

Contents: Chapter 6

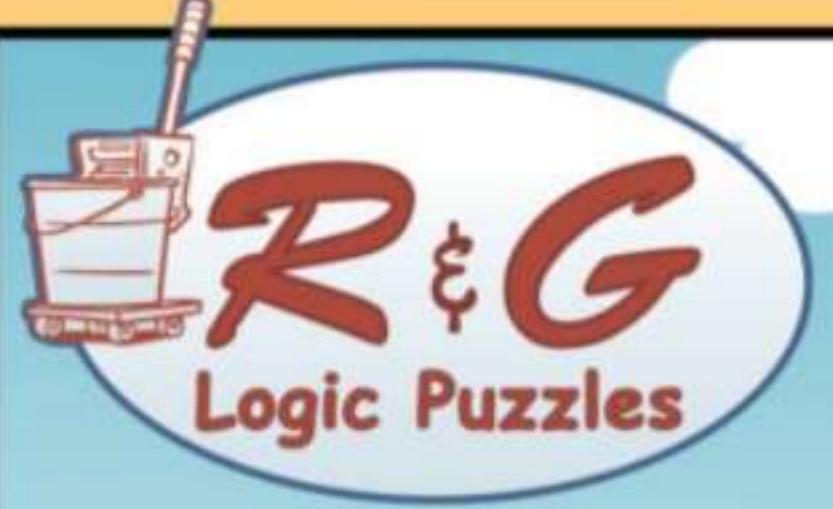
Click the Play List tab in the top-left to view a recommended reading/practice sequence.

	Logic Puzzles	78
	After all but one possibility is eliminated, what can you conclude about the remaining possibility?	
	Bon Voyage	82
	Anybody want a peanut?	
	Grid Puzzles	83
	How do you solve a Sudoku?	
	R Code Breaker	89
	Can you figure out your opponent's code with less than 10 guesses?	
	Truth-tellers and Liars	90
	Can you figure out who is lying and who is telling the truth?	
	The Math Bowl	98
	Can the Little Monsters win their first regional Math Bowl title?	

Chapter 6:

Logic





We can organize our work with a chart, like this.

I put the room numbers across the top, and the little monsters' names on the side.

	1	2	3	4
Alex				
Grogg				
Lizzie				
Winnie				

How does the chart work?

If we can eliminate a room for a monster, we put an X on the grid by that monster's name under the room number.

	1	2	3	4
Alex				
Grogg	X	X		
Lizzie				
Winnie				

For example, the first clue says that Grogg needs a big bed.

Rooms 1 and 2 have small beds.

So, we put X's by Grogg's name under rooms 1 and 2 to show that he won't be in either of those rooms.

The second clue says that we need to tuck in the sheets for the boy in the room next to Grogg's.

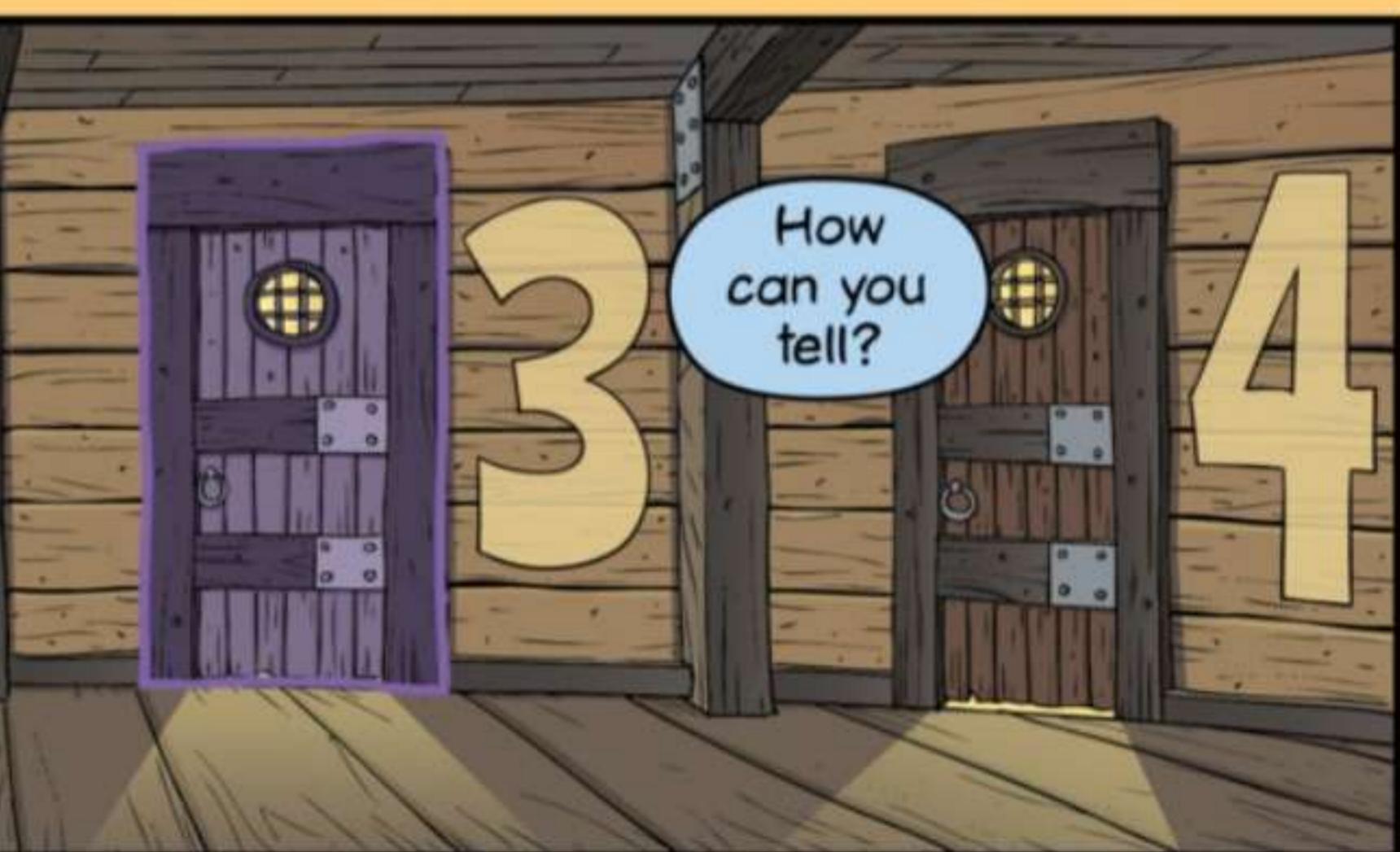
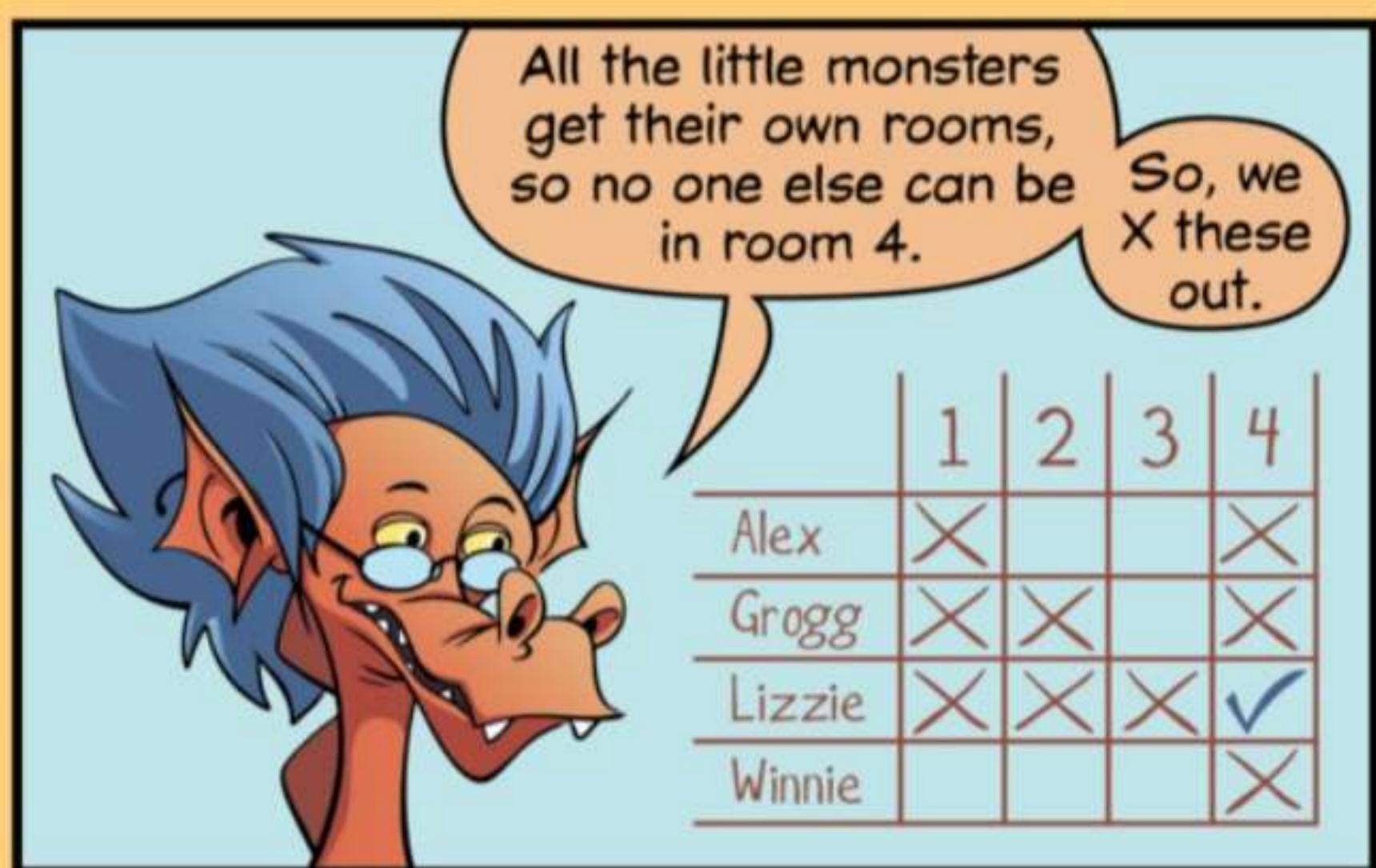
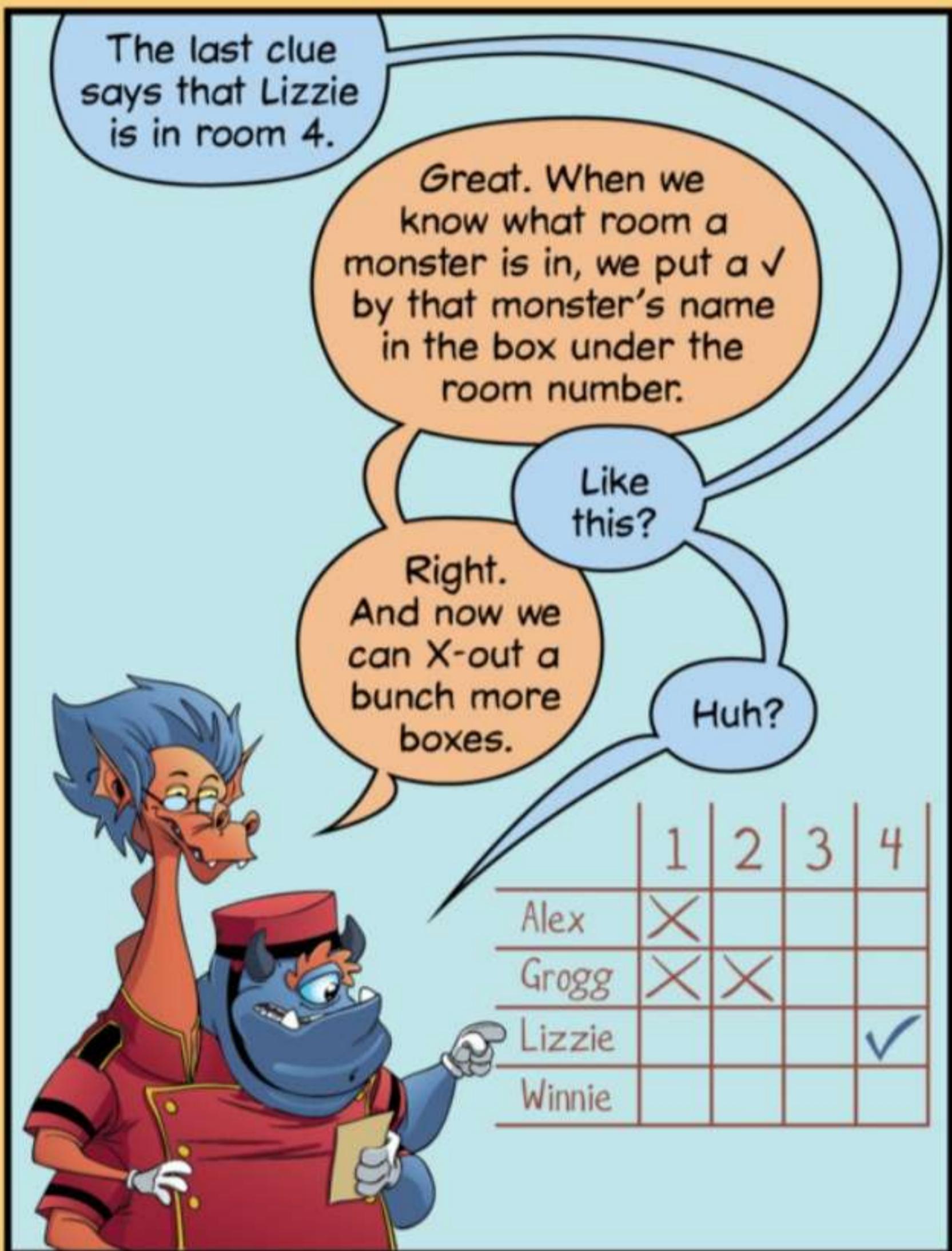
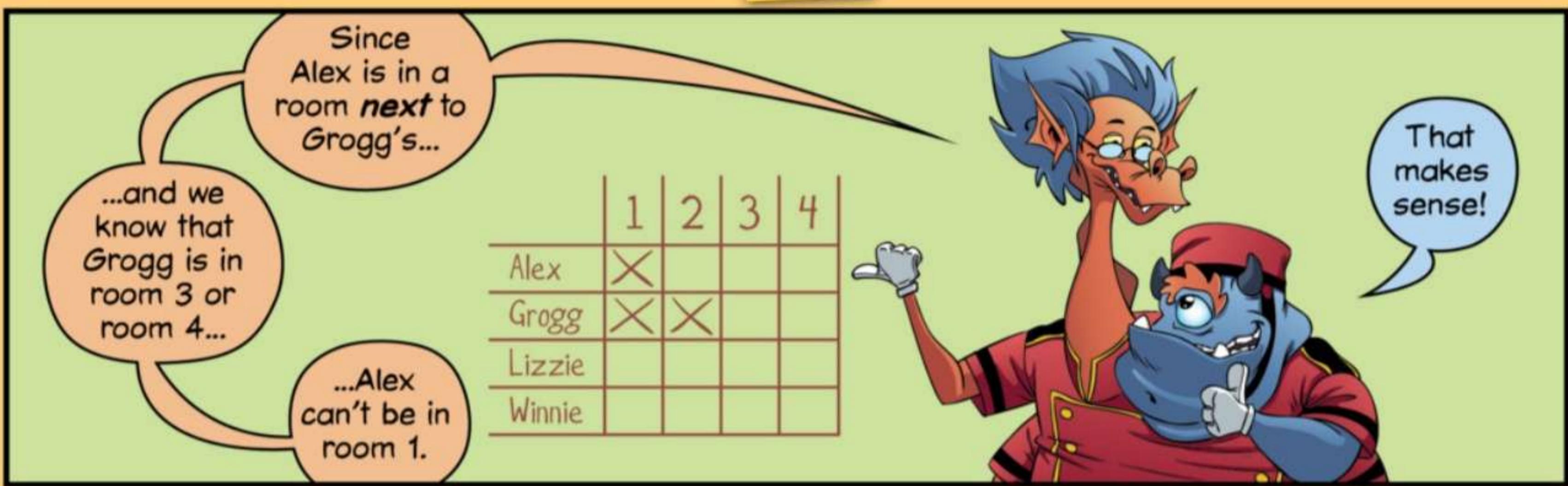
Alex is the only boy, besides Grogg.

