

College Algebra, Section 4.2, #48
Combining Functions; Composite Functions

Exchange Rates On a certain date, each euro was worth 1.3773 U.S. dollars and each Mexican peso was worth 0.06047 euro. Find the value of 100 Mexican pesos in U.S. dollars at that time. ¹

We are asked to convert Mexican pesos to U.S. dollars but we are not directly given the exchange rate. Instead, we are given a rate that will exchange Mexican pesos to euros and another rate that will exchange euros to U.S. dollars.

Let's start by looking at the function that will exchange Mexican pesos for euros and I'll call it $E(P)$. This function starts with the number of Mexican pesos we have, P , and will convert those pesos to euros, E .

$$E(P) = P \cdot \frac{0.06047 \text{ euro}}{1 \text{ pesos}} \quad \text{because it only takes 0.06047 euros to buy 1 Mexican peso.}$$

Then we'll look at the next function that will exchange euros for U.S. dollars. I'll call it $U(E)$ and it will start with the number of euros we have, E , and will convert those euros to U.S. dollars, U .

$$U(E) = E \cdot \frac{1.3773 \text{ dollars}}{1 \text{ euro}} \quad \text{because it takes 1.3773 dollars to buy 1 euro.}$$

Now we can put these two functions together into a composite that starts with Mexican pesos, converts them to euros, and then converts euros to U.S. dollars. That is $U \circ E(P)$ which is read, "U of E of P".

To answer the given question we let $P = 100 \text{ pesos}$ and work from the inner function to the outer function.

$$\begin{aligned} U \circ E(P) &= U \circ E(100 \text{ pesos}) \\ &= U(E(100 \text{ pesos})) \\ &= U\left(100 \text{ pesos} \cdot \frac{0.06047 \text{ euro}}{1 \text{ pesos}}\right) \\ &= U\left(100 \cancel{\text{ pesos}} \cdot \frac{0.06047 \text{ euro}}{1 \cancel{\text{ peso}}}\right) && \text{See how nicely the pesos cancel to leave us with euros?} \\ &= U(6.047 \text{ euros}) \\ &= 6.047 \text{ euros} \cdot \frac{1.3773 \text{ dollars}}{1 \text{ euro}} \\ &= 6.047 \cancel{\text{ euros}} \cdot \frac{1.3773 \text{ dollars}}{1 \cancel{\text{ euro}}} && \text{And here the euros cancel to leave us with dollars.} \\ &= 8.3285331 \text{ dollars} \end{aligned}$$

The value of 100 Mexican pesos in U.S. dollars is \$8.33.

¹Harshbarger/Yocco, *College Algebra In Context*, 5e, p. 274, #48.