Name: _____ Date: _____ Period: _____

2.1 **Compositions of Functions**

**Engage:** Shopping!

Dorothy Kelly is shopping and finds several items that are on sale at 25% off the original price. She wishes to buy a sweater originally at $43.98, a pair of jeans for $38.59, and a blouse for $31.99. She has $100 that her grandmother gave her for her birthday. The sales tax where she lives in Rome, Georgia is 7%. Does Dorothy have enough money for all three items? Explain.

BILL Total: $43.98 + 38.59 + 31.99 = $114.56

25% Discount: .25(114.56) = − 28.64

SUBTOTAL $85.92

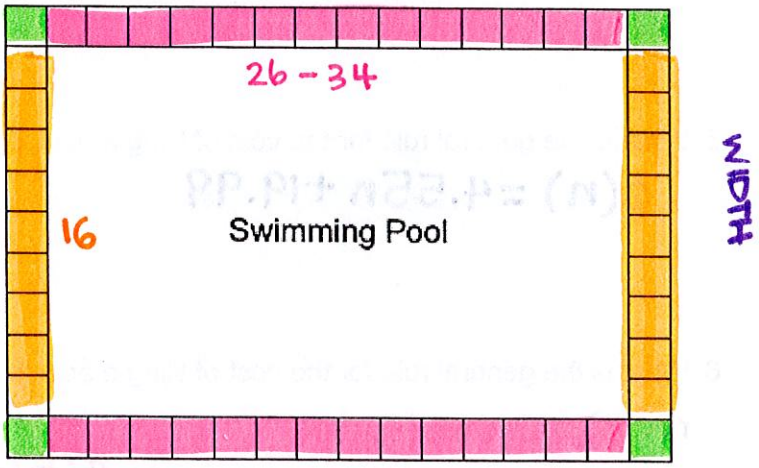
7% TAX: .07(85.92) = + 6.01

TOTAL $91.93

Yes, Dorothy has enough money because $100 > $91.93.

**Explore:** Pool Problem

The Kelly family is building a rectangular swimming pool and wants to lay 1 ft x 1 ft tiles around the perimeter of the pool. They want the pool to be 16 feet wide, but they haven't yet decided how long it should be. They would like the pool to be at least 26 feet long, but given the size of their backyard, the maximum length is 34 feet.




1. How many tiles are needed if the length of the pool is 26 feet? Use colors to demonstrate your strategy for counting the tiles.

$\underset{\text{length}}{26(2)} + \underset{\text{width}}{16(2)} + \underset{\text{corners}}{4} = 88$ tiles

a) Use your strategy to determine how many tiles are needed if the length of the pool is x feet.

# of tiles = $x \cdot 2 + 32 + 4$

$= 2x + 36$

b) What is the minimum number of tiles that would be needed? What is the maximum? How do you know?

minimum maximum

$2(26) + 36 \leq$ # of tiles $\leq 2(34) + 36$

$88 \leq$ # of tiles $\leq 104$

The minimum # of tiles (for length 26 ft) is 88 and the maximum # of tiles (for length 34 ft) is 104.

2. Home Depot sells 1 ft by 1 ft tiles for $4.55 per tile and charges a delivery fee of $19.99. Write a rule for the total cost of having *n* tiles delivered.

total cost = $4.55n + 19.99$

3. Fill in the table to help the Kelly family compare the cost of various size pools. Ignore sales tax. Show your work.

| Side Length | Number of Tiles | Cost |
|---|---|---|
| 26 feet | $2(26)+36=88$ | $4.55(88)+19.99=420.39$ |
| 30 feet | $2(30)+36=96$ | $4.55(96)+19.99=456.79$ |
| 34 feet | $2(34)+36=104$ | $4.55(104)+19.99=493.19$ |

4. What is the general rule for the number of tiles needed, based on a length of *x* feet?

$n(x) = 2x+36$

5. What is the general rule for the cost of tiling a pool, based on the number of tiles?

$c(n) = 4.55n + 19.99$

6. What is the general rule for the cost of tiling a pool that is 8 feet wide by *x* feet long?

$n(x) = 2x + 2(8) + 4$

$n(x) = 2x + 20$

$c(n) = 4.55n + 19.99$

width changed

$c(n(x)) = 4.55(2x+20) + 19.99$

$c(n(x)) = 9.10x + 110.99$

With Question Number 6, you have just encountered a composition of functions. Function composition is when you place one function inside of another function.

The notations for composing two functions are: $f(g(x))$ *or* $(f \circ g)(x)$. The circle is 'open' between the two function letters unlike the notation for multiplication which is a 'closed' (filled-in) circle.