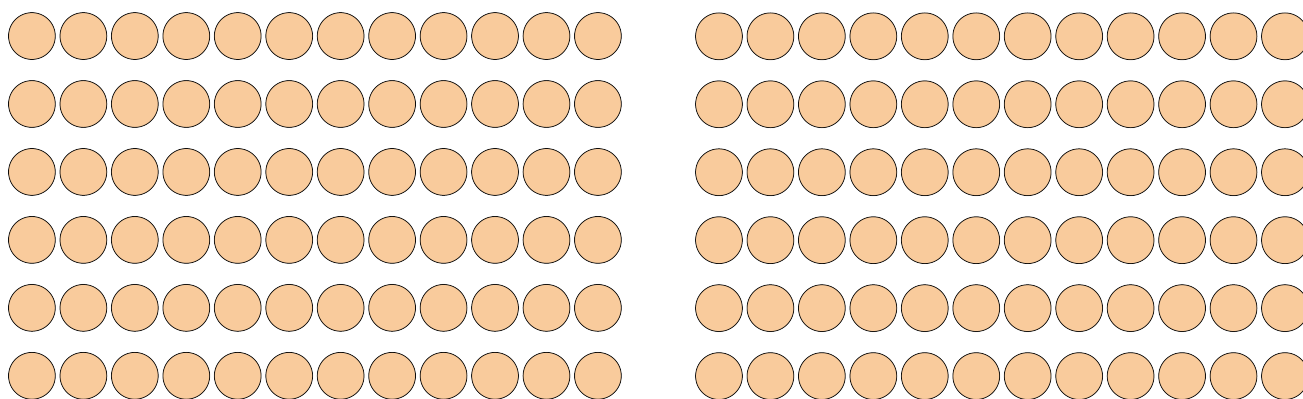**Problem of the Week**
Problem A and Solution
Graduation Ceremony

Problem

At Emily Carr Elementary School, the Grade 8 students are graduating and are having a ceremony. Tickets are given to the graduates and the school staff for free. Parents and other students need to buy tickets.

Staff set up 6 rows of 24 chairs in the gym. The diagram below shows the arrangement.

We know that

- $\frac{1}{3}$ of the chairs are filled with adults (parents/relatives) who bought tickets for \$4 each,

- $\frac{1}{4}$ of the chairs are filled with other students who bought tickets for \$2 each,

- $\frac{1}{6}$ of the chairs are filled with staff of the school, and

- the remaining chairs are filled with the graduates.

(a) How many graduates are at the ceremony?

(b) How much money was collected from ticket sales?

Solution

We will first figure out how many of each category of people are at the graduation. One way to do this is to use the diagram showing the setup of the chairs.

Since there are 6 rows of chairs, each row contains $\frac{1}{6}$ of the total number of chairs. Since $\frac{1}{6}$ of the chairs are filled with the staff of the school, the number of chairs filled with staff is the same as the number of chairs in one row. We illustrate this by marking all of the chairs in one row (the sixth row in the diagram) with the letter S.

We can use a line down the centre aisle and a line between the third and fourth rows to divide the setup of the chairs into 4 equal parts. Since $\frac{1}{4}$ of the chairs are filled with other students, we mark all of the chairs in one of the quarters (the top-left quarter in the diagram) with the letter O. Of course, we chose a quarter that did not already have marked chairs.

Also, if we divide the number of rows into 3 equal parts, that would result in two rows in each part. So two rows contain $\frac{1}{3}$ of the total number of chairs. Since $\frac{1}{3}$ of the chairs are filled with adults, we mark all of the chairs in two rows (the fourth and fifth rows in the diagram) with the letter A.
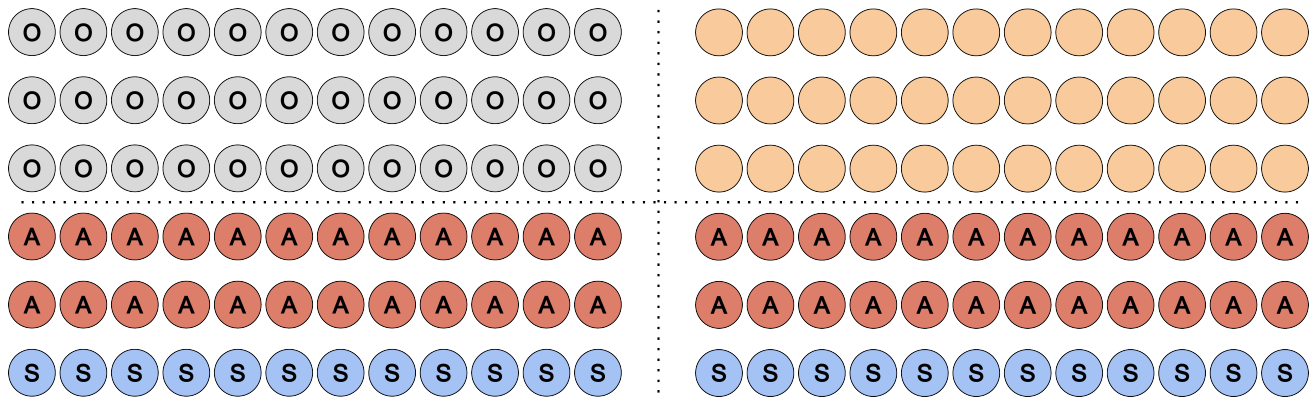
Counting the number of chairs in each category, we get:

24 staff, 48 adults, and 36 other students.

(a) Counting the number of unmarked chairs, we get 36 chairs remaining that are filled with graduates.

(b) Since there are 48 adults who paid \$4 per ticket, the total amount paid by adults is $48 \times \$4 = \$192$.

Since there are 36 other students who paid \$2 per ticket, the total amount paid by other students is $36 \times \$2 = \$72$.

The total amount collected from ticket sales is $\$192 + \$72 = \$264$.