



Problem of the Week

Problem A and Solution

Winter Olympics

Problem

Alex, Ben, Gwen, and Jenna can hardly wait for the Winter Olympics. This year, they are lucky enough to attend the games in person, and they got tickets for several events. They have given each other nicknames as well. The four nicknames are Boss, Buzz, Cosmo, and Tiger. Using the following clues, determine the nickname of each of the children.

Clues:

- Jenna plans to watch the bobsled race with Tiger and drink hot chocolate with Buzz.
- Gwen will attend the ski jumping event with Tiger, and a hockey game with Boss.
- Cosmo, Tiger and Alex all have tickets for the opening ceremonies.
- Cosmo and Jenna are excited to see the figure skating competition.

A chart may be helpful in solving this problem.

Solution

Each clue eliminates at least one possible person/nickname pair. If *Person A* is doing something with *Person B*, then *Person A* and *Person B* must be different people. We can put an **X** in the chart where we know someone does not match a nickname.

There are several ways to determine the correct nicknames; here is one way.
From this clue:

- Jenna plans to watch the bobsled race with Tiger and drink hot chocolate with Buzz.

We can update the table as follows:

| Nickname | Alex | Ben | Gwen | Jenna |
|----------|------|-----|------|-------|
| Boss | | | | |
| Buzz | | | | X |
| Cosmo | | | | |
| Tiger | | | | X |



From these clues:

- Gwen will attend the ski jumping event with Tiger, and a hockey game with Boss.
- Cosmo, Tiger and Alex all have tickets for the opening ceremonies.
- Cosmo and Jenna are excited to see the figure skating competition.

We can update the table as follows:

| Nickname | Alex | Ben | Gwen | Jenna |
|----------|------|-----|------|-------|
| Boss | | | ✗ | |
| Buzz | | | | ✗ |
| Cosmo | ✗ | | | ✗ |
| Tiger | ✗ | | ✗ | ✗ |

At this point, we know that *Jenna* must have the nickname *Boss*, since this is the only nickname left in her column. We can put a check in that box, and eliminate *Boss* as the possible nickname for everyone else. Now the table looks like this:

| Nickname | Alex | Ben | Gwen | Jenna |
|----------|------|-----|------|-------|
| Boss | ✗ | ✗ | ✗ | ✓ |
| Buzz | | | | ✗ |
| Cosmo | ✗ | | | ✗ |
| Tiger | ✗ | | ✗ | ✗ |

Now we can conclude that *Alex* must have the nickname *Buzz*, since this is the only nickname left in his column. We can put a check in that box, and eliminate *Buzz* as the possible nickname for everyone else. Now the table looks like this:

| Nickname | Alex | Ben | Gwen | Jenna |
|----------|------|-----|------|-------|
| Boss | ✗ | ✗ | ✗ | ✓ |
| Buzz | ✓ | ✗ | ✗ | ✗ |
| Cosmo | ✗ | | | ✗ |
| Tiger | ✗ | | ✗ | ✗ |



Next we can conclude that *Gwen* must have the nickname *Cosmo*, since this is the only nickname left in her column. We can put a check in that box, and eliminate *Cosmo* as the possible nickname for *Ben*, who is the only person left. The only nickname left is *Tiger*. That must be *Ben's* nickname. The final version of the table must be:

| Nickname | Alex | Ben | Gwen | Jenna |
|----------|------|-----|------|-------|
| Boss | ✗ | ✗ | ✗ | ✓ |
| Buzz | ✓ | ✗ | ✗ | ✗ |
| Cosmo | ✗ | ✗ | ✓ | ✗ |
| Tiger | ✗ | ✓ | ✗ | ✗ |

So Alex's nickname is Buzz, Ben's nickname is Tiger, Gwen's nickname is Cosmo, and Jenna's nickname is Boss.





Teacher's Notes

Logical thinking is essential in the study of mathematics and computer science. Since the time of Aristotle, mathematicians have been describing formal ways of writing logical statements. One of the most commonly used systems for writing logical statements was developed by British mathematician George Boole in the mid-nineteenth century. Today we refer to **AND**, **OR**, and **NOT** as Boolean operators.

We use these words in English to make logical conclusions. For example in this problem, when we put an **X** in the chart to eliminate “Buzz” as a possible nickname for Jenna, we have recorded the logical fact that “Buzz” is **NOT** Jenna’s nickname.

If we revisit this version of the table:

| Nickname | Alex | Ben | Gwen | Jenna |
|----------|------|-----|------|----------|
| Boss | | | | |
| Buzz | | | | X |
| Cosmo | | | | |
| Tiger | | | | X |

we can describe Jenna’s nickname using a lesser known Boolean operator. We can say that Jenna’s nickname is “**Boss**” **XOR** “**Cosmo**”. This is more precise than saying Jenna’s nickname is “**Boss**” **OR** “**Cosmo**”, since **A XOR B** describes a situation where **A is true** or **B is true** but **A and B cannot both be true**. Since Jenna only has one nickname, it cannot be both “Boss” and “Cosmo”.

