From which will the air extract more heat on a cold day when the outside temperature is just above freezing: a cup of piping hot tea at 95 degrees Celsius or a tepid swimming pool at 20 degrees Celsius? As always: explain your logic.

Surface area is important

The air will extract more heat from the tepid swimming pool because the **pool has a greater surface area than the cup of tea**. Surface area is an important physical feature in heat conductivity.

Total volume is even more important

The air and the liquids will seek temperature equilibrium so the swimming pool will give more heat because there is a larger surface area for the heat to transfer and a **much larger volume that contains heat**.

However, bodies don’t contain “heat” they only transfer it.

The air will extract more heat from the swimming pool, as this has a larger surface area to extract heat from in comparison to the cup that is substantially warmer. The amount of heat transferred would be higher then the swimming pool, in regard to the cup, but **if it was a larger container with similar heat as the cup**, unless it was synonymous to a jacuzzi while this might not even suffice the same amount of heat extracted, The swimming pool will extract more heat.

You've probably seen those small gaps between sections of roadway where Arkadelphia crosses the freeway. They allow the road to expand without buckling when the air temperature changes greatly. Try to estimate the coefficient of linear expansion for concrete based on that example. If that seems too difficult at first, consider what other quantities you need to estimate (or observe) first to make this determination. (Don't get hung up on details or try to be too precise. Explain your chain of logic.)

Remember: units are important!

I need to estimate alpha. The equation for this is: change in dimension * change in temperature / dimension. Saying the regular dimension of the road piece is 10 meters by 10 meters by 0.5 meters, so 50 meters^3. If it got warmer by 20 degrees Celsius (a steep growth) and the road grew by 1cm in length and width and height, the equation would look like so: 0.01m^3 *20 degrees Celsius / 50 meters^3 = alpha. Alpha in this case would be 0.004.

Calculation steps shown, but a running verbal explanation is needed

delta L/L = alpha deltaT

alpha = deltaL/ L * deltaT

deltaT = -12°C - 12°C = 24°C

L = 10 m

deltaL = 2 cm = 0.02 m

0.02 m / 10 m * 24°C   m's cancel

0.02 / 240

alpha = 8.3 x 10^-5 1/°C

The concrete would expand 8.3 x 10^-5 times its original length per degree Celsius

Reminder: you shouldn't be using a calculator!

If this is the case, then I could make a good estimate due to tennis courts creating cracks due to the same reason. Let's say **the temperature change is 10C** and the road length is **7.3 meters** (average road width).Let's say the road goes from 7.3 meters to 7.4 meters. The equation would be 0.1m/7.3 m=a (10°C). Solving for a (coefficient of linear expansion) we get an answer of 0.00136 m/m*C.