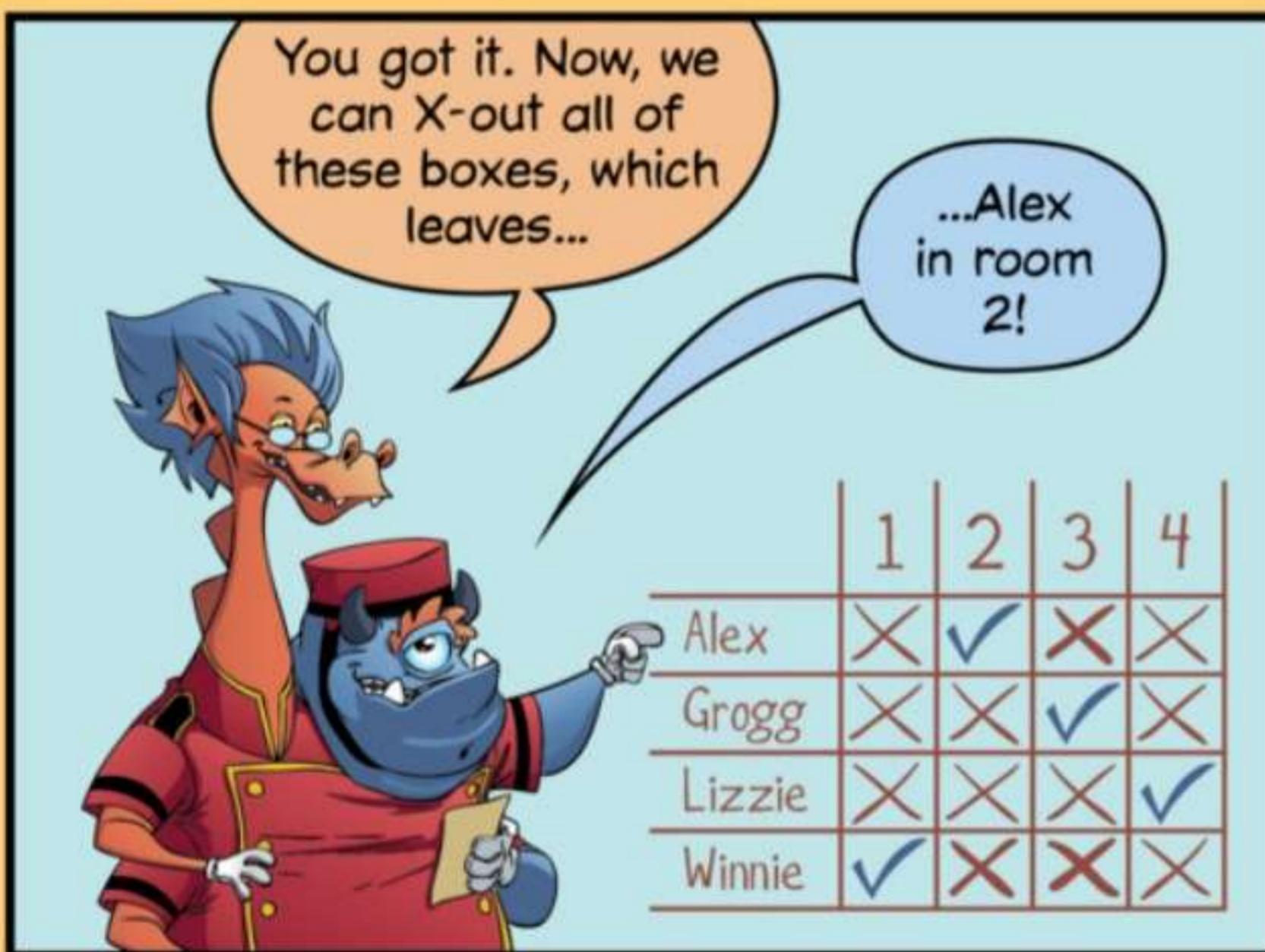
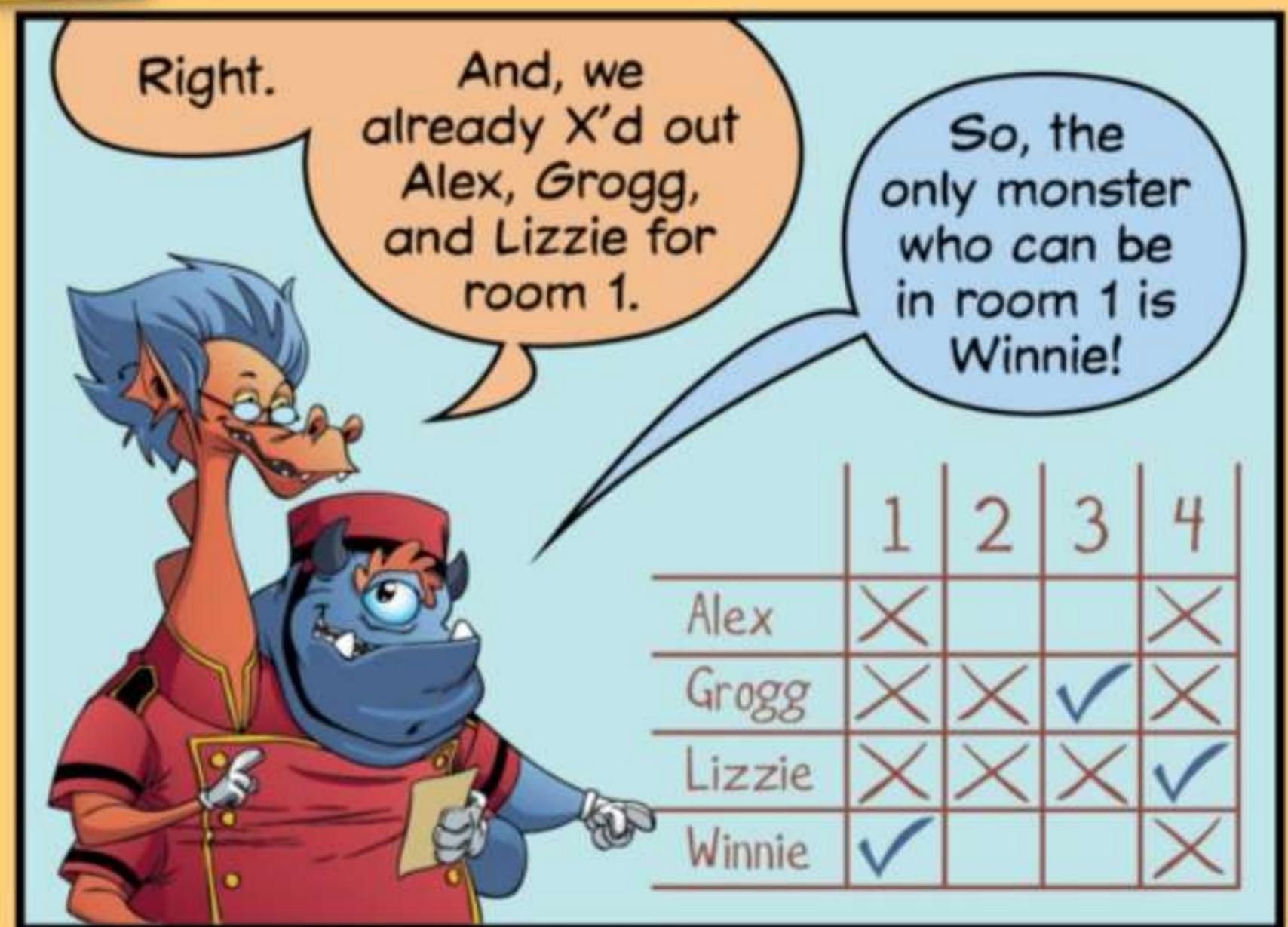
But the clue doesn't tell us which room he's in.

The clue does help us eliminate one room for Alex.

Which room?

Which room can be eliminated as a choice for Alex?







MATH TEAM

Grid Puzzles

We've got just enough time for one more practice before we arrive at the site of this year's regional Math Bowl.

A lot of the problems you'll see in the Math Bowl will be more like puzzles than math problems.

Here's an example.

In this Sudoku puzzle, a 4×4 grid is separated into four smaller 2×2 grids, called **boxes**.

1			
			2
		3	
4			

STANDARD SUDOKU PUZZLES USE A 9×9 GRID.
THE SUDOKU PUZZLES IN THIS SECTION USE A 4×4 GRID.

The goal is to place a digit in each small square so that every row, column, and box in the grid contains each of the digits 1 through 4, like this.

1	2	3	4
4	3	2	1
2	1	4	3
3	4	1	2

Try this one.

