THE TICKET PROBLEM

These types of problems require making two equations, and then solving the equations by substitution or addition. One equation usually comes from adding up the number of tickets, and the other equation uses the value of the tickets.

Example: There were 411 people at a play. Admission was $5 for adults and $3.75 for children. The receipts were $1,978.75. How many adults and how many children attended?

Step 1: Figure out what information you've been given, and what you're supposed to find.

- We know that 411 people attended.
- We know that adult tickets are $5.00 each.
- We know that child tickets are $3.75 each.
- We know that the total of receipts (total amount of money brought in) is $1,978.75.
- We need to figure out how many adults attended, and how many children attended.

Step 2: Make the first equation.

- This equation will add up to the total number of people who attended (411).
- We know that **all the adults plus all the children adds up to all the people**. So make variables to replace "adults" and "children," and there's your equation. So, make a = adults and c = children.
- All the adults (a) plus (+) all the children (c) adds up to all the people (411), or: $\boldsymbol{a + c = 411}$.

Step 3: Make the second equation.

- This equation will add up to the total amount of money brought in ($1,978.75).
- The value of one adult ticket is $5.00. If you had 23 adult tickets, the value would be $5 times 23. So, if you have a adult tickets, the value is $5 times a, or $5a$.
- The value of one child ticket is $3.75. If you had 23 child tickets, the value would be $3.75 times 23. So, if you have c child tickets, the value is $3.75 times c, or $3.75c$.
- We know that the value of all tickets came up to $1,978.75. Since all tickets means all adult tickets and all child tickets, we can say that **the value of all adult tickets plus the value of all child tickets equals the total value of all tickets**.
- That sentence, put into an equation, is: $\boldsymbol{5a + 3.75c = 1978.75}$. It's often easier to work with integers than with decimals, so remove decimals by multiplying by a factor of 10. 100 is the best one this time, because there are two decimal places in two of the numbers. Thus: $\boldsymbol{500a + 375c = 197{,}875}$.

Step 4. Solve.

- You have two equations, $a + c = 411$ and $500a + 375c = 197{,}875$.
- Use either the substitution or addition method. For this example, we'll use the addition method.
- Multiply equation 1 ($a + c = 411$) by –500. This will allow us to cancel out the a terms in both equations when we add them. So, equation 1 now becomes $-500a - 500c = -205{,}500$.
- Add:
$$\begin{array}{r} -500a - 500c = -205{,}500 \\ \underline{500a + 375c = \ \ 197{,}875} \\ -125c = -7625 \end{array}$$
- Continue solving: $c = 61$.
- The c stands for child tickets. If there are 61 child tickets, there must be 350 adult tickets (since $a + c = 411$, $a + 61 = 411$, $a = 350$).

Step 5. Put the answer in the correct form, if necessary.

- If this problem had started as a system of equations, we would show the answer in coordinate-point form (x,y), or (350, 61). However, the system of equations was simply a method for solving the original question, which was how many adults and children attended the play.
- The answer: **350 adults and 61 children attended the play**.