

## 1 The File `cheryls_birthday.pl`

Albert and Benard have just become friends with Cheryl, and they want to know when her birthday is.

<code>possible_date(Month, Day)</code>	<code>cheryls_birthday.pl</code>
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Cheryl gives them a list of 10 possible dates.

```
possible_date(may, 15).
possible_date(may, 16).
possible_date(may, 19).
possible_date(june, 17).
possible_date(june, 18).
possible_date(july, 14).
possible_date(july, 16).
possible_date(august, 14).
possible_date(august, 15).
possible_date(august, 17).
```

Cheryl then tells Albert and Bernard separately the month and the day of her birthday, respectively.

Albert says, “I don’t know when Cheryl’s birthday is, but I know that Bernard doesn’t know either.”

If Albert knows the month but doesn’t know the date, then the month does not uniquely determine the day.

<code>month_uniquely_determines_day(Month)</code>	<code>cheryls_birthday.pl</code>
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If a month uniquely determines the day, it means that the month has only one possible day.

```
month_uniquely_determines_day(Day) :-
    possible_date(Month, Day),
    findall(D, possible_date(Month, D), [_]).
```

If Albert knows that knowing the day alone isn’t enough information, then the day does not uniquely determine the month.

<code>day_uniquely_determines_month(Month)</code>	<code>cheryls_birthday.pl</code>
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If a day uniquely determines the month, it means that the day occurs in only one possible month.

```
day_uniquely_determines_month(Month) :-
    possible_date(Month, Day),
    findall(M, possible_date(M, Day), [_]).
```

<code>albert_knows_month(Month, Day)</code>	<code>cheryls_birthday.pl</code>
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So, Albert knows that the month does not uniquely determine the day, nor does the day uniquely determine the month.

```
albert_knows_month(Month, Day) :-
    possible_date(Month, Day),
    \+(month_uniquely_determines_day(Day)),
```

```
\+(day_uniquely_determines_month(Month)).
```

Bernard says, “At first I didn’t know when Cheryl’s birthday is, but I know now.”

<code>bernard_knows(Month, Day)</code>	<code>cheryls_birthday.pl</code>
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Since Bernard knows the day, and now knows that the month does not uniquely determine the day, he can deduce the month.

```
bernard_knows(Month, Day) :-  
    possible_date(Month, Day),  
    findall(M, albert_knows_month(M, Day), [Month]).
```

Albert says, “Then I also know when Cheryl’s birthday is.”

<code>albert_knows(Month, Day)</code>	<code>cheryls_birthday.pl</code>
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Since Albert knows the month, and now knows that knowing the day and that the month does not uniquely determine the day determines the month, Albert can deduce the day.

```
albert_knows(Month, Day) :-  
    possible_date(Month, Day),  
    findall(D, bernard_knows(Month, D), [Day]).
```

```
cheryls_birthday(Month, Day) :-  
    bernard_knows(Month, Day),  
    albert_knows(Month, Day).
```