Bridging the Gaps

Task: An engineer is designing a bridge that is to stretch 2.434 km. She wants the bridge to be constructed from aluminium or from steel. Metals expand or contract with a change in temperature.

The rule to find the total length a metal will expand by is the product:

original length x change in temperature x expansion constant

where the expansion constant for Aluminium is 2.22 x 10-5 per °C and for steel it is 1.30 x 10-5per °C.

While she would prefer to use Aluminium because it is much lighter, her design can only allow for up to 2.8 m of expansion for the full length of the bridge. If the local climate experiences temperatures that range from an average of -10 °C (winter nights) to mid 30's of °C (midday summer), which material should the engineer choose for the bridge? Comment on any rounding decisions you made.

1. Convert the length of the bridge design to metres, leaving the value in standard form.
2. Find the range of temperatures, to just 1 significant figure, that the bridge is expected to tolerate.
3. Use the rule given, to calculate the expected expansion of the bridge if it was to be made from steel and if it was to be made from aluminium.
4. Decide on which material the engineer should use for her design.
5. Comment on how you rounded your calculated values.