Birthday Logic

A middle/high school math test in Singapore had this curious problem (re-phrased):

Bob and Craig just became friends with Alice, and they want to know when her birthday is. Alice gives them a list of 10 possible dates:

January 8	January 10	January 13
March 4	March 13	
July 16	July 20	
November 4	November 10	November 16

Alice then *separately* tells Bob the month of her birthday, and Craig the day of her birthday. The following conversation ensues:

Bob: I don't know when Alice's birthday is, but I know that Craig doesn't know either.
Craig: At first I didn't know when Alice's birthday was, but I know now.
Bob: Then I also know when Alice's birthday is.

Now we too know Alice's birthday. What is it?

Answer of problem **Birthday Logic**

Let's make a table of possible birthday dates:

	4	8	10	13	16	20
January		x	x	x		
March	x			x		
July					x	x
November	x		x		x	

From the table the answer is obvious: $\boxed{\text{March 13}}$.

If it is still not clear:

Bob:	I don't know when Alice's birthday is, but I know that Craig doesn't know either.
	Since Bob is certain that Craig does not know, one concludes that there must be some ambiguity in the day, and that rules out January and July (for us and Craig), since they have unambiguous days 8 and 20
Craig:	At first I didn't know when Alice's birthday was, but I know now.
	With just March and November left, we and Bob eliminate day 4 that would prevent Craig from knowing, since it is ambiguous.
Bob:	Then I also know when Alice's birthday is.
	Since now even Bob knows, we eliminate ambiguous November month.

We are left with March 13.