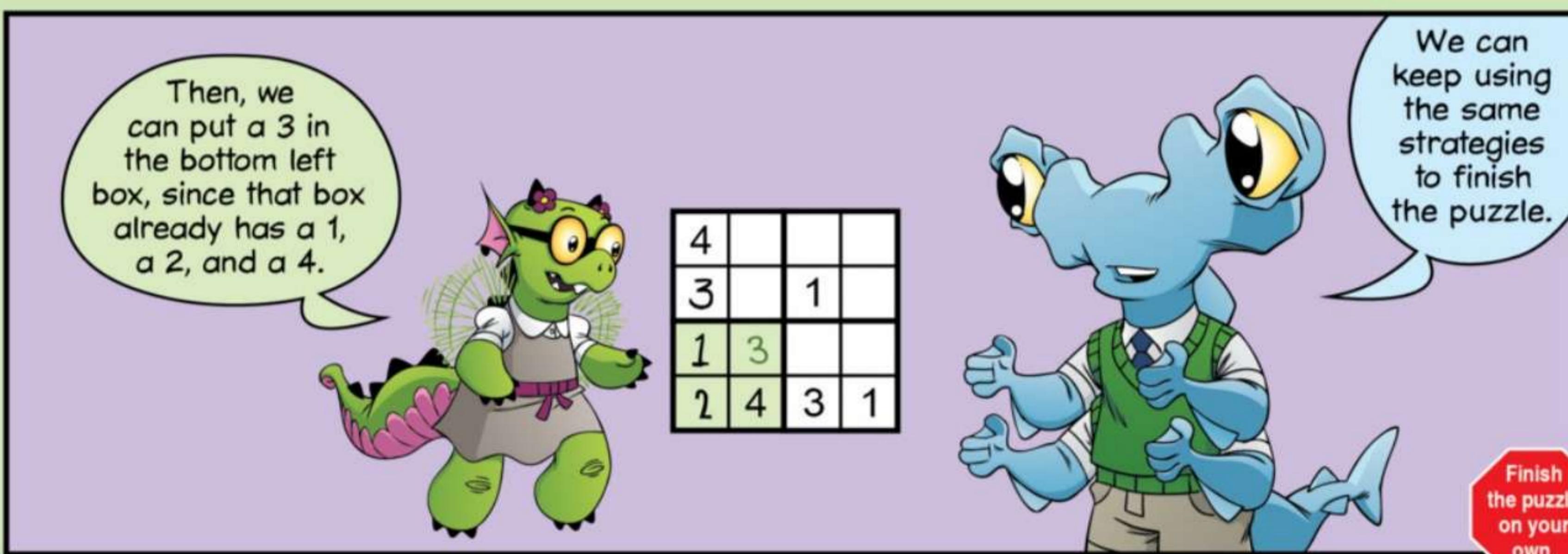
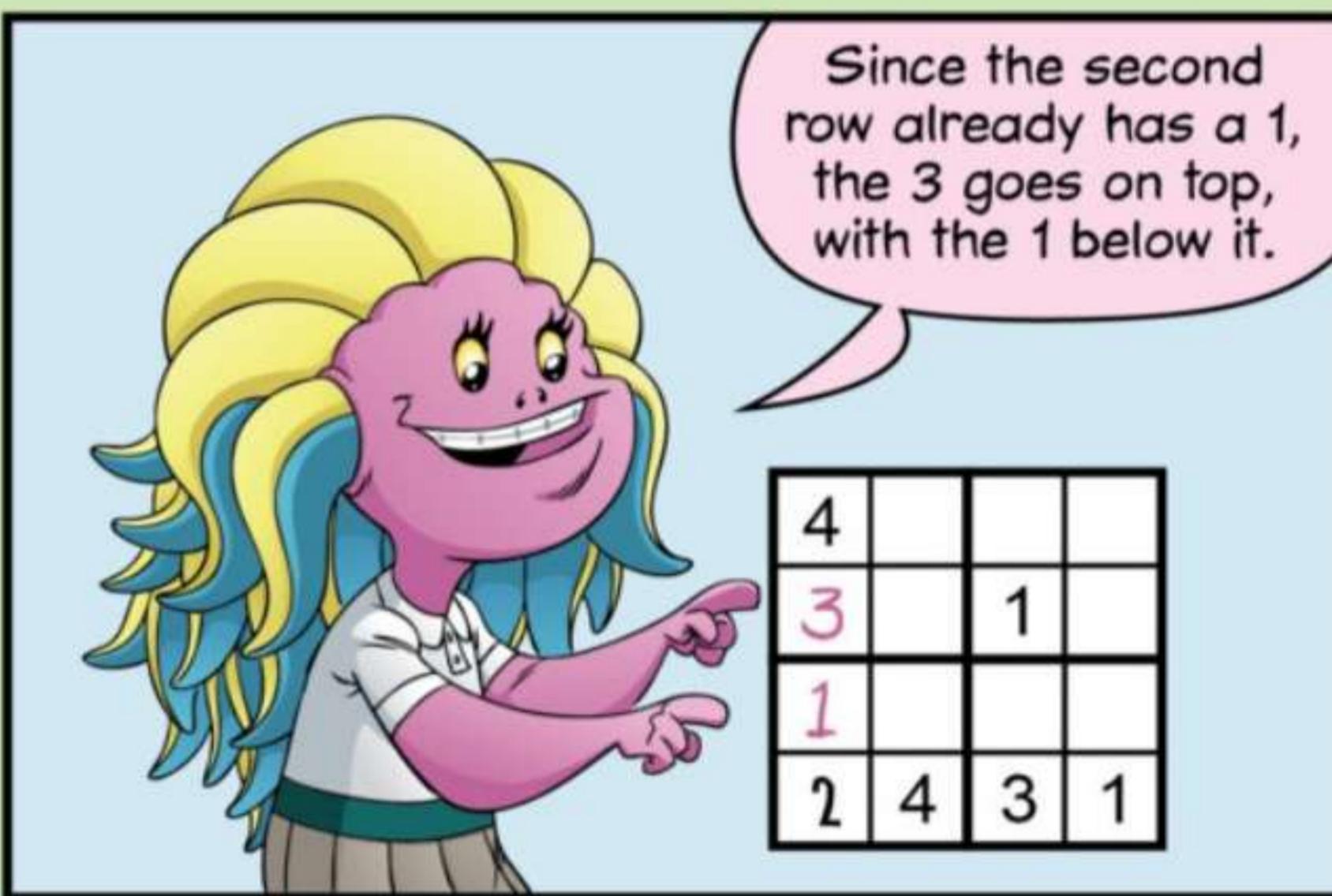
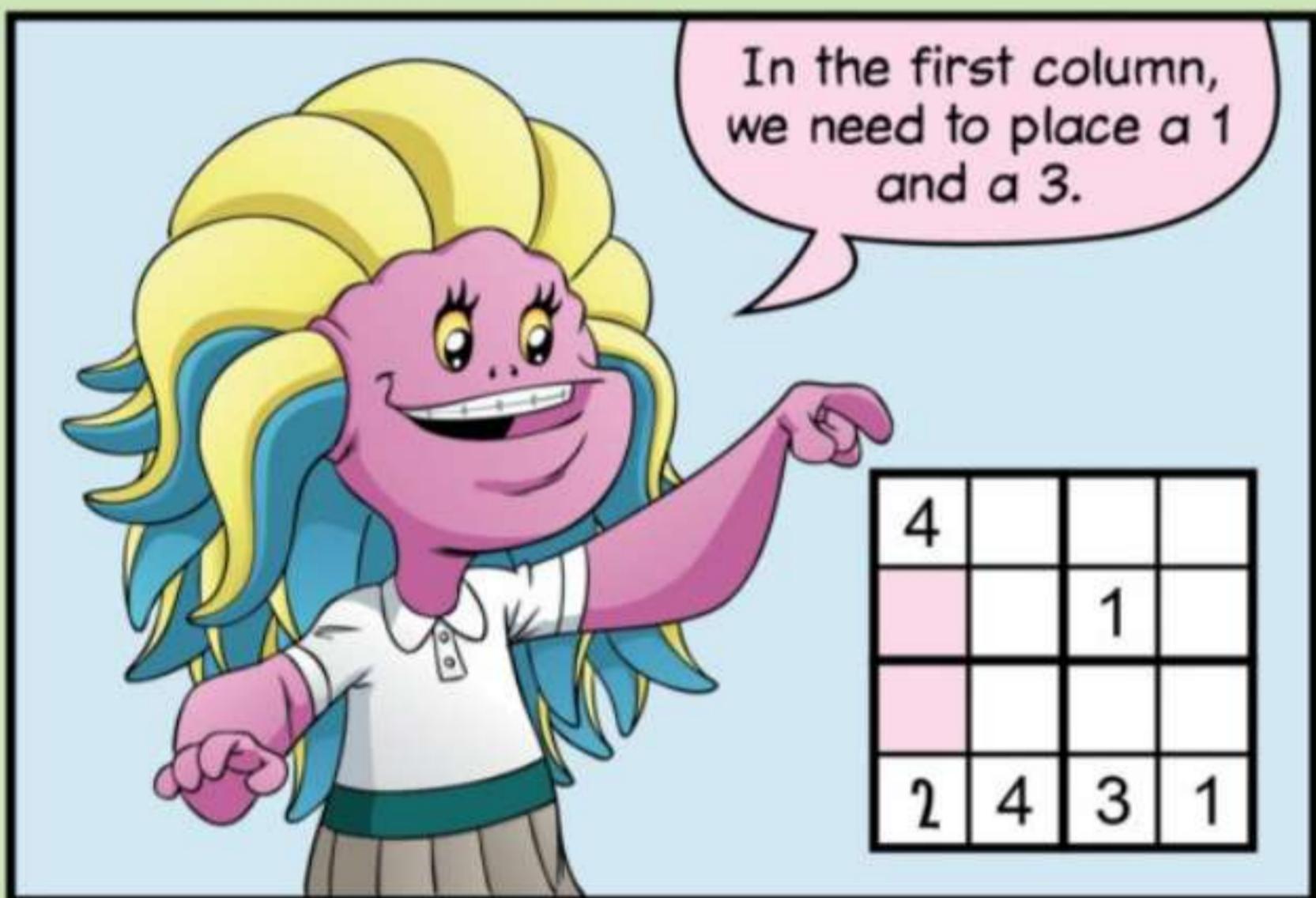
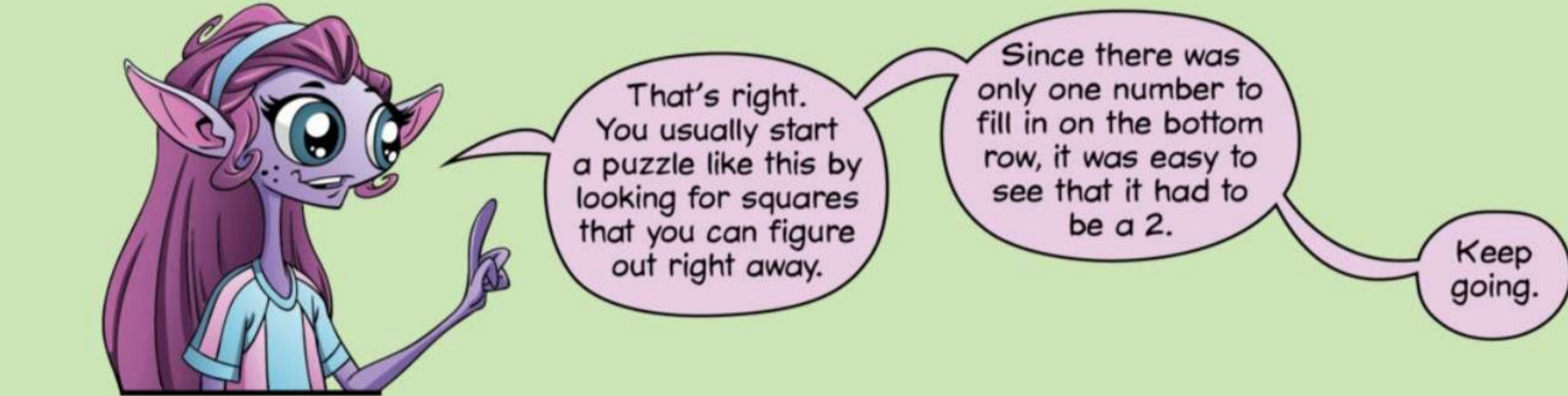
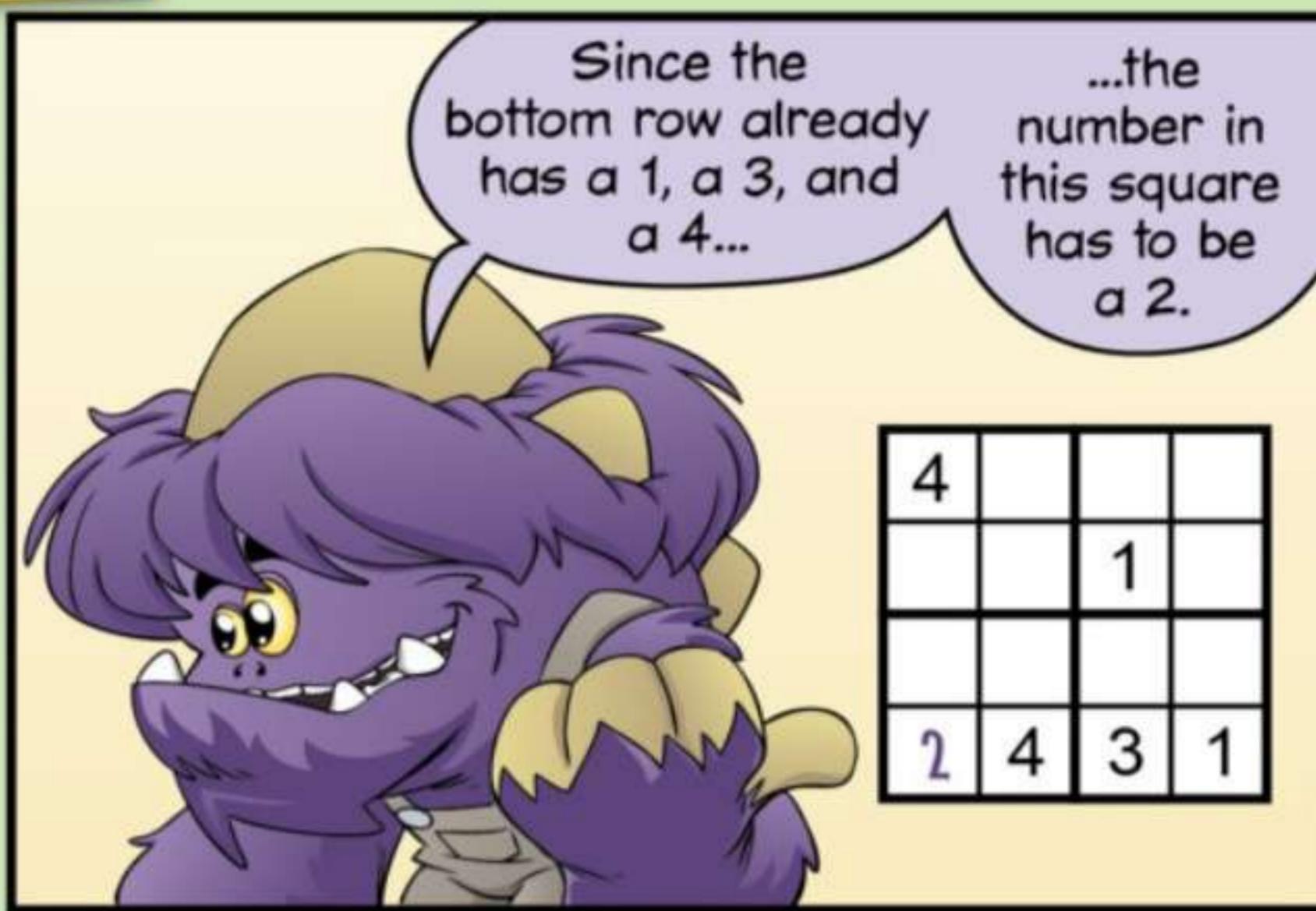
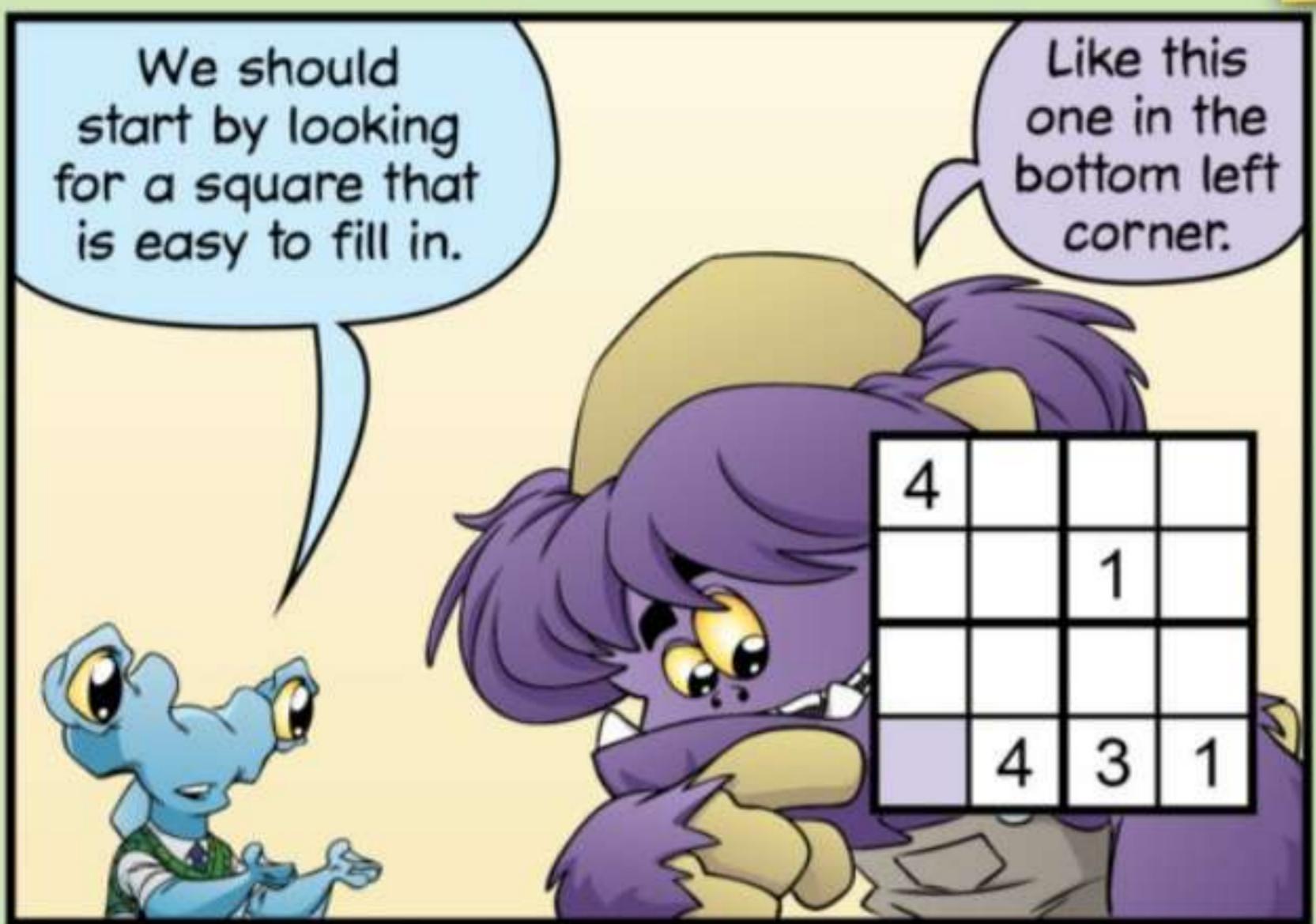
Where do we begin?

