Of the 70 (as of 2010) women to win the Academy Award for Best Actress, there are 4 pairs who share the same birthday: Jane Wyman and Diane Keaton (Jan 5), Joanne Woodward and Elizabeth Taylor (Feb 27), Barbra Streisand and Shirley MacLaine (Apr 24), and Helen Mirren and Sandra Bullock (Jul 26).

Finding the Probability That an Event Does Not Occur

Probability That an Event Does Not Occur

If the probability that an event occurs is p, then the probability that the event does not occur is

$$\text{Probability that event does not occur} = 1 - p.$$

EXAMPLE 3 Finding the Probability of an Event

A classroom has 35 students. What is the probability that at least two of them have the same birthday?

SOLUTION

To answer this question, you can use a technique that is frequently used in probability. That is, it is often easier to find the probability that an event *does not* occur, and then subtract the result from 1 to find the probability that it *does* occur.

$$\text{Probability that all 35 students have } \textit{different} \text{ birthdays} = \overbrace{\left(\frac{366}{366}\right)\left(\frac{365}{366}\right)\left(\frac{364}{366}\right)\left(\frac{363}{366}\right)\cdots\left(\frac{333}{366}\right)\left(\frac{332}{366}\right)}^{35 \text{ factors}} \approx 0.187$$

$$\text{Probability that at least 2 students have the } \textit{same} \text{ birthday} = 1 - 0.187 = 0.813$$

So, the probability that at least 2 of the students have the same birthday is about 81.3%. Surprising, isn't it?

Checkpoint

Help at Math.andYOU.com

Use a spreadsheet to extend the result of the above example to 40 students.

DATA

	A	B	C
1	**Number of Students**	**Unused Birthdays**	**Probability of Different Birthdays**
2	1	366	100.00%
3	2	365	99.73%
4	3	364	99.18%
5	4	363	98.37%
36	35	332	18.65%
37	36	331	
38	37	330	
39	38	329	
40	39	328	
41	40	327	