LESSON MAKER PRO

Seats by Spreadsheet

Use quotas to divide seats fairly.

HIGH SCHOOL · FM.FDV.A.28

FM.FDV.A.28 "Use spreadsheets to examine apportionment methods in large problems."

NAME _____ DATE _____

HAMILTON'S METHOD

Multiply each group's share of the total population by the number of seats to find its quota. Give each group the whole-number part of its quota, then award leftover seats to the largest fractional parts. In a spreadsheet, keep the total and seat-count cells fixed when you fill a quota formula down.

WORKED EXAMPLE

Divide 10 seats among these clubs using Hamilton's method. The member counts are in spreadsheet cells B2:B4.

CLUB MEMBERS

Row and club	B: Members
2 Art	120
3 Music	230
4 Tech	150

1. Total members: 500. Put 10 in F1 and 500 in F2.
2. Enter =B2*$F$1/$F$2, then fill down. Quotas: 2.4, 4.6, 3.
3. Whole-number seats: 2, 4, 3. Music has the largest fractional part.

Answer: Art: 2 seats; Music: 5 seats; Tech: 3 seats.

PRACTICE 4 problems

1 Cell C2 holds a quota of 2.75. Write a spreadsheet formula for its fractional part.

ANSWER _____

2 For 6 seats, a spreadsheet shows quotas of A: 1.6, B: 2.1, C: 2.3. Which group gets the leftover seat?

ANSWER _____

3 Cell C3 contains =B3*$F$1/$F$2. If B3 is 36, F1 is 6, and F2 is 90, what quota appears in C3?

ANSWER _____

4 For 8 seats, the quotas are A: 2.4, B: 3.2, C: 2.4. Can you award the leftover seat uniquely? Explain.

ANSWER _____

APPLY IT Show your work

1 A youth media app divides 9 creator-council seats among channels by subscriber count. Use Hamilton's method. Give the seats in table order.

CHANNEL SUBSCRIBERS

Channel	Subscribers
Music	24,000
Gaming	31,000
Sports	27,000
Art	18,000

ANSWER _____

2 A city divides 7 youth-council seats among neighborhoods with 20,000, 30,000, and 50,000 residents. Use Hamilton's method. Give the seats in that order.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A spreadsheet lists populations A: 50,000, B: 30,000, C: 10,000. Use Hamilton's method first for 4 seats, then for 5 seats. Which group loses a seat when the total grows?

WORK SPACE AND ANSWER

ANSWER KEY

Seats by Spreadsheet

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Cell C2 holds a quota of 2.75. Write a spreadsheet formula for its fractional part.	**=C2-INT(C2)**
2	For 6 seats, a spreadsheet shows quotas of A: 1.6, B: 2.1, C: 2.3. Which group gets the leftover seat?	**A**
3	Cell C3 contains =B3*$F$1/$F$2. If B3 is 36, F1 is 6, and F2 is 90, what quota appears in C3?	**2.4**
4	For 8 seats, the quotas are A: 2.4, B: 3.2, C: 2.4. Can you award the leftover seat uniquely? Explain.	**No. A and C tie for the largest fractional part, so a tie-break rule is needed.**

PART 2 · APPLY IT

1. **Music: 2; Gaming: 3; Sports: 2; Art: 2.** The 100,000 subscribers give quotas of 2.16, 2.79, 2.43, and 1.62. After awarding whole-number seats, the two leftover seats go to Gaming and Art.
2. **1, 2, 4 seats.** The quotas are 1.4, 2.1, and 3.5. The last seat goes to the third neighborhood.

CHALLENGE

With 4 seats: A 2, B 1, C 1. With 5 seats: A 3, B 2, C 0. C loses a seat.

Accept equivalent spreadsheet formulas that return the fractional part in problem 1. In problem 4, do not accept an award to A or C without a stated tie-break rule.