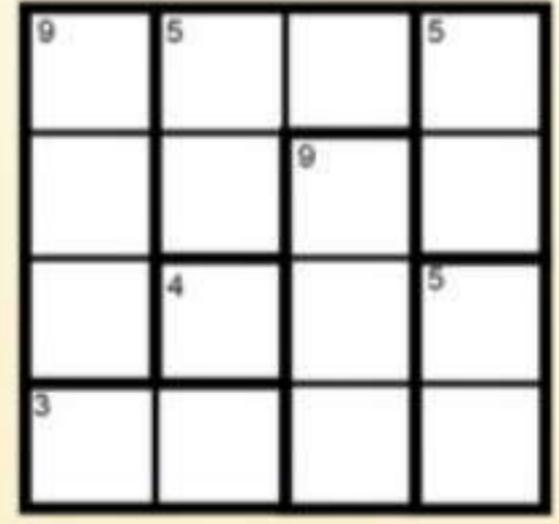
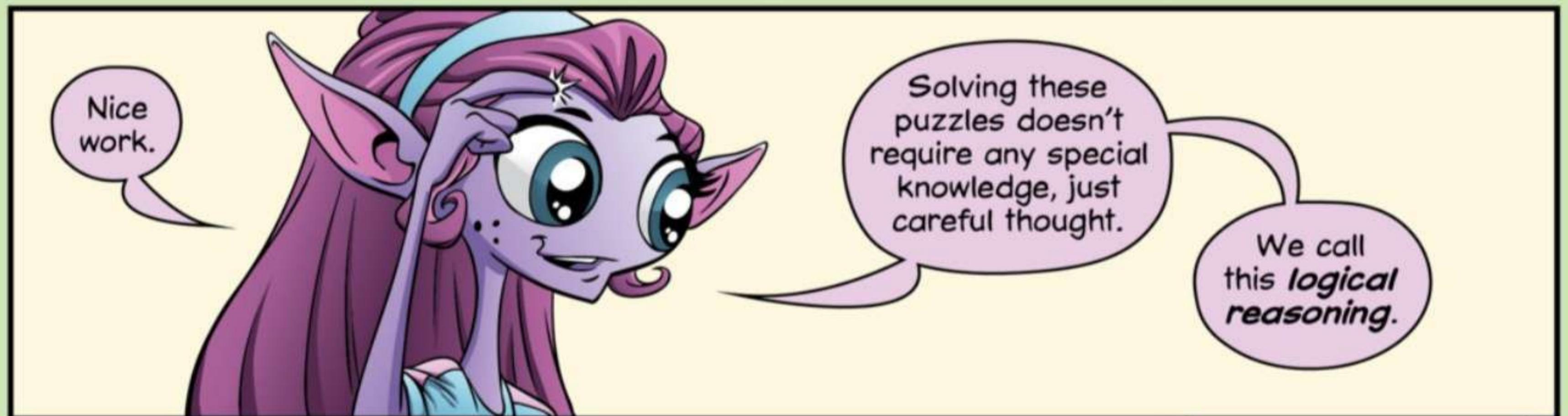
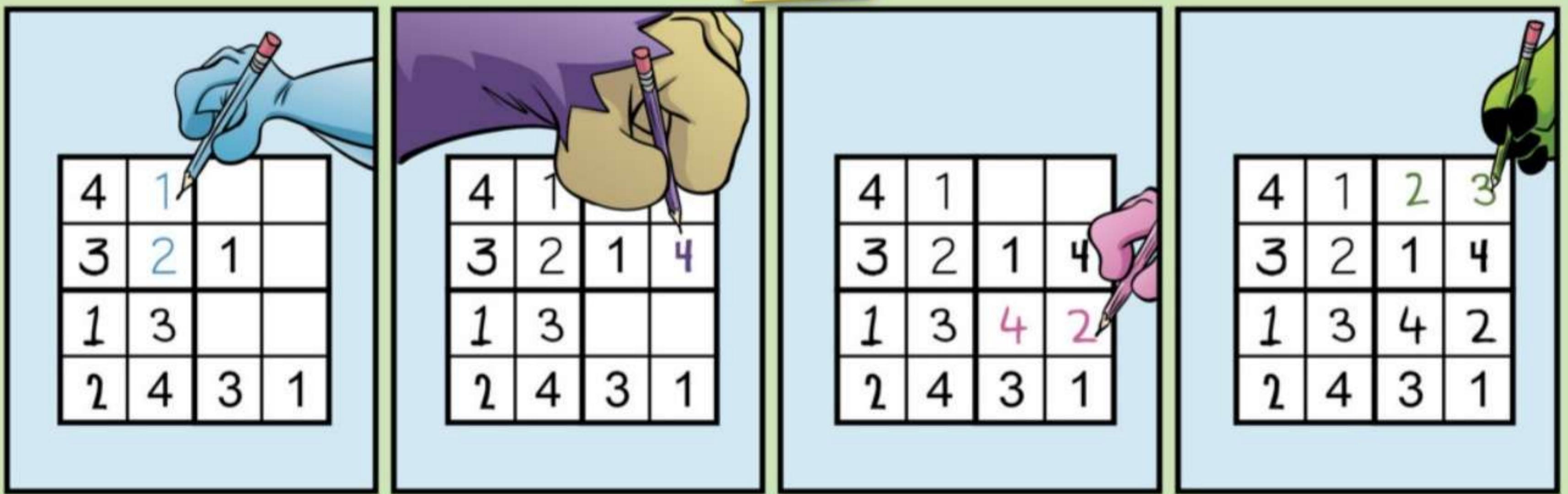
Great question!
Figuring out where to start a puzzle is a very important step.

4			
	1		

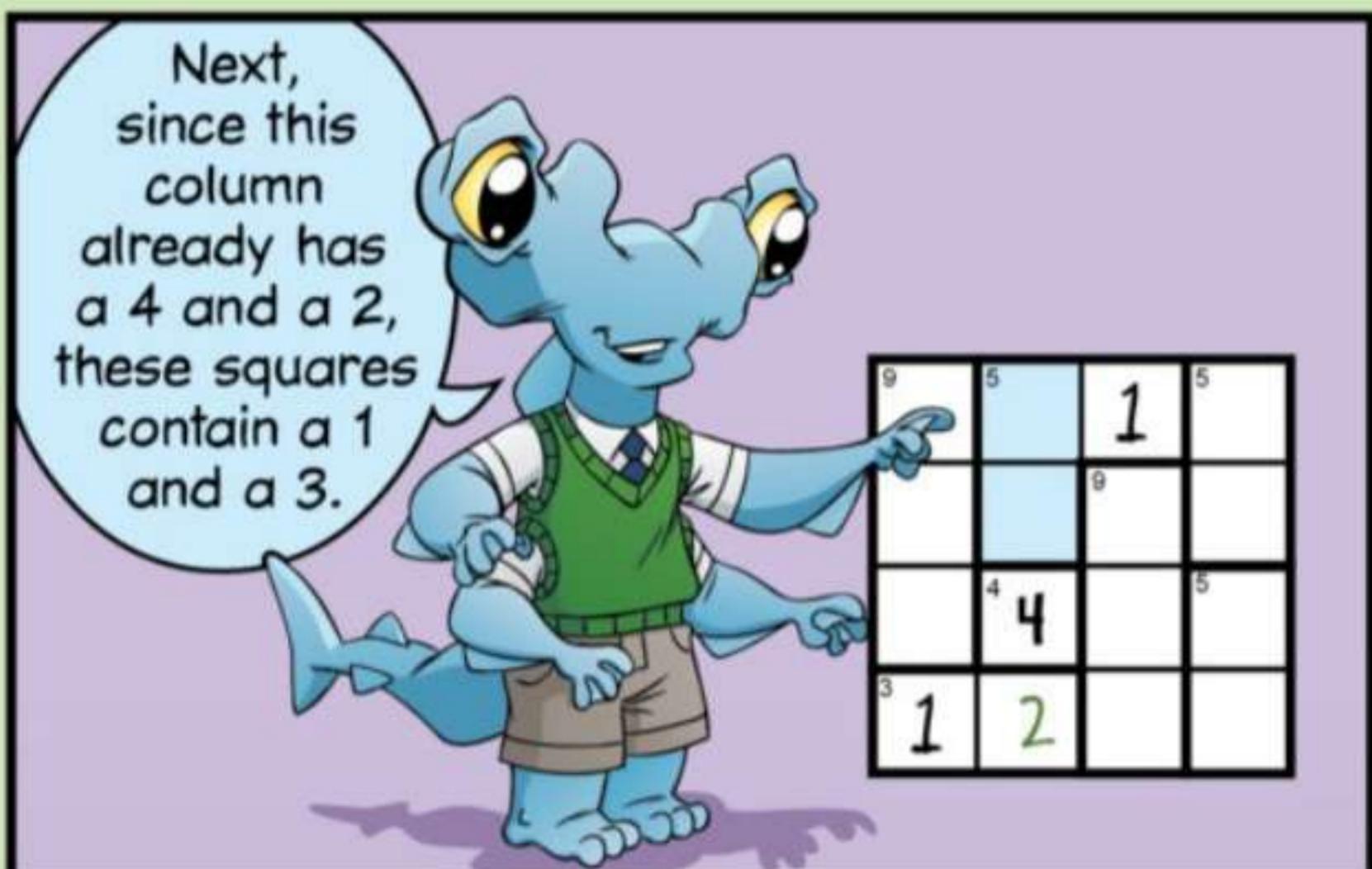
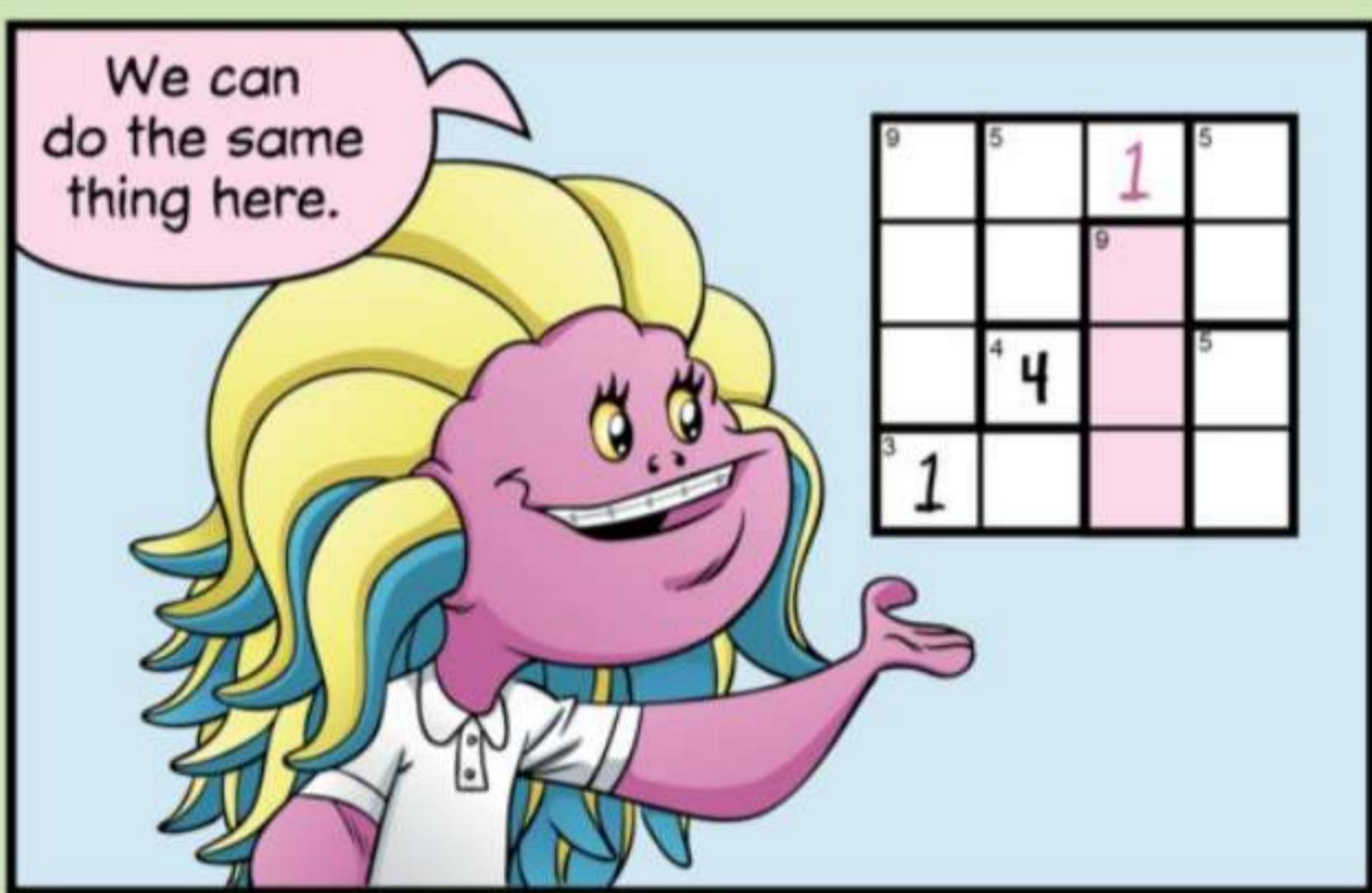
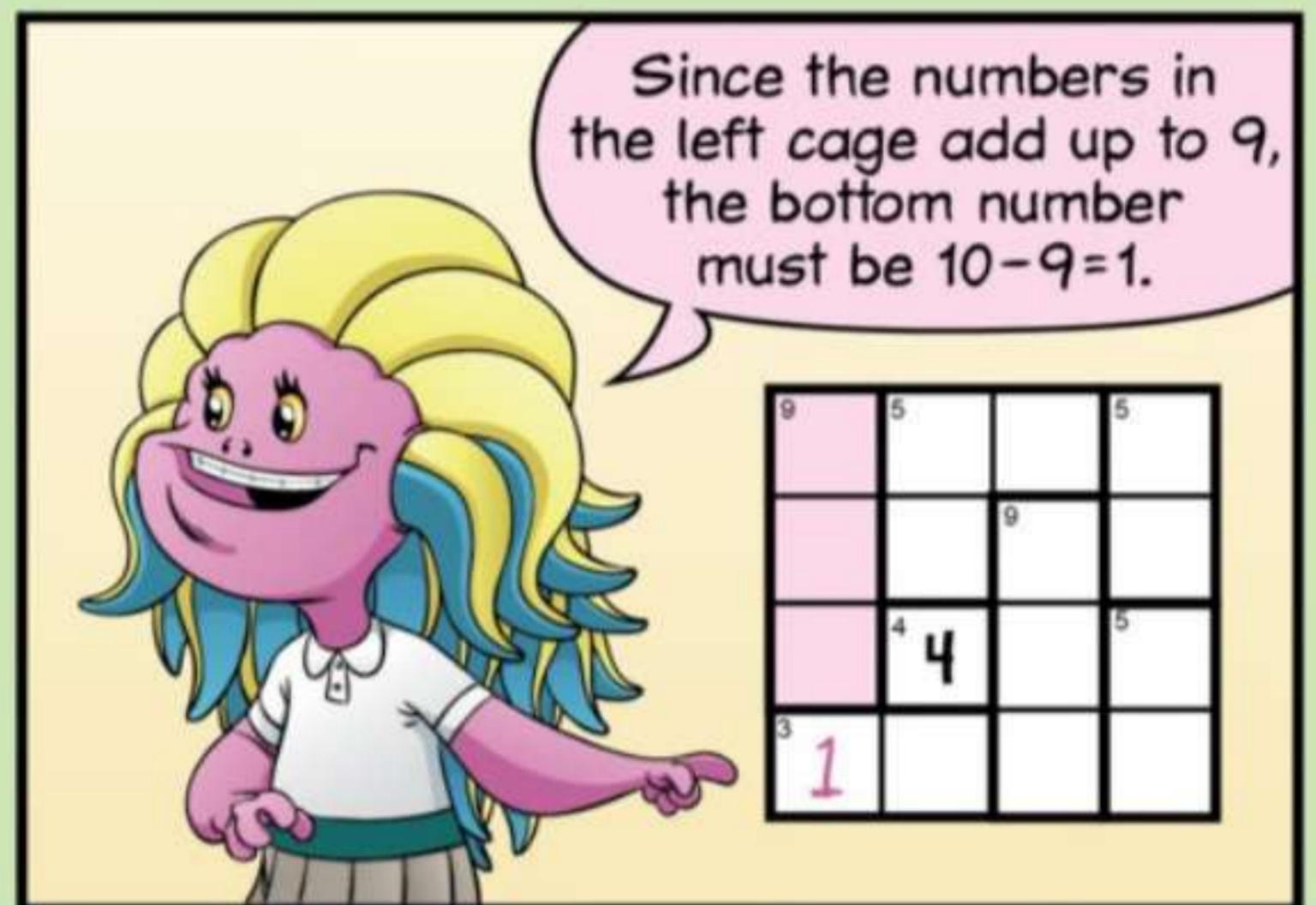
4	3	1	
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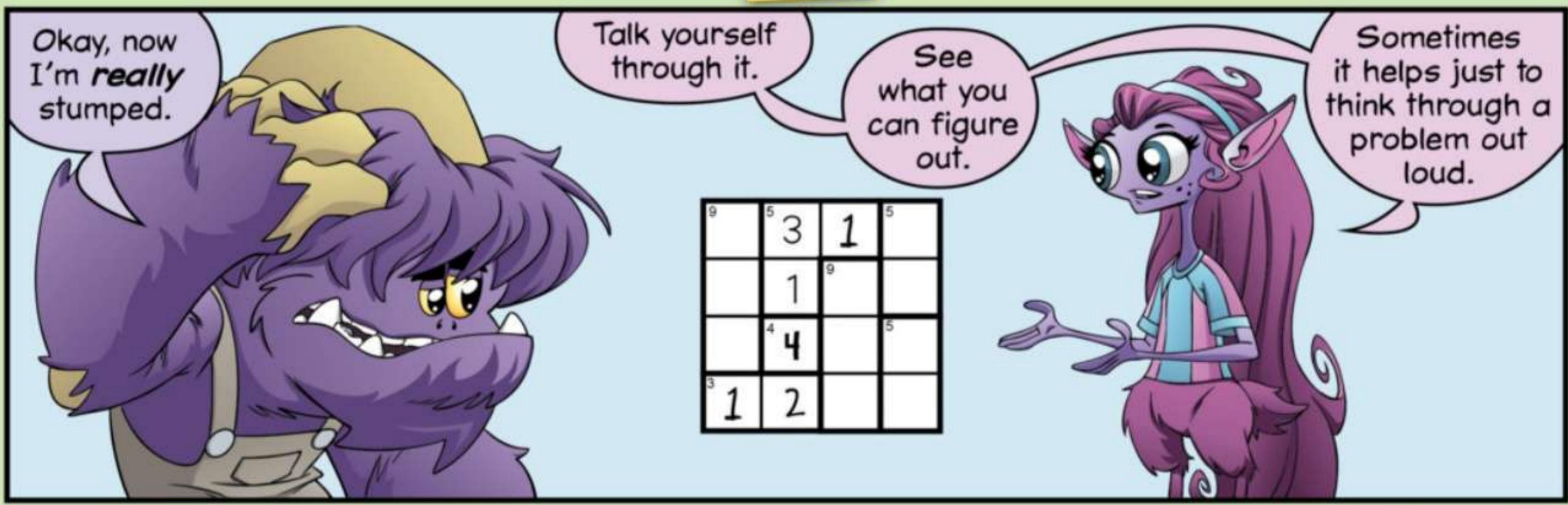
Where would you start this puzzle?



