

**Shoe Sizes** If  $x$  is the size of a man's shoe in Britain, then  $d(x) = x + 0.5$  is its size in the United States.<sup>1</sup>

a. Find the inverse of the function.

Finding the inverse of a function is very mechanical process. We use the following steps:

$d(x) = x + 0.5$	Start with the original function, $d(x)$ .
$y = x + 0.5$	Replace $d(x)$ with $y$ .
$x = y + 0.5$	Replace all $x$ 's with $y$ 's and all $y$ 's with $x$ 's.
$x - 0.5 = y$	Solve for $y$ .
$d^{-1}(x) = x - 0.5$	Replace $y$ with the inverse function notation, $d^{-1}(x)$ .

This inverse function,  $d^{-1}(x) = x - 0.5$ , is used when we want to convert,  $x$ , a man's shoe size in the U.S. to a man's shoe size in Britain.

b. Use the inverse function to find the British size of a shoe if it is U.S. size  $8\frac{1}{2}$ .

Let  $x = 8\frac{1}{2}$ .

$$\begin{aligned}d^{-1}(x) &= x - 0.5 \\d^{-1}(8.5) &= 8.5 - 0.5 \\ &= 8\end{aligned}$$

If a man's shoe size is  $8\frac{1}{2}$  in the U.S., then he wears an 8 in Britain.

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<sup>1</sup>Harshbarger/Yocco, *College Algebra In Context*, 5e, p. 284, #32.