

Let take that Kate will add  $x$  gallons of hot water at 70 degrees to 2 gallons of cold water at 10 degrees if she wants to receive warm water at 40 degrees. Than we will have next equation:

$$70 \cdot x + 10 \cdot 2 = 40 \cdot (2 + x) \Rightarrow$$

$$\Rightarrow 70 \cdot x + 20 = 80 + 40 \cdot x \Rightarrow$$

$$\Rightarrow 70 \cdot x - 40 \cdot x = 80 - 20 \Rightarrow$$

$$\Rightarrow 30 \cdot x = 60 \Rightarrow$$

$$\Rightarrow x = 2$$

So, she needs to add 2 gallons of hot water for receive warm water.

Answer: 2 gallons.