Ex. 1) $Cr(NO_3)_3 + NaOH \rightarrow Cr(OH)_3 + NaNO_3$

First make a list of all of the elements on each side and their amounts.

1 Cr	**1 Cr**
3 N (one N X 3)	**1 N**
9 + 1 = 10 O (3 O's X 3) + 1 O in NaOH	**3 + 3 = 6 O** (1 O X 3) + 3 O's in $NaNO_3$
1 Na	**1 Na**
1 H	**3 H** (1 H X3)

Either the N or the H needs fixed. Do not fix the oxygen, since they are everywhere.

3 N $\quad$ **<u>3</u>**(1 N) = 3 N

Multiply the 1 N by 3 to get three total on each side.
The 3 that is multiplied goes in the front of the compound containing the N.

$Cr(NO_3)_3 + NaOH \rightarrow Cr(OH)_3 + \underline{\mathbf{3}}\ NaNO_3$

<u>This 3 we added will now be multiplied through the compound: 3 X 1Na = 3 Na, 3 X 1N = 3 N, 3 X 3O's = 9 O.</u>

Again make a list of all elements and their amounts.

$Cr(NO_3)_3 + NaOH \rightarrow Cr(OH)_3 + \underline{\mathbf{3}}\ NaNO_3$

1 Cr	**1 Cr**
3 N (one N X 3)	**3 N** (3 X 1 N)
9 + 1 = 10 O (3 O's X 3) + 1 O in NaOH	**3 + 9 = 12 O** (1 O X 3) + (3 X 3 O's)
1Na	**3 Na** (3 X 1 Na)
1 H	**3 H** (1 H X3)

Either the Na or the H need fixed, O should be saved for last, since it is everywhere.
Multiply the Na by 3, so there will be 3 on each side.

<u>3</u>(1Na) = 3 Na $\quad$ 3 Na

The 3 that is multiplied goes in the front of the compound.

$\mathbf{Cr(NO_3)_3 + \underline{3}\ NaOH \rightarrow Cr(OH)_3 + 3\ NaNO_3}$

<u>This 3 we added will now be multiplied through the compound: 3 X 1Na = 3 Na, 3 X 1 O = 3 O, 3 X 1 H = 3 H.</u>

1 Cr	**1 Cr**	
3 N	**3N**	
9 O + 3 O= 12 O	**3 O + 9 O = 12 O**	
3 Na	**3 Na**	
3 H	**3 H**	balanced

Ex. 2) $Na_2CO_3 + AlI_3 \rightarrow NaI + Al_2(CO_3)_3$

2 Na	1 Na
1 C	3 C
	(1 C X 3 = 3)
3 O	9 O
	(3 O's X 3 = 9)
1 Al	2 Al
3 I	1 I

Fix either Na or Al first. (Start with the positive metals and then move to other elements.) To fix Na we need to multiply by 2 on the right side.

2 Na   **<u>2</u>** (1 Na) = 2 Na

The 2 that is multiplied goes in the front of the compound.

$Na_2CO_3 + AlI_3 \rightarrow \underline{\mathbf{2}}\ NaI + Al_2(CO_3)_3$

<u>This 2 we added will now be multiplied through the compound: 2 X 1Na = 2 Na, 2 X 1 I = 2 I.</u>

2 Na	2 Na
1 C	3 C
3 O	9 O
1 Al	2 Al
3 I	2 I

Now let's fix Al, by multiplying the left Al by 2.

<u>2</u> (1 Al) = 2 Al   2 Al

The 2 that is multiplied goes in the front of the compound.

Na_2CO_3 + **2** $AlI_3 \rightarrow$ 2 NaI + $Al_2(CO_3)_3$

This 2 we added will now be multiplied through the compound: 2 X 1 Al = 2 Al, 2 X 3 I = 6 I.

2 Na	2 Na
1 C	3 C
3 O	9 O
2 Al	2 Al
6 I	2 I

Next fix C or O or I. If we fix C, we need to multiply the C on the left by 3.

3 (1 C) = 3 C 3 C

The 3 that is multiplied goes in the front of the compound.

This 3 we added will now be multiplied through the compound: 3 X 2Na = 6 Na, 3 X 1 C = 3 C, 3 X 3 O = 9 O.

3 Na_2CO_3 + 2 $AlI_3 \rightarrow$ 2 NaI + $Al_2(CO_3)_3$

6 Na	2 Na
3 C	3 C
9 O	9 O
2 Al	2 Al
6 I	2 I

Now fix either the Na or the I. We already have a 2 in front of NaI, which is not working. We have two choices. We can either multiply that 2 by some number to fix it or we can get rid of the 2 and put a number there that works. ****We can get rid of the 2 in front of the NaI, since it is not part of the compound. (We put that number there back in the 1st step, so we can change it.) **** In this case it will probably be easier to multiply the 2 by 3 making 6, which will fix both the Na and the I.

6 Na 3(2 Na) = 6 Na

3 X 2 = **6** and this **6** needs to go in front of the NaI

3 Na_2CO_3 + 2 $AlI_3 \rightarrow$ **6** NaI + $Al_2(CO_3)_3$

6 Na	6 Na	
3 C	3 C	
9 O	9 O	
2 Al	2 Al	
6 I	6 I	It is now balanced!

Counting with parenthesis:

3 $Ca(NO_3)_2$

3 X 1 Ca = 3 Ca

3 X (1 N X 2 = 2N inside the parenthesis)
3 X 2 = 6 N total

3 X (3 Oxygen X 2 = 6 Oxygen inside the parenthesis)
3 X 6 = 18 Oxygen total

<u>*End of Notes*</u>