EXAMPLE 2 **Use the combinations formula**

LUNCH MENU You order a sandwich at a restaurant. You can choose 2 side dishes from a list of 8. How many combinations of side dishes are possible?

Solution

The order in which you choose the side dishes is not important. So, to find the number of combinations of 8 side dishes taken 2 at a time, find $_8C_2$.

$_8C_2 = \dfrac{8!}{(8-2)! \cdot 2!}$ **Combinations formula**

$= \dfrac{8!}{6! \cdot 2!}$ **Subtract.**

$= \dfrac{8 \cdot 7 \cdot 6!}{6! \cdot (2 \cdot 1)}$ **Expand factorials.**
Divide out common factor, 6!.

$= 28$ **Simplify.**

▶ There are 28 different combinations of side dishes you can order.

EXAMPLE 3 **Find a probablity using combinations**

PHOTOGRAPHY A yearbook editor has selected 14 photos, including one of you and one of your friend, to use in a collage for the yearbook. The photos are placed at random. There is room for 2 photos at the top of the page. What is the probability that your photo and your friend's photo are the two placed at the top of the page?

Solution

STEP 1 **Write** the number of possible outcomes as the number of combinations of 14 photos taken 2 at a time, or $_{14}C_2$, because the order in which the photos are chosen is not important.

$_{14}C_2 = \dfrac{14!}{(14-2)! \cdot 2!} = \dfrac{14!}{12! \cdot 2!} = \dfrac{14 \cdot 13 \cdot 12!}{12! \cdot (2 \cdot 1)} = 91$

STEP 2 **Find** the number of favorable outcomes. Only one of the possible combinations includes your photo and your friend's photo.

STEP 3 **Calculate** the probability.

P(your photo and your friend's photos are chosen) $= \dfrac{1}{91}$

✓ **GUIDED PRACTICE** for Examples 2 and 3

2. **WHAT IF?** In Example 2, suppose you can choose 3 side dishes out of the list of 8 side dishes. How many combinations are possible?

3. **WHAT IF?** In Example 3, suppose there are 20 photos in the collage. Find the probability that your photo and your friend's photo are the two placed at the top of the page.