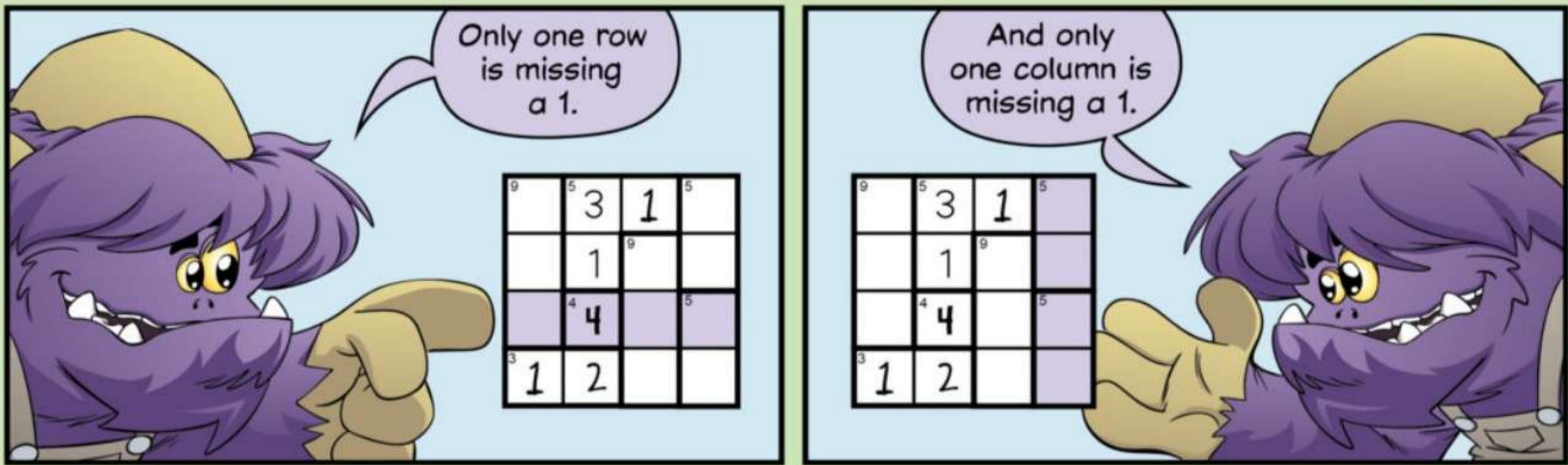
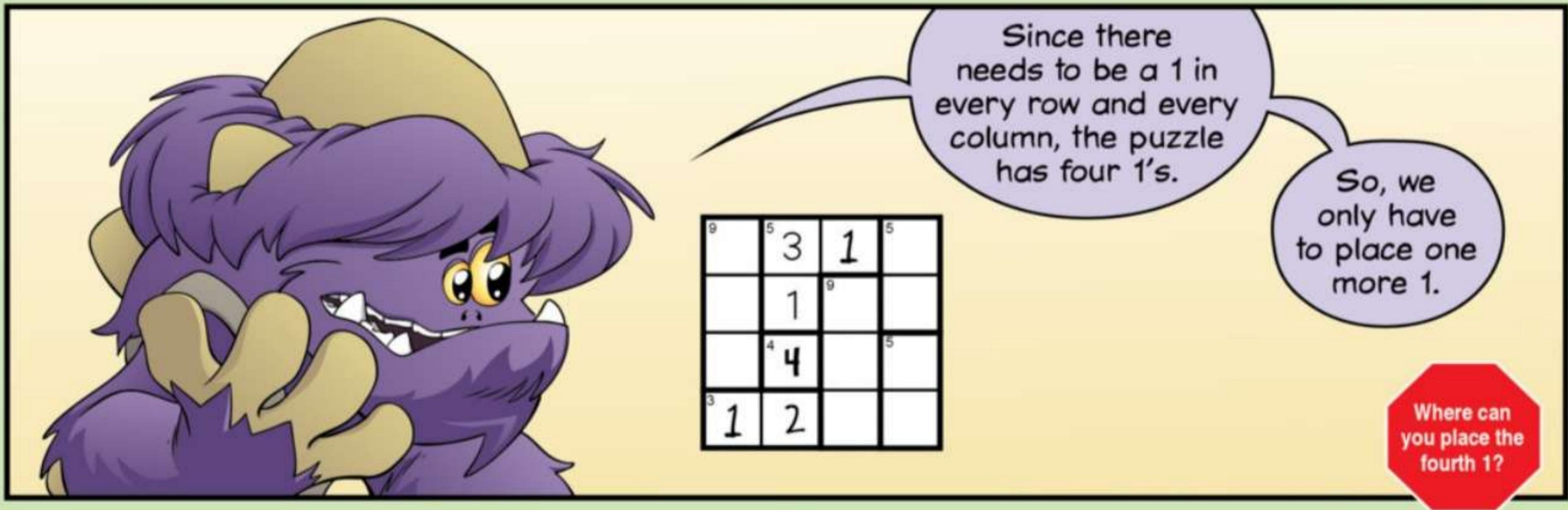


Try it.





9	5	3	1	5
1				
	4			5
3	1	2		



9	5	3	1	5
1		9		
4	4		5	1
3	1	2		4

9	5	3	1	5
1		9		
4	4		5	1
3	1	2	3	4

9	5	3	1	5
1		9		
4	4		5	1
3	1	2	3	4

9	5	3	1	2
1		9		3
4	4		5	1
3	1	2	3	4

9	5	3	1	2
1		9	4	3
4	4	2	5	1
3	1	2	3	4

9	5	3	1	2
2	1	9	4	3
4	4	2	5	1
3	1	2	3	4

Great work!
And just in time,
I think we've
arrived.

PIECES

Code Breaker

Game Play:

Code Breaker is a pencil-and-paper game for two players, a coder and a guesser. The coder secretly chooses three different digits to make a 3-digit code. The guesser tries to guess the code. After each guess, the coder gives two clues:

1. How many of the digits in the guess are correct.
2. How many of the correct digits are in the right place.

The guesser tries to guess the code in as few tries as possible. Each guess must be a 3-digit code whose digits are all different. The guesser keeps track of guesses and clues as shown below.

Guess	Correct Digits	Right Place
123	0	0
456	1	0
789	1	1
580	1	0
704	2	0
049	3	3 yay!

If you want to keep score, take turns as coder and guesser. Award 1 point to the coder for each incorrect guess, and 10 points to the guesser for a correct guess.

Variations:

- You can play Code Breaker with 4-digit numbers.
- Each player can have a code. In this case, players take turns trying to guess the other player's code, with clues given after each guess. The first player to correctly guess the other player's code wins. Take turns guessing first.

Code Breaker is a slight variation of a game called Bulls and Cows. The game Mastermind is also very similar, but uses colored pegs instead of digits.

Sample Game:

Grogg chooses 049 as his secret code.

Winnie's first guess is 123.

Grogg tells Winnie that she has 0 correct digits, and 0 digits in the correct place.

Winnie guesses 456 next.

Grogg tells Winnie that she has 1 correct digit, and 0 digits in the correct place.

Winnie guesses 789.

Grogg tells Winnie that she has 1 correct digit, and 1 digit in the correct place.

Winnie guesses 580.

Grogg tells Winnie that she has 1 correct digit, and 0 digits in the correct place.

Winnie guesses 704.

Grogg tells Winnie that she has 2 correct digits, and 0 digits in the correct place.

