \text{ x } \frac{1 \text{ mol } PCl_5}{1 \text{ mol } Cl_2} = 0.15 \text{ mol } PCl_5$

(4) and (5) $C = \frac{n}{V}$

$$k_{eq} = \frac{[PCl_3][Cl_2]}{[PCl_5]}$$

$$k_{eq} = \frac{(0.01)^2}{0.016}$$

$$k_{eq} = 0.00625$$