When you buy a gallon of gas, over 60 percent of the energy you pay for goes out the radiator in the form of waste heat? That's why you have a radiator in your car in the first place.

Wilson Greatbatch
Energy in Everyday Life

Order of Magnitude Estimate

Frank Timmes
ftimmes@asu.edu
What is the total length of all the thread used to make the clothing you are wearing?
Our guidelines for making an order-of-magnitude estimate:

* Guess
* Talk to your gut
* Divide and conquer
* Lie skillfully
* Punt
* Use guerrilla warfare
* Lower your standards
* Cross-check
I’ll guess I’m wearing about 1 m² of clothing and each square meter of cloth contains 5000 threads top-bottom and 5000 threads left-right, so 10,000 threads total.

So the length of thread is 10,000 m. This is about 1/4 the circumference of the Earth. Seems large, but maybe not.
I’ll choose to refine my wild guess pathway - clothing area of a human and the thread count of the clothing.

Humans, with wide variation, are ~ 2 m tall, ~ 0.5 m across, and ~0.2 m thick. The surface area of this box is

\[ \approx 2 \times [(2 \times 0.5) + (0.5 \times 0.2)] \]

\[ \approx 2 \text{ m}^2. \]

Alternatively, human are approximately cylinders about 2 m tall and 1/3 m in radius. The surface area of the cylinder is \(2\pi \times \text{radius} \times \text{height} \)

\[ \approx 6 \times 2 \times (1/3)^2 \]

\[ \approx 12/9 \text{ m}^2 \]

\[ \approx 1.5 \text{ m}^2 \]

These are close, so I’ll keep the round 2 m\(^2\) area.
I know bedding sheets have thread counts of 100 threads/in to nearly 1000 threads/in.

I’ll assume clothes have similar thread counts and use a mean thread count of 300 threads/in.

Converting to meters, \((300 \text{ threads/in}) \times (1\text{ in}/2.5 \text{ cm})\) 
\(~ 100 \text{ threads/cm} \sim 10^4 \text{ threads/m}~

Since threads run up-down and left-right, we have \(2 \times 10^4 \text{ threads} \) in 1 square meter of cloth.
People wear a different number of layers of clothes depending on where they live, from undergarments and sweaters to t-shirts and shorts.

I’ll punt and just assume on each person wears one layer of clothes covering most of their body.
The distance covered by the threads is then
$2 \text{ m}^2 \times (2 \times 10^4 \text{ threads/m}^2) = 40,000 \text{ meters.}$

This is about the circumference of the Earth(!) and four times larger than my initial guess, but within an order of magnitude.