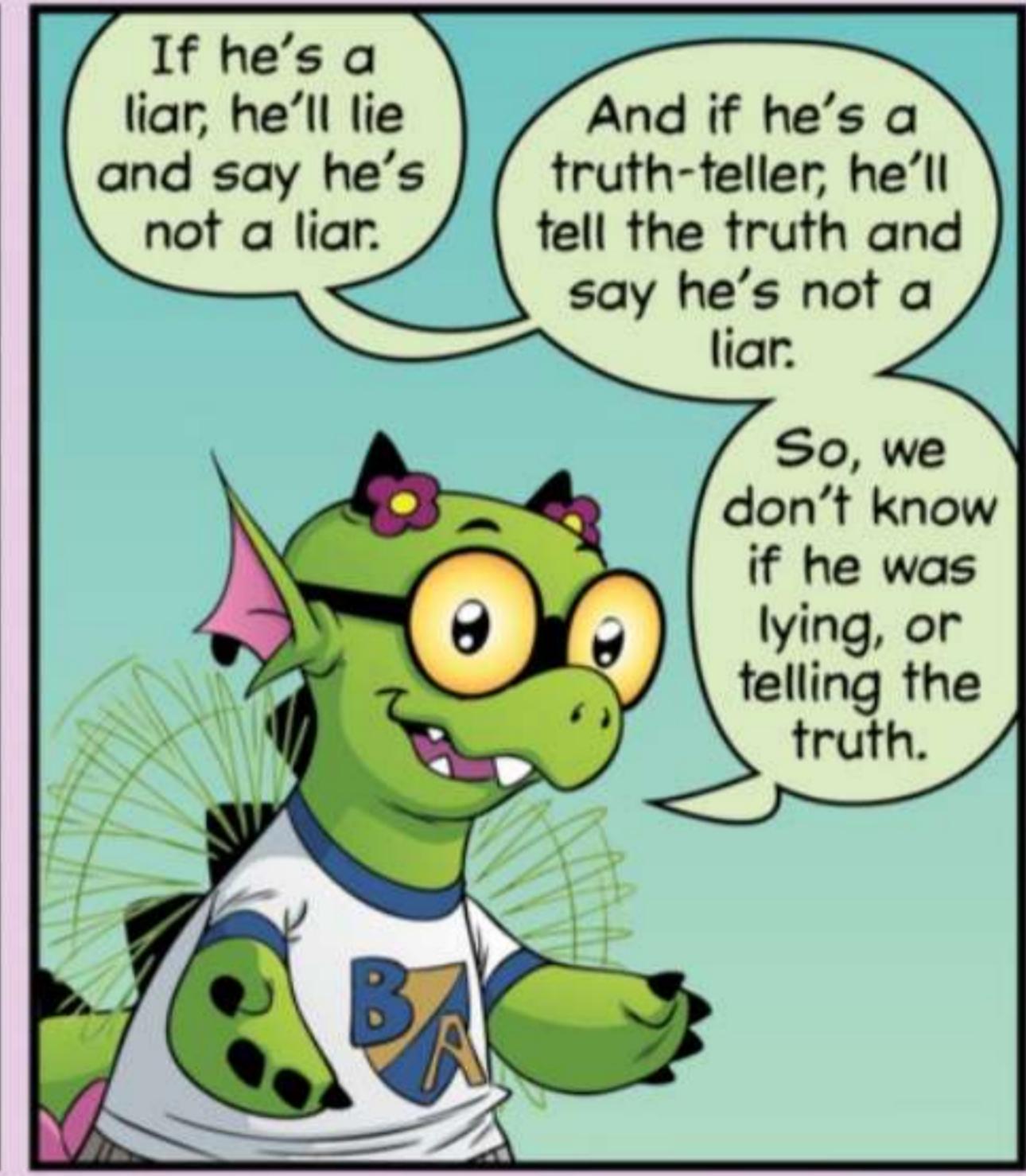
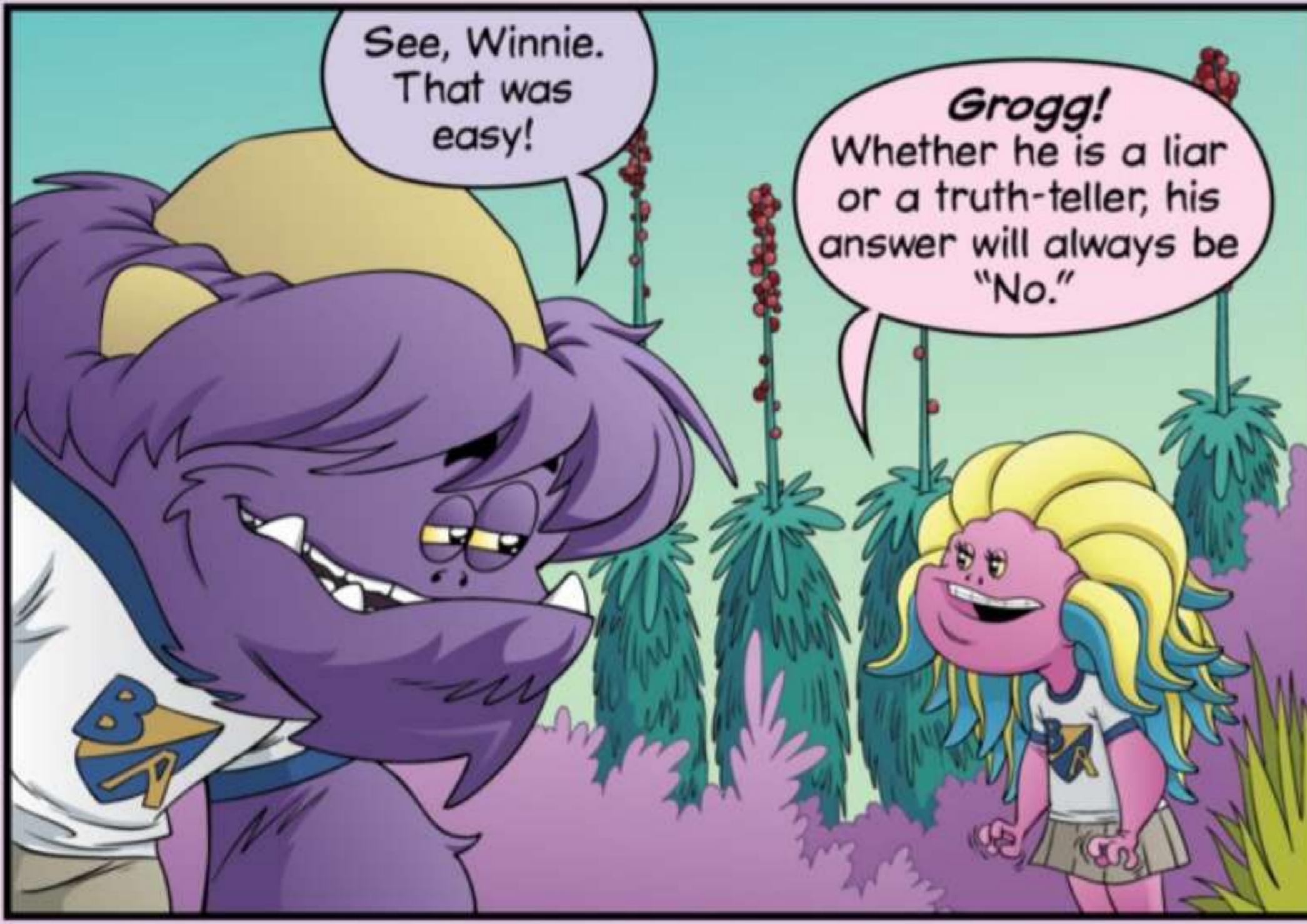
Winnie uses the 5 clues above to figure out Grogg's code, 049!

Find a
partner
and
play!

The Lab

TRUTH & LIES







What question would you ask a liar to figure out which way to go?









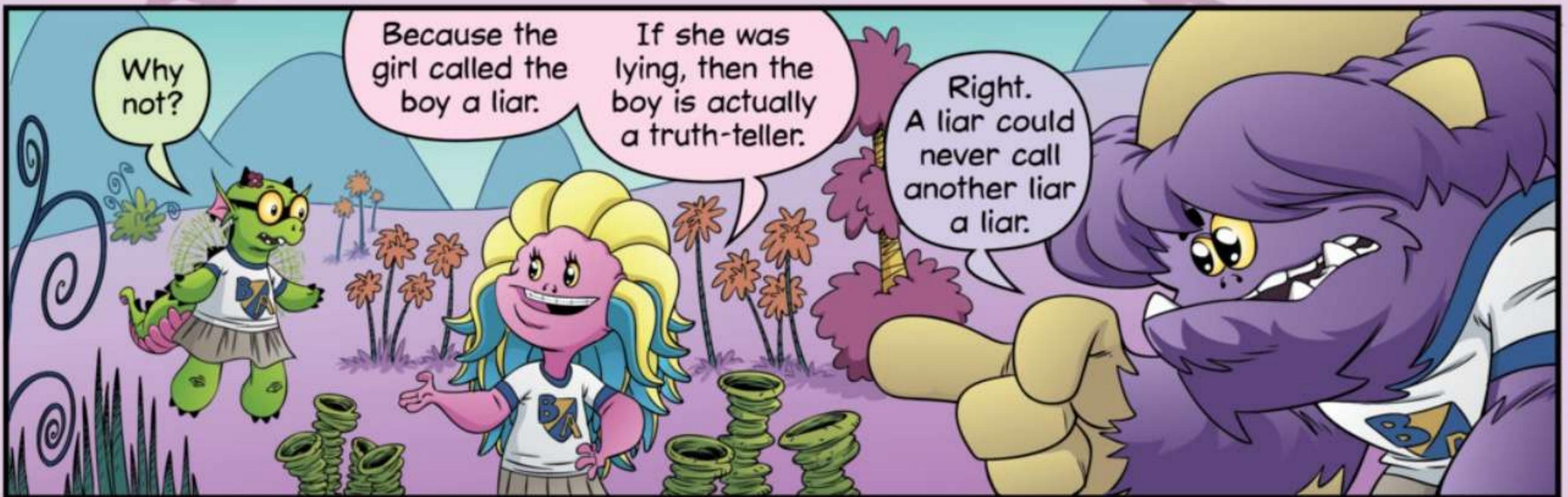


Girl	Boy	Path
Lie	Lie	Lie, Lie
Truth	Lie	Lie, Truth
Lie	Truth	Truth, Lie
Truth	Truth	Truth, Truth

There are four possibilities.

Wait. They can't both be liars.

And they can't both be telling the truth.



Girl	Boy	Path
Lie	Lie	Impossible
Truth	Lie	
Lie	Truth	
Truth	Truth	Impossible

But, if the girl was telling the truth, then the boy really is a liar.

That leaves us with only two cases to explore.

Either she was telling the truth and he lied... or she was lying and he told the truth.



So, if the girl is a truth-teller and she tells us to go right, we should go right.

Girl	Boy	Path
Lie	Lie	Impossible
Truth	Lie	Right
Lie	Truth	
Truth	Truth	Impossible

But... If the girl was lying, then the boy is a truth teller.

In that case, the boy was telling the truth when he said the girl will tell us to go left.

But, if she's lying when she tells us to go left, we should go right.

Girl	Boy	Path
Lie	Lie	Impossible
Truth	Lie	Right
Lie	Truth	Right
Truth	Truth	Impossible

So, it doesn't matter which one was lying.

We should go right!

To the Math Bowl!

MATH TEAM

The Math Bowl

Hi, guys.

How'd you get here so fast?

I took the shuttle bus from the docks.

Inconceivable!

WELCOME TO THE ANNUAL MATH BOWL



Welcome to your first Math Bowl.

The first round starts in about 30 minutes.

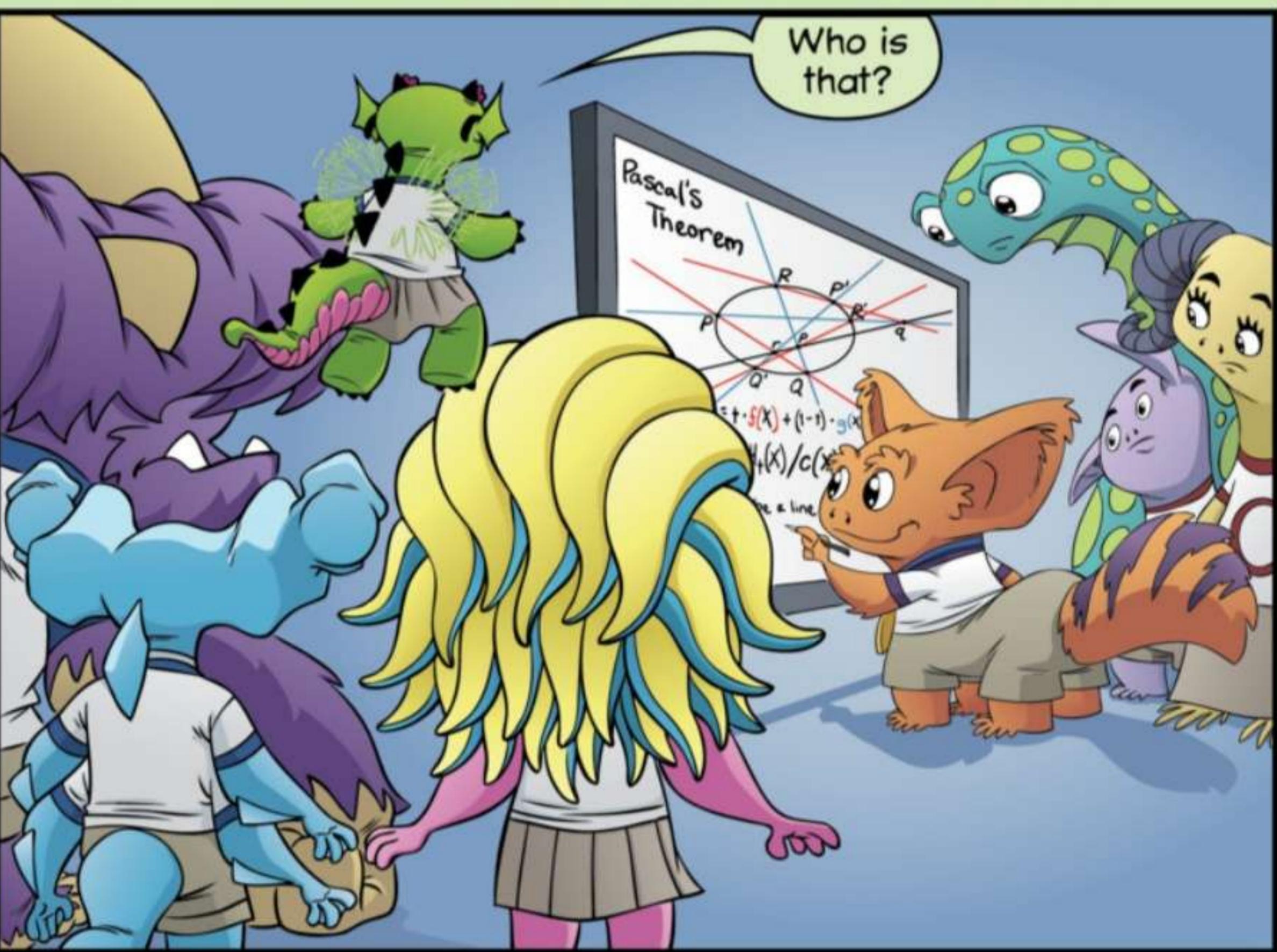
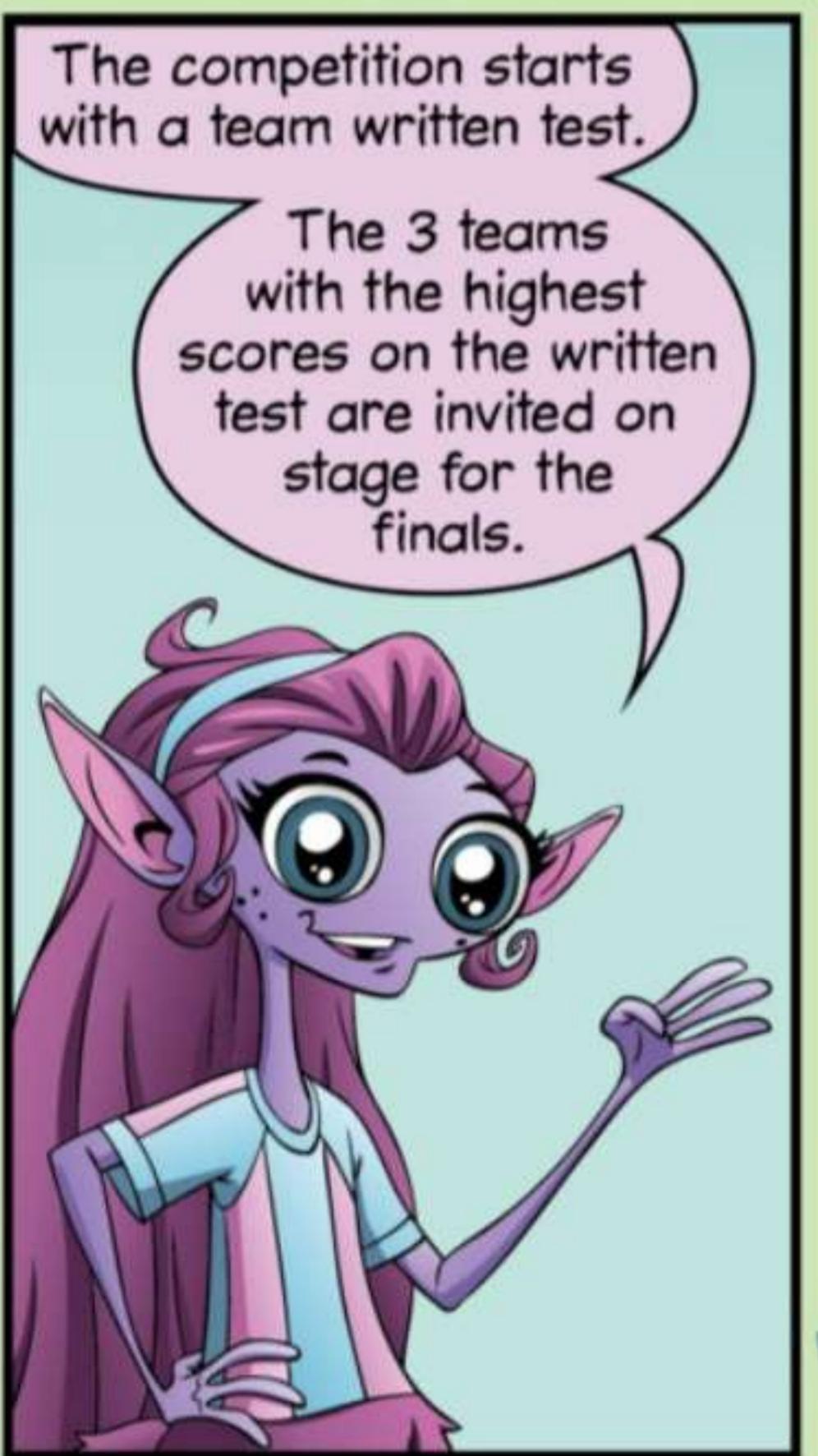
First round?



