This is the amazing Martin Gardner geometric vanish dollar bill!

Here’s how to prepare the puzzle:

1) Print out this page on 8-1/2” x 11” paper. You can use any plain paper, but a heavy matte paper will work best.

2) When the sheet comes out of the printer, lift up the end closest to you, flip the sheet over end-for-end (not side-to-side) and insert it back into the printer. This will help ensure that the two halves of the bill will line up. Now print page two of this template on the back of the same sheet.

3) Cut out the five pieces as shown, along the red lines. Neatness counts: scissors work fine, but you’ll get better results using a straightedge and a sharp cutter, such as an X-acto knife.

4) Turn the pieces over and reassemble them to make the back of the bill. The other side of the bill is tinted a different color, to make the process easier.

5) You’ll find that you don’t need Martin’s face to complete the back of the bill! (You’ll also find a character on back of Martin’s portrait who was famous for disappearing!)

If you take a ruler and measure the length and width of the rectangular dollar bill frame on the front of the bill (as opposed to the edges of the paper itself), and compare it to the size of the frame on the back, you’ll find that they’re exactly the same size!

Can you explain this mystery? (See page 2 for a brief explanation of the mathematics behind this illusion.)
A Mathematical Explanation:

No laws of physics or logic have been violated here (:-)"

The secret here is that the back configuration of the dollar is slightly smaller than the front version. The missing area gets removed around the outer border of the dollar bill. To see this, first measure the length and width of the assembled front of the dollar bill with Martin Gardner’s portrait in place, measuring from edge to edge of the paper. Then turn the pieces over, reassemble them, measure again, and you will find that the bill is slightly smaller! By turning over and rearranging the pieces, you have effectively trimmed the outside edge of the bill by a tiny amount all around the border -- exactly equal to the area of the small piece with Martin’s face.

The illusion works because the pieces change their orientation: the outer corners of the four pieces point inward when you turn them over and reassemble. The entire bill becomes slightly smaller all around the outside perimeter. That small decrease in length and width is exactly equal to the area of Martin Gardner’s portrait.

One piece of magician’s misdirection we used was to ask you to compare the dollar bill’s rectangular border on the back and front -- as opposed to the overall outer dimensions of the paper). This bill’s border does not change in size, so that will help you fool your friends!

- Chris Morgan

(You’ll note that the bill image on this side is slightly bigger than the one on page 1. That’s done on purpose to make sure the illusion works even if your printer doesn’t line up the two pages exactly. The extra area gets trimmed off when you cut out the pieces.)