









Step 3. DOF analysis on each subunit					
Subunit	Unknowns	# unknowns	# balance eqns.	# other relations	DOF
Unit 1					
Splitter					
Unit 2					
Mixer					
Overall					
L	1	1	1	1	













Subunit	Unknowns	# unknowns	# balance eqns.	# other relations	DOF
Unit 1	m _{A,1} ,m _{B,1}	2	2		0
Mixer	m _{A,1} ,m _{B,1} , m _{A,2} ,m _{B,2}	4	2		2
Unit 2	m _{A,2} ,m _{B,2} m _{A,3} ,m _{B,3}	4	2		2
Overall	m _{A,3} ,m _{B,3}	2	2		0

Solution Strategy

- Start with units that have DOF = 0
- Cross out unknowns on table as they are solved for
- · Systematically work through all units
- You should never need to solve more than a couple of simultaneous equations at a time

Devise a solution strategy using the DOF table from the previous slide.

Now Do the DOF Analysis

Subunit	Unknowns	# unknowns	# balance eqns.	# other relations	DOF
Unit 1	m _{A,1} ,m _{B,1}	2	2		0
Mixer	m _{A,1} ,m _{B,1} , m _{A,2} ,m _{B,2}	4	2		2
Unit 2	m _{A,2} ,m _{B,2} m _{A,3} ,m _{B,3}	4	2		2
Overall	m _{A,3} ,m _{B,3}	2	2		0





Work on Board in Class



What if no unit has DOF = 0?

- Write down equations- sometimes you can solve for a portion of the unknowns even if you can't solve for all of them for a given unit
- Check your other relations- sometimes a relationship associated with one unit can be used to permit the solution of another unit
- Consider grouping units. For example, two units connected by a stream of unknown composition can sometimes be grouped together to permit solution







Subunit	Unknowns	# unknowns	# balance eqns.	# other relations	DOF
Unit 1	A,B,C, X _{ci} (4 of 5)	8	5	0	3
Unit 2	C,D,E, X _{ci} (4 of 5)	8	5	0	3
Overall	A,B,D,E	4	5	0	-1