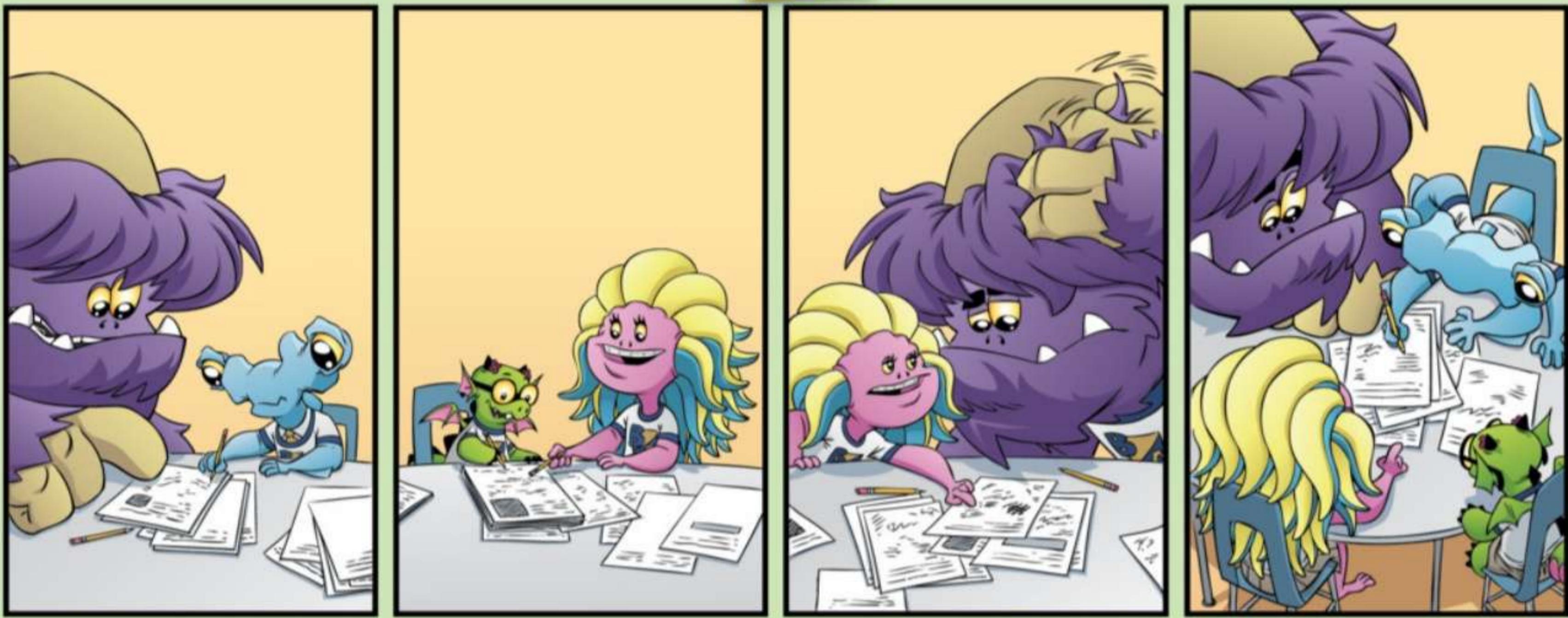
The competition starts with a team written test.

The 3 teams with the highest scores on the written test are invited on stage for the finals.

Who is that?







Okay...
We've finished
almost all of the
problems.

We've got
about 10 minutes
to do the two we
haven't solved
yet.

Number 13
is reeeeally
confusing.

Question 13

Two purple hats and three orange hats are placed in a bag. Anna, Bridget, and Clara are all blindfolded. Each pulls a hat from the bag and puts it on her own head. When the blindfolds are removed, each girl can see the hats on the other girls, but not her own hat. Professor Pickle asks Anna, "Do you know what color your hat is?" Anna says, "No." Professor Pickle then asks Bridget, "Do you know the color of your hat?" Bridget says, "I didn't know before Anna said 'no', but now I do." What color is the hat on each girl's head?

Anna _____ Bridget _____ Clara _____

Read the problem carefully... twice.

If Anna doesn't know the color of her own hat, how are **we** supposed to figure it out?

How could Anna know the color of her own hat?

She can only see Bridget's and Clara's hats.

What would Anna need to see in order to know her own hat color?



SUMMARY: 1. BRIDGET AND CLARA DON'T BOTH HAVE PURPLE HATS 2. ANNA AND CLARA DON'T BOTH HAVE PURPLE HATS.





So, Clara has a purple hat, and Bridget has an orange hat.

And since Bridget doesn't see two purple hats, Anna's hat is orange, too.

Got it!

Two purple hats and three orange hats are placed in a bag. Anna, Bridget, and Clara are all blindfolded. Each pulls a hat from the bag and puts it on her own head. When the blindfolds are removed, each girl can see the hats on the other girls, but not her own hat. Professor Pickle asks Anna, "Do you know what color your hat is?" Anna says, "No." Professor Pickle then asks Bridget, "Do you know the color of your hat?" Bridget says, "I didn't know before Anna said 'no', but now I do." What color is the hat on each girl's head?

Anna Orange Bridget Orange Clara Purple

We solved all but one problem. This last puzzle is really tough.

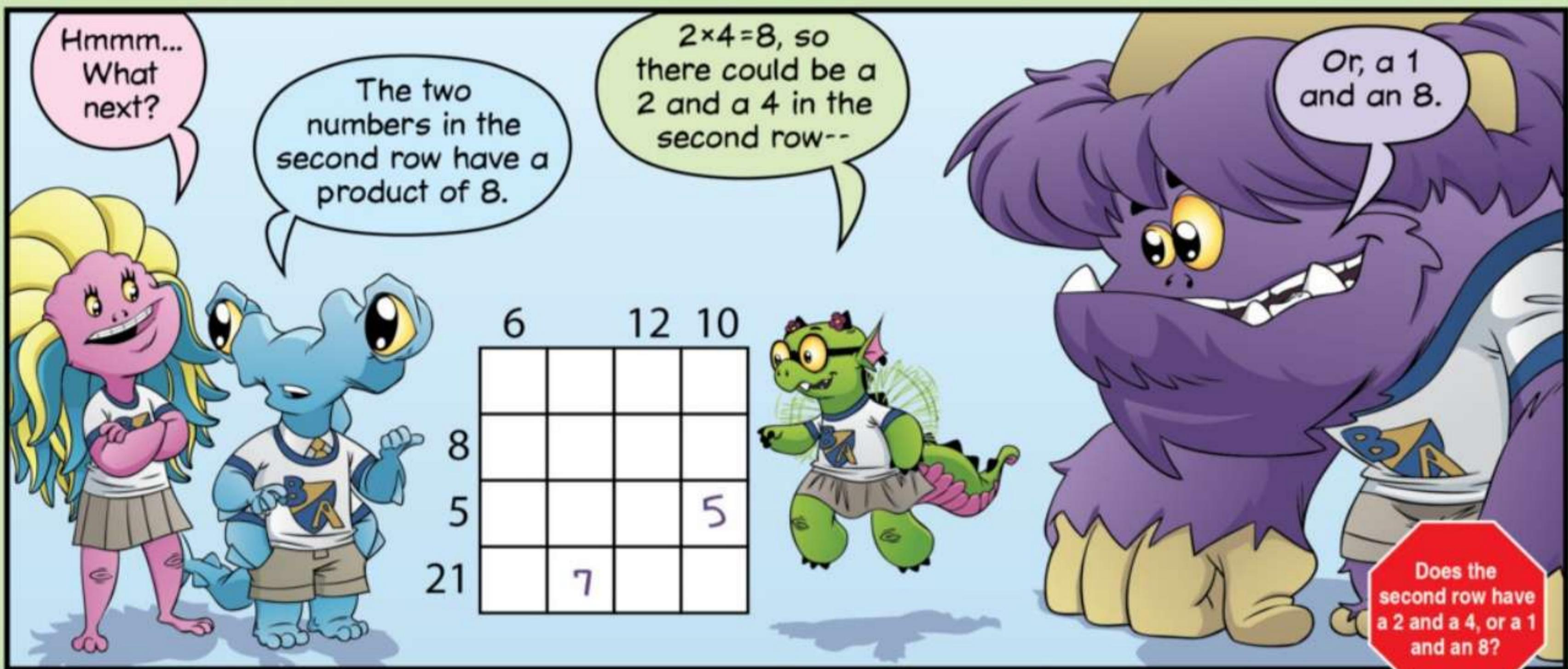
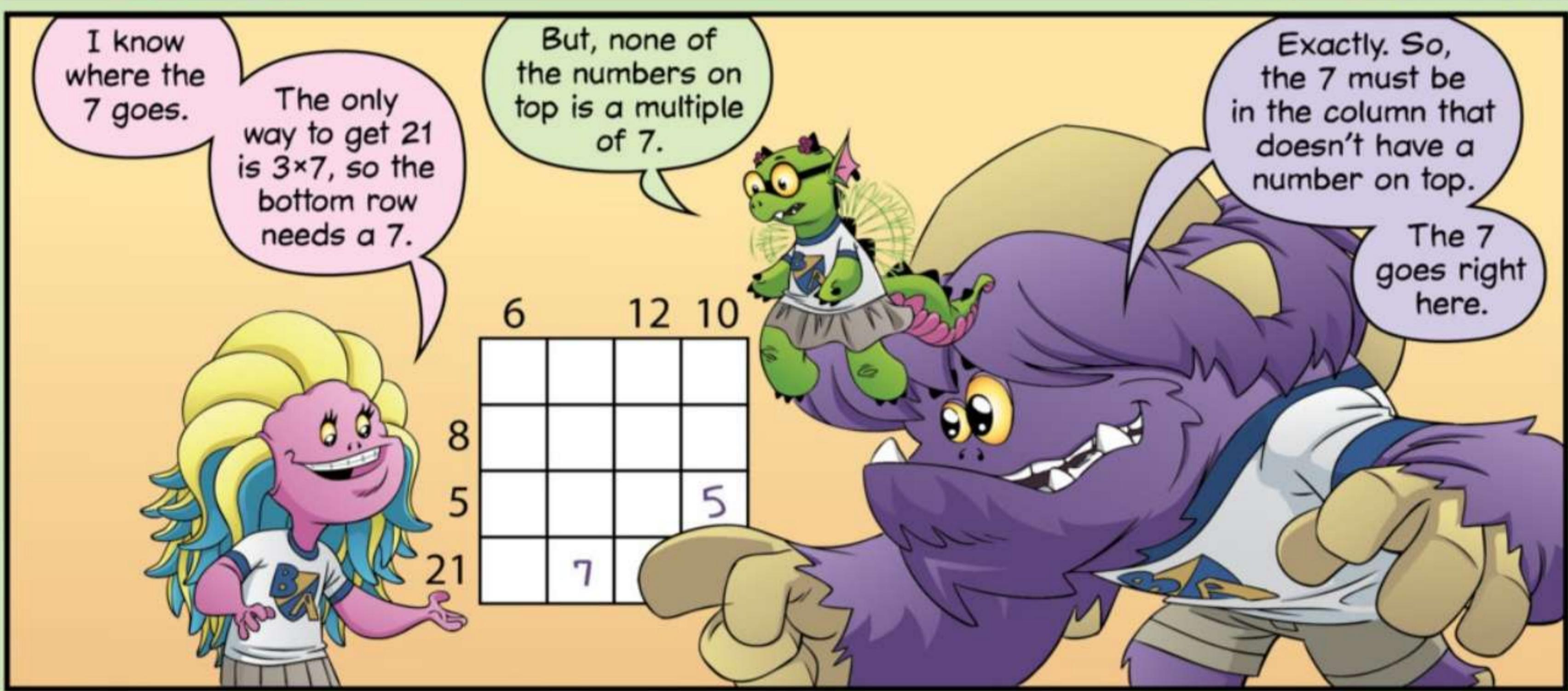
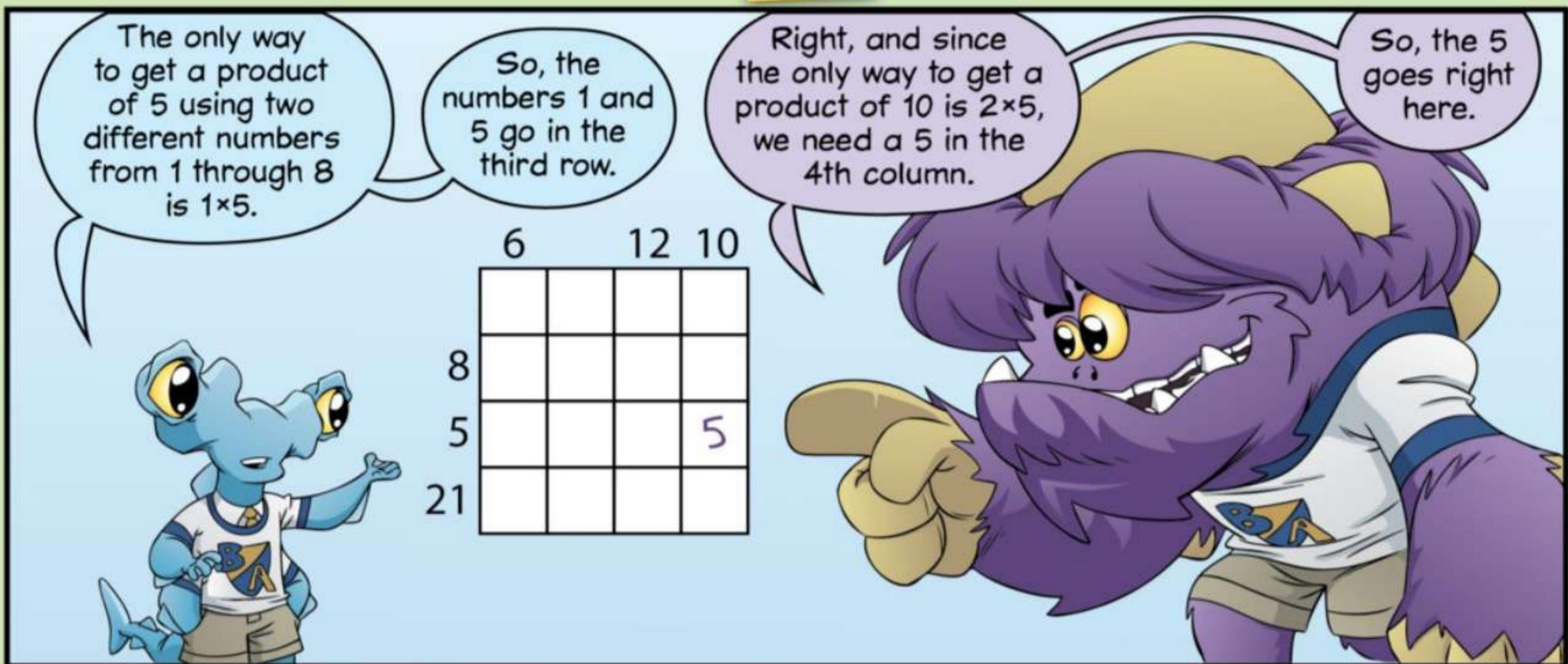
I know where the 5 goes.

