

Problem 1

Grandma Thelma has asked you to help her pick between two new toasters at Sears: The Kelvinator and the Toastmaster, both have the same shelf price.

Thelma knows that the Toastmaster takes 3 minutes to make toast the way she likes it and that the Kelvinator would take 300 seconds to do the same thing. She has also worked out that The Toastmaster's power rating is 1400W while the label on the Kelvinator states that it has a potential difference of 80V and draws 15A of current.

If Thelma makes toast once a day, and electricity costs \$0.09 per kW*h, which toaster will be cheaper after 60 days of use and how much money will Grandma Thelma save because of this choice?

The _____ will be the better choice; it will save Thelma _____ a day.

Solution

Kelvinator

$$P=VI$$

$$P= 80 \text{ V} \times 15 \text{ A}$$

$$P= 1200 \text{ W}$$

$$P= 1.2 \text{ kW}$$

$$\Delta t = \frac{300s}{3600 \text{ s/h}}$$

$$\Delta t = 0.08 \text{ h}$$

$$E=P \times \Delta t$$

$$E= 1.2 \text{ kW} \times 0.08 \text{ h/day} \times 60 \text{ days}$$

$$E= 5.76 \text{ kWh}$$

$$\text{Cost} = \text{rate} \times E$$

$$\text{Cost} = 0.09\$/\text{kWh} \times 5.76 \text{ kWh}$$

$$\text{Cost} = \$ 0.52$$

Toastmaster

$$P=1400\text{W}$$

$$P= 1.4\text{kW}$$

$$\Delta t = \frac{3 \text{ min}}{60 \text{ min/h}}$$

$$\Delta t = 0.05 \text{ h}$$

$$E=P \times \Delta t$$

$$E= 1.4 \text{ kW} \times 0.05 \text{ h}$$

$$E= 4.2 \text{ kWh}$$

$$\text{Cost} = \text{rate} \times E$$

$$\text{Cost} = 0.09\$/\text{kWh} \times 4.2 \text{ kWh}$$

$$\text{Cost} = \$ 0.38$$

The Toastmaster would save Thelma \$ 0.14 over 60 days.