Tickets to Fairview Elementary School’s production of Beauty and the Beast went on sale this week. The school theater has 24 rows of 16 seats each.

1/3 of all the seats have been sold to students for $3 each.
1/4 of them have been sold to adults for $5 each.
1/6 of them were given to the teachers.

1. If everyone who already has a ticket goes to the show, what fraction of the seats in the theater will be filled?
2. How many seats are still available?

Extra: How much money has been collected so far? If all the remaining seats are sold to students, how much money will be raised altogether?

MATH STANDARDS ALIGNMENT:
Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.

Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers.

Personal Finance Big Ideas:
Opportunity Cost
METHOD 1: MAXIMIZE QUARTERS

After reading the problem we each made a list of noticings and then we combined our lists to have:

- tickets are on sale
- Beauty and the Beast is the production
- the theater has 24 rows
- each row in the theater has 16 seats
  - \( \frac{1}{3} \) of the seats have been sold to students
  - \( \frac{1}{4} \) of the seats have been sold to adults
  - \( \frac{1}{6} \) of the seats were given to teachers
  - \( \frac{1}{3} \) and \( \frac{1}{4} \) and \( \frac{1}{6} \) of the seats would give us the total number filled so far
- a student ticket costs $3
- an adult ticket costs $5
- a teacher ticket is free or costs $0

We added the fractions of the three types of seats that were already reserved. We changed them to a common denominator of 12.

\[
\frac{1}{3} + \frac{1}{4} + \frac{1}{6} = \frac{4}{12} + \frac{3}{12} + \frac{2}{12} = \frac{9}{12} = \frac{3}{4}
\]

\( \frac{3}{4} \) of the seats will be filled.

To find out how many tickets are still available, we first found the total number of seats in the theater: 24 rows \( \times \) 16 seats per row = 384 seats total. Since \( \frac{3}{4} \) of them are reserved, \( \frac{1}{4} \) of them must still be available. \( \frac{1}{4} \) \( \times \) 384 = 96 seats still available.
Extra: To find out how much money has been collected already, we multiplied the number of seats sold by the price per seat for students and adults. Then we added them together.

\[ \frac{1}{3} \cdot 384 \text{ seats} = 128 \text{ seats and if 128 seats cost $3 per seat that's 128} \cdot $3 = $384 \text{ for student seats} \]

\[ \frac{1}{4} \cdot 384 \text{ seats} = 96 \text{ seats and if 96 seats cost $5 per seat that's 96} \cdot $5 = $480 \text{ for adult seats} \]

The teacher seats are free and so we added $384 and $480 to get a total of $864 collected so far.

There were 96 seats remaining and if each of those were sold to a student at $3 per seat that's 96 \cdot $3 = $288. When we added that to the $864 we got a total of $1152, if remaining seats are sold to students.

**METHOD 2: MAKE A TABLE**

I found the total number of seats by multiplying the numbers of rows by the number of seats in each row. 24 rows x 16 seats per row = 384 seats total.

I made a table to keep track the number of tickets sold and the costs. For each type of ticket I multiplied the fraction sold by 384 (total seats) to find the number of tickets sold. Then I multiplied that number by the price per seat to calculate the total received.

<table>
<thead>
<tr>
<th>Category</th>
<th>Fraction sold</th>
<th>Number sold</th>
<th>$ per seat</th>
<th>Total received</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student</td>
<td>1/3 of 384</td>
<td>128</td>
<td>$3</td>
<td>$384</td>
</tr>
<tr>
<td>Adult</td>
<td>1/4 of 384</td>
<td>96</td>
<td>$5</td>
<td>$480</td>
</tr>
<tr>
<td>Teacher</td>
<td>1/6 of 384</td>
<td>64</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>So far:</td>
<td></td>
<td>288</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unsold</td>
<td>1/4 of 384</td>
<td>96</td>
<td>$3</td>
<td>$288</td>
</tr>
<tr>
<td>Total:</td>
<td></td>
<td>384</td>
<td></td>
<td>$1152</td>
</tr>
</tbody>
</table>

1. 288 seats sold out of 384 available = 288/384 = 3/4 of available seats will be filled.
2. 384 total seats - 288 seats sold = 96 seats still available.

Extra: In my table I added all the money received from adult and student tickets (teachers got in free): $384 + $480 = $864 received so far. If the remaining seats (96) are sold to students, that will bring in an additional $288. I added $864 to that to get a total of $1152 earned if all remaining tickets are sold to students.
METHOD 3: MAKE AN ARRAY

I used 1/4 graph paper and, with one square to represent each seat, drew a rectangle of 24 rows with 16 squares in each row.

1/3 of 24 is 8, so I colored in 8 rows to represent student seats sold. 1/4 of 24 is 6, so I colored in 6 rows to represent adult seats sold. 1/6 of 24 is 4, so I colored in 4 rows to represent teacher seats.

18 rows had been reserved, or 18/24, or 3/4 of the total seats.

If 3/4 have been filled then 1/4 of the rows, or 6 rows, are still available. 6 rows with 16 seats per row equals 96 seats that are still available.
METHOD 4: ALGEBRA

If we let \( x \) = the total number of tickets, we know after reading the problem that

\( x \) is the number of tickets sold to students.

\( x \) is the number of tickets sold to adults.

\( x \) is the number of tickets given to teachers.

When we add those seats that are taken, we get:

\[
\begin{align*}
\frac{1}{3} x + \frac{1}{4} x + \frac{1}{6} x &= \frac{4}{12} x + \frac{3}{12} x + \frac{2}{12} x \\
&= \frac{9}{12} x \\
&= \frac{3}{4} x
\end{align*}
\]

Three-fourths of the seats in the theater will be filled.

We also know from the problem that the theater has 24 rows of 16 seats each, which means the total number of seats can be found by multiplying 24 by 16. We got 384.

If 288 were filled then 384 – 288 or 96 seats are still available.