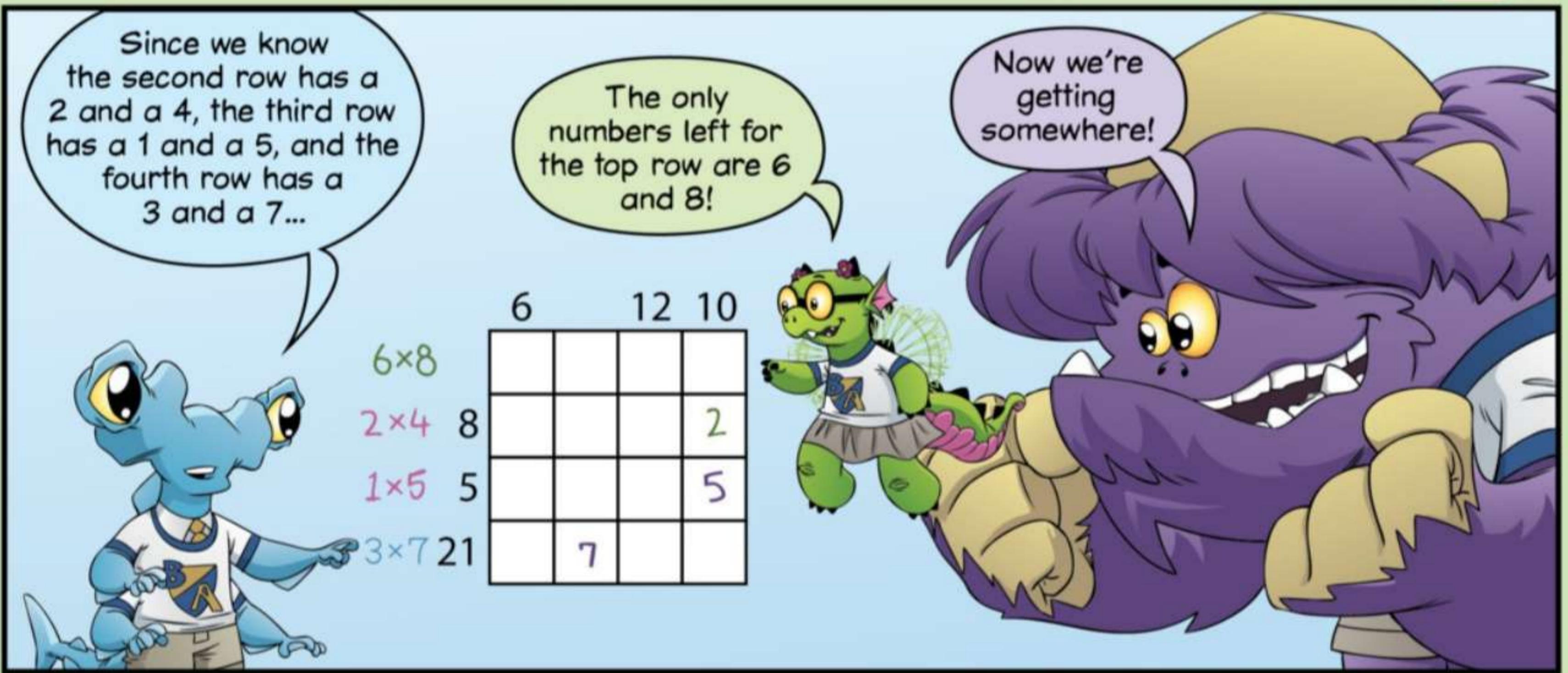
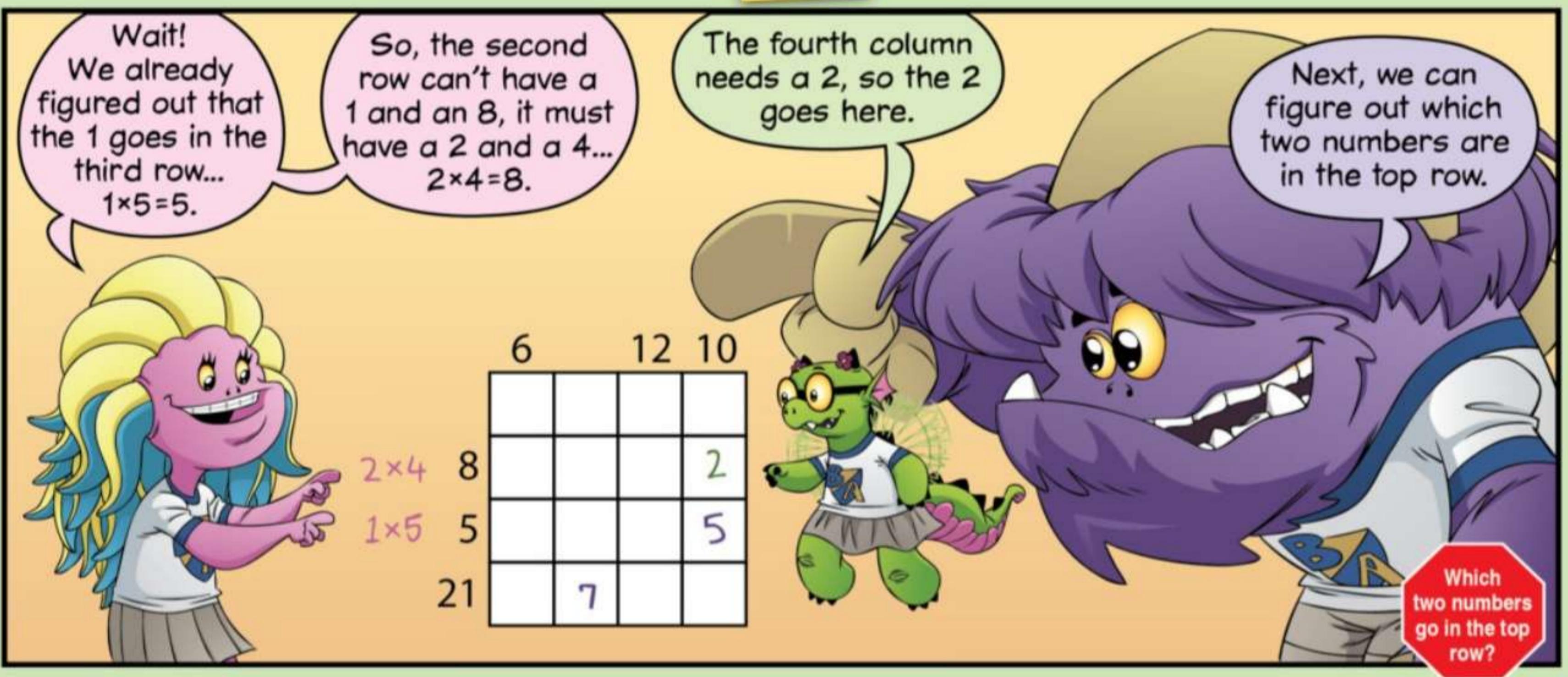
Question 15

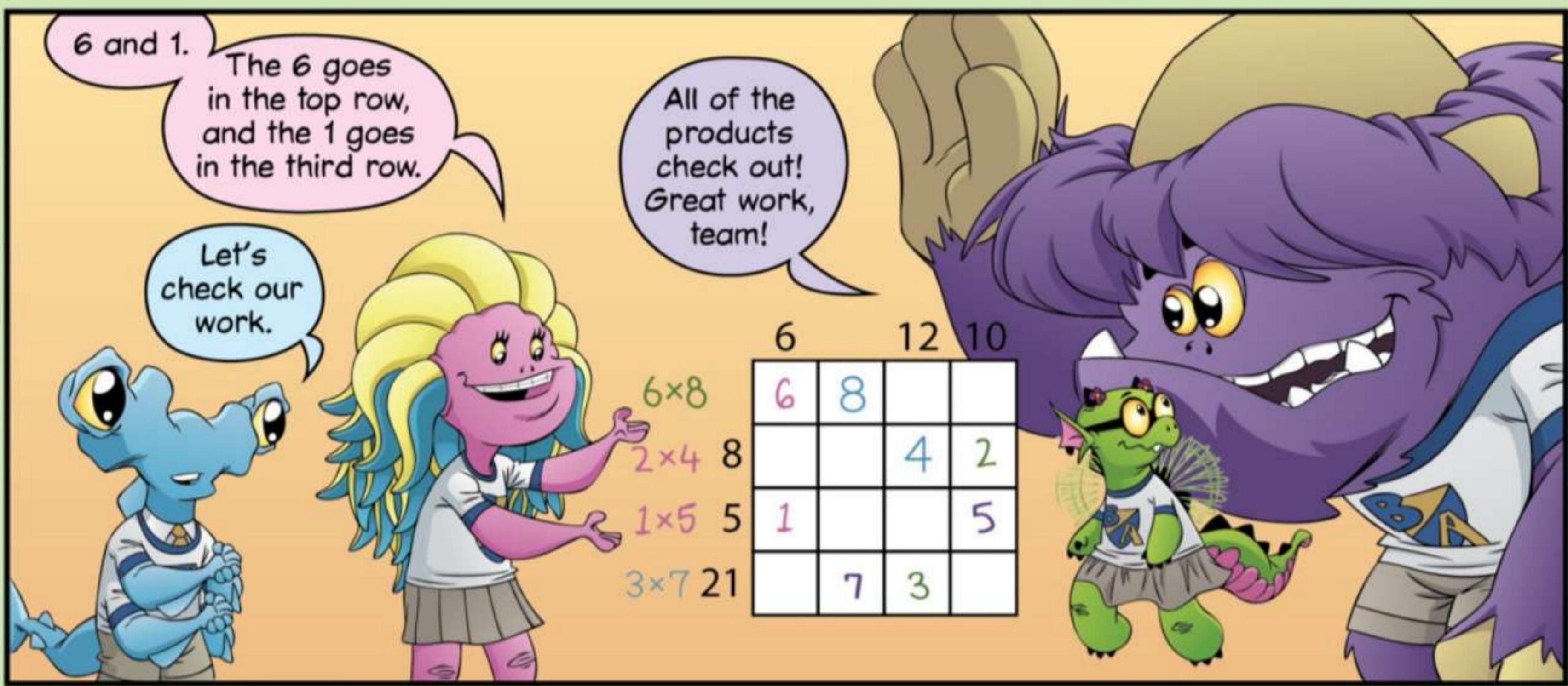
Place the numbers 1 through 8 in the grid below so that there are exactly two numbers in each row and column. Each clue outside the grid gives the product of the two numbers in a given row or column.

	6	12	10
8			
5			
21			

Where should the 5 be placed?







I'll now announce the top three teams.

Qualifying in third place is Orb Elementary.

Each of the top two qualifying teams had a perfect score in the team round!

Please welcome a little monster who has graced this stage each of the past 3 years, Maxwell Norris!



And, our final qualifying team is new to the Math Bowl this year:

Please welcome the team from Beast Academy!

Whoa.

Really!?

Inconceivable!

Great job! Get up there and do your best!



The team round rules are simple. I will read a series of questions that will also appear on the screen.

The first team to correctly answer 10 questions will be crowned this year's regional Math Bowl champion.

Teams, please test your buzzers.

Ping!

Bloop!

Zerr!



If everyone is ready, I'll read the first question.

A square field with a side length of 135 feet is surrounded by a fence whose--

A square field with a side length of 135 feet is surrounded by a fence whose posts are spaced 5 feet apart. Including the posts on the corners, how many posts are on each side of the fence?

28 posts.



28 is correct.
Max scores the first point.

Question 2:
How much larger is 3^5 than 5^3 ?

118.



Question 3:
What is the area--

18 square inches.

Question--

Yikes.
How did he--

13.



