1. Find all real solutions of the equation $\sqrt{\sqrt{x + 1} + x} = 1$.

   - A 0 ← Right Answer
   - B 3
   - C 2
   - D 0, 3
   - E 2, 3

   Solution: We have

   \[
   \sqrt{\sqrt{x + 1} + x} = 1
   \]

   \[
   \left( \sqrt{\sqrt{x + 1} + x} \right)^2 = 1^2
   \]

   \[
   \sqrt{x + 1} + x = 1
   \]

   \[
   \sqrt{x + 1} = 1 - x
   \]

   \[
   (\sqrt{x + 1})^2 = (1 - x)^2
   \]

   \[
   x + 1 = 1 - 2x + x^2
   \]

   \[
   0 = -3x + x^2
   \]

   \[
   0 = x(-3 + x)
   \]

   The values $x = 0$ and $x = 3$ are only potential solutions. We must check them to see if they satisfy the original equation. Plugging in these values into the original equation we see that $x = 0$ is a solution but $x = 3$ is not. So, the only solution is $x = 0$. 
2. Next-door neighbors Bob and Jim use hoses from both houses to fill Bob’s swimming pool. They know that it takes 14 h using both hoses. They also know that Bob’s hose, used alone, takes 50% less time than Jim’s hose alone. How much time is required to fill the pool by each hose alone?

A 18 h, 36 h
B 21 h, 42 h ← Right Answer
C 25 h, 50 h
D 27 h, 54 h
E 30 h, 60 h

Solution: Let

\[ x = \text{the time (in hours) it takes to fill Bob’s swimming pool with Bob’s hose only} \]

Then

\[ 2x = \text{the time (in hours) it takes to fill Bob’s swimming pool with Jim’s hose only} \]

So, the equation is

\[
\frac{1}{x} + \frac{1}{2x} = \frac{1}{14}
\]

\[
\left(\frac{1}{x} + \frac{1}{2x}\right) \cdot 14x = \frac{1}{14} \cdot 14x
\]

\[
\frac{1}{x} \cdot 14x + \frac{1}{2x} \cdot 14x = \frac{1}{14} \cdot 14x
\]

\[ 14 + 7 = x \]

\[ 21 = x \]

and the result follows.