LESSON MAKER PRO

Who Gets the Seats?

Divide whole items fairly among groups

HIGH SCHOOL · FM.FDV.A.26

FM.FDV.A.26 "Explain and apply mathematical aspects of fair division, with respect to classic problems of apportionment, cake cutting, and estate division. Include applications in other contexts and modern situations."

NAME _____ DATE _____

LARGEST REMAINDERS

To share whole items by group size, find each group's quota: total items × group size / total group size. Give each group the whole-number part of its quota. Then give any items left over to the groups with the largest fractional remainders.

WORKED EXAMPLE

Three clubs have 50, 30, and 20 members. Share 17 event badges among them by club size.

1. There are 100 members. The quotas are 17 × 50/100 = 8.5, 17 × 30/100 = 5.1, and 17 × 20/100 = 3.4.
2. Give the clubs 8, 5, and 3 badges. That uses 16 badges.
3. The largest fractional remainder is 0.5, so give the last badge to the first club.

Answer: 9, 5, and 3 badges

PRACTICE 6 problems

1 Three groups have 2, 1, and 1 members. Share 12 seats by group size. How many seats does each group get?

ANSWER _____

2 Three groups have 5, 3, and 2 members. Share 14 tickets by group size. How many tickets does each group get?

ANSWER _____

3 Three groups have 3, 3, and 2 members. Share 16 microphones by group size. How many does each group get?

ANSWER _____

4 Three groups have 4, 3, and 1 members. Share 18 passes by group size. How many passes does each group get?

ANSWER _____

5 Three groups have 5, 3, and 2 members. Share 19 seats by group size. What is the second group's quota, and how many seats does it receive?

ANSWER _____

6 Three groups have 7, 2, and 1 members. Share 23 passes by group size. Which group gets the extra pass after each group receives the whole-number part of its quota? Give the final allocations.

ANSWER _____

APPLY IT Show your work

1 The school has 26 recording slots for three student-run podcasts with 5, 3, and 2 members. Share the slots by group size. How many slots does each podcast get?

WORK SPACE

ANSWER _____

2 An estate includes 29 concert vouchers of equal value. A will gives three heirs shares of 1/2, 3/10, and 1/5. Use largest remainders to divide the whole vouchers. How many does each heir get?

WORK SPACE

ANSWER _____

CHALLENGE One step up

A student council has 31 event seats for three groups with 5, 4, and 3 members. One plan gives them 13, 11, and 7 seats. Find the largest-remainder allocation. Explain which group should receive a seat instead.

WORK SPACE AND ANSWER

Who Gets the Seats?

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Three groups have 2, 1, and 1 members. Share 12 seats by group size. How many seats does each group get?	**6, 3, and 3 seats**
2	Three groups have 5, 3, and 2 members. Share 14 tickets by group size. How many tickets does each group get?	**7, 4, and 3 tickets**
3	Three groups have 3, 3, and 2 members. Share 16 microphones by group size. How many does each group get?	**6, 6, and 4 microphones**
4	Three groups have 4, 3, and 1 members. Share 18 passes by group size. How many passes does each group get?	**9, 7, and 2 passes**
5	Three groups have 5, 3, and 2 members. Share 19 seats by group size. What is the second group's quota, and how many seats does it receive?	**Quota: 5.7 seats. Allocation: 6 seats.**
6	Three groups have 7, 2, and 1 members. Share 23 passes by group size. Which group gets the extra pass after each group receives the whole-number part of its quota? Give the final allocations.	**The second group gets the extra pass. The allocations are 16, 5, and 2 passes.**

PART 2 · APPLY IT

1. **13, 8, and 5 slots** The quotas are 13, 7.8, and 5.2. After assigning 13, 7, and 5 slots, give the remaining slot to the second podcast.
2. **14, 9, and 6 vouchers** The quotas are 14.5, 8.7, and 5.8. Assign 14, 8, and 5 vouchers first, then give the two remaining vouchers to the third and second heirs.

CHALLENGE

The allocation is 13, 10, and 8 seats. The quotas are 12 11/12, 10 1/3, and 7 3/4. After assigning 12, 10, and 7 seats, the first and third groups have the largest fractional remainders. Compared with the proposed plan, the third group should receive a seat instead of the second group.

Allocations are listed in the same order as the groups. Accept equivalent fractions in place of decimal quotas.