

1. What are the methods of Jefferson, Adams, and Webster?
2. Apply *Jefferson's* method to find the final apportionment of the 225 nurses from our old example (reproduced below).

The methods of Jefferson, Adams, and Webster require trial and error; do scratchwork below the table. Keep a running summary of the trials.

State a modified standard divisor (MSD) that works. Fill in the table.

Shift	Avg. # patients	SQ	LQ	MSQ	MLQ	App't
A	871	72.58	72			
B	1029	85.75	85			
C	610	50.83	50			
D	190	15.83	15			
Total	2700	224.99	222			

(OVER)

3. Chapter 4, Problems 5 & 25: The Republic of Tropicana has 23.8 million people. Legislative seats are apportioned to the five states A, B, C, D, and E according to their populations.
- (a) Given the standard quotas in the table below, how many seats are in the Tropicana Legislature?
- (b) What is the standard divisor?
- (c) Calculate the population of each state, and enter it in the table below.
- (d) Apply *Adams'* method to find the final apportionment. Note the modified *upper* quota (MUQ) is now a relevant concept. Keep a running summary of the trials.

State a modified standard divisor (MSD) that works. Fill in the table.

State	Population	SQ	UQ	MSQ	MUQ	App't
A		40.50				
B		29.70				
C		23.65				
D		14.60				
E		10.55				
Total						

4. Apply *Webster's* method to find the final apportionment of the 225 nurses. Note the modified *rounded* quota (MRQ) is now a relevant concept. Keep a running summary of the trials.

State a modified standard divisor (MSD) that works. Fill in the table.

Shift	Avg. # patients	SQ	RQ	MSQ	MRQ	App't
A	871	72.58	73			
B	1029	85.75	86			
C	610	50.83	51			
D	190	15.83	16			
Total	2700	224.99	226			

(OVER)

5. **Quota rule:** A subgroup's apportionment should always be either its upper quota or its lower quota.

See §4.9 for discussions of upper quota and lower quota violations. Example 9 shows an example of how the quota rule can be violated.

Drawback	Hamilton	Jefferson	Adams	Webster
Violates quota rule				
Alabama paradox				
Population paradox				
New-states paradox				

6. **Balinski and Young's Impossibility Theorem:** There are no perfect apportionment methods. Any apportionment method that does not violate the quota rule must produce a paradox, and any apportionment method that does not produce paradoxes must violate the quota rule.