How to Figure Out Cheryl's Birthday
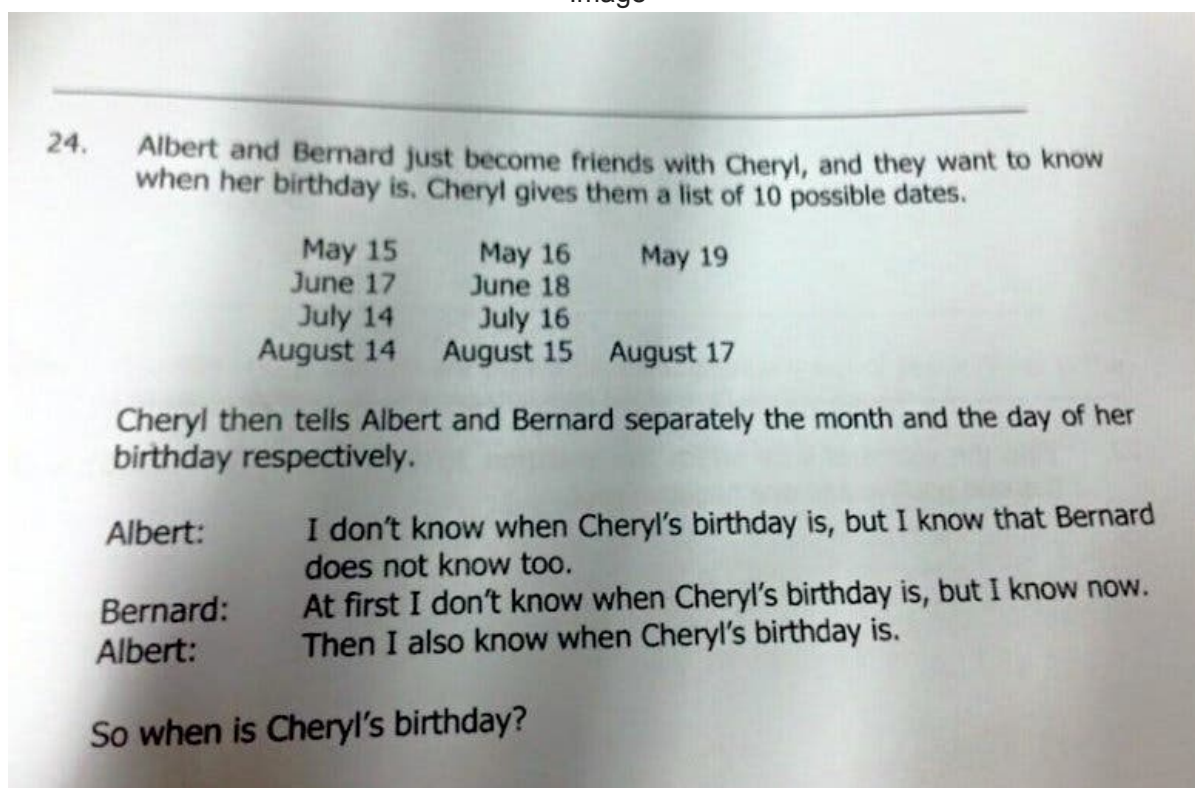
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If you have not already, read about the question first.

Otherwise, this answer will be even more confusing.

Image

This genre of logic puzzles is baffling in large part because people rarely act this way. The puzzles also have built-in assumptions — everyone is truthful, for instance and no one gets offended and walks off when strangers insist on making basic communication so complicated. Students who compete in math competitions are generally familiar with the conventions of logic puzzles, but people who have not taken a math class for more than a decade generally say, "Huh?"

This puzzle is particularly convoluted. Why don't Albert and Bernard just blurt out what Cheryl has told them? Why is Cheryl so coy about revealing the month and day, but not year, of her birthday? What else is Cheryl trying to hide?

But if you are willing to play, here's how the logic unwinds.

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It helps to put the list of 10 dates into table form:

Image

	14	15	16	17	18	19
May		15	16			19
June				17	18	
July	14		16			
August	14	15		17		

Now let's examine what Albert and Bernard say. Albert goes first:

> **I don't know when your birthday is, but I know Bernard doesn't know, either.**

The first half of the sentence is obvious — Albert only knows the month, but not the day — but the second half is the first critical clue.

The initial reaction is, how could Bernard know? Cheryl only whispered the day, so how could he have more information than Albert? But if Cheryl had whispered "19," then Bernard would indeed know the exact date — May 19 — because there is only one date with 19 in it. Similarly, if Cheryl had told Bernard, "18," then Bernard would know Cheryl's birthday was June 18.

Thus, for this statement by Albert to be true means that Cheryl did not say to Albert, "May" or "June." (Again, for logic puzzles, the possibility that Albert is lying or confused is off the table.) Then Bernard replies:

> **I didn't know originally, but now I do.**

So from Albert's statement, Bernard now also knows that Cheryl's birthday is not in May or June, eliminating half of the possibilities, leaving July 14, July 16, Aug. 14, Aug. 15 and Aug. 17. But Bernard now knows. If Cheryl had told him "14," he would not know, because there would still be two possibilities: July 14 and Aug. 14. Thus we know the day is not the 14th.

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Now there are only three possibilities left: July 16, Aug. 15 and Aug. 17. Albert again:

> **Well, now I know too!**

The same logical process again: For Albert to know, the month has to be July, because if Cheryl had told him, "August," then he would still have two possibilities: Aug. 15 and Aug. 17.

The answer is July 16.

Cheryl is a Cancer, which still does not explain her behavior.

If you want it broken down another way, The Guardian also explained it.

Disagree? Got a question? Write a comment.

If you had fun and would like to try more (harder!) math puzzles, check out The Times' Numberplay blog.