

Review Apportionment

Vocabulary:

1. What are the 4 methods of apportionment and what sets them apart from the others?

- Hamilton: give leftovers to highest decimal
- Jefferson: change divisor until truncated quotas sum to # items being apportioned
- Webster: divide by I.R. then round by arithmetic mean
- Hill: " " " " " " geometric mean

2. How do you find the ideal ratio? sum of populations ÷ # items apportioned

3. How do you find quotas? each population ÷ I.R.

4. Define Truncating drop decimal

5. Define Fair Share Everyone gets what they think is fair

6. Define Apportionment Distribution (or allotment) into shares

7. Define Modified Divisor changing the I.R.

8. How do you find a modified quota? population ÷ modified divisor

9. How do you find geometric mean? square root of the product of two integers

Problems:

1. Jim, Kim and Andy are heirs to an estate that has a car, boat, house and \$300,000 cash.

	Car	Boat	House
Jim	10000	6000	125000
Kim	9000	7500	129000
Andy	8000	7200	130000

$$\frac{141000 + \text{cash}}{3} = 147000$$

$$\frac{145500 + \text{cash}}{3} = 148500$$

$$\frac{145200 + \text{cash}}{3} = 148400$$

- List items received.
- Find each person's fair share.
- Find the amount of cash owed / received to equal the fair share.
- What is the final settlement?

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32. Christian, Sam and Shimee wish to divide up the following items.

	Christian	Sam	Shimee
Tractor	\$20,000	\$18,000	\$15,000
Excavator	\$46,000	\$42,000	\$35,000
8 family portraits	\$3,000	\$2,000	\$4,000
Horse farm	\$201,000	\$190,000	\$180,000

- List items received.
- Find each person's fair share.

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c. Find the amount of cash owed / received to equal the fair share.

d. What is the final settlement?

3. Johnny's school for the Tired has 956 freshman, 760 sophomores, 440 juniors and 344 seniors. There are 25 seats on the student council. Determine the number of seats for each class using the following methods.

a. Find the ideal ratios = $\frac{2500}{25} = 100$

b. Find the quotas 9.56 7.6 4.4 3.44

c. Apportion using Hamilton's Method

d. Apportion using Jefferson's method

b. Apportion using Hill's method

f. Apportion using Webster's method.

10 8 4 3

10 8 4 3

4. Imagine there are 24 seats to be divided up among 4 states whose populations are 59,000, 26,500, 16,500 and 6,000.

a. Find the ideal ratios = $\frac{108000}{24} = 4500$

b. Find the quotas 13.11 5.89 3.67 1.33

d. Apportion using Hamilton's Method

d. Apportion using Jefferson's method (16500 ÷ 4) = 4125

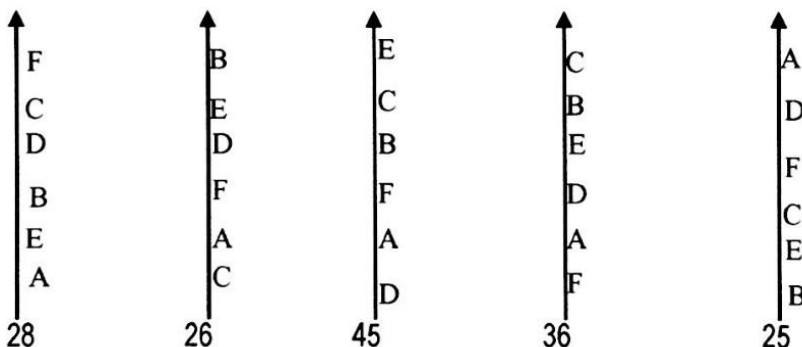
c. Apportion using Hill's method

f. Apportion using Webster's method.

13 6 4 1

13 6 4 1

Review: Voting Theory



1. Find the Plurality Winner. C

2. Borda winner. C (on back)

3. Run-off C

4. Sequential run off E (on back)

5. Condorcet C

Run-off: E vs C

	45	36	
(from B)	26	25	(from A)
	<u>28</u>	28	(from F)
	71	89	

A vs B = B

25	36
45	26
28	28

B vs C = C

26	25
36	45
28	28

C vs A = C

36	25
45	26
28	

C vs D = C

36	25
45	26
28	

C vs E = C

25	45
36	26
28	

#11

$$\begin{array}{r}
 \text{Jim} \\
 141000 \\
 + 300000 \\
 \hline
 441000 \\
 \div 3 \text{ people} \\
 \hline
 147000
 \end{array}$$

$$\begin{array}{r}
 \text{Kim} \\
 145500 \\
 + 300000 \\
 \hline
 445500 \\
 \div 3 \\
 \hline
 148500
 \end{array}$$

$$\begin{array}{r}
 \text{Andy} \\
 145200 \\
 + 300000 \\
 \hline
 445200 \\
 \div 3 \\
 \hline
 148400
 \end{array}$$

Fair Share: 147000

$$\begin{array}{r}
 - 10000 \text{ (car)} \\
 \hline
 137000 \\
 + 1200 \text{ (bonus)} \\
 \hline
 138200
 \end{array}$$

Final settlement and car

$$\begin{array}{r}
 - 7500 \text{ (boat)} \\
 \hline
 141000 \\
 + 1200 \\
 \hline
 142200
 \end{array}$$

and boat

$$\begin{array}{r}
 - 130000 \text{ (house)} \\
 \hline
 18400 \\
 + 1200 \\
 \hline
 19600
 \end{array}$$

and house

Estate

$$\begin{array}{r}
 300,000 \text{ (start)} \\
 - 137,000 \\
 - 141,000 \\
 - 18,400 \\
 \hline
 3,600
 \end{array}$$

Sum of value of items

Christian

Sam

Shimee

270,000

252,000

234,000

+ 0 (cash)

270,000

÷ 3 (people)

÷ 3
84,000

÷ 3
78,000

190,000

- 267,000

- 0

- 4,000

Fair Share

- 177,000

+ 84,000

+ 74,000

cash owed/received

+ 6,333.33 (bonus)

+ 6,333.33

+ 6,333.33

- \$170,666.67

+ \$90,333.33

+ \$80,333.33

Final Settlement

and tractor, excavator, and farm

and no items

and family portraits

Estate

0

+ 177,000

- 84,000

- 74,000

19,000

÷ 3 heirs