Summary of first lesson (2nd of october, 2019).
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A brief review of mono dimensional heat transfer: **CONDUCTION & CONVECTION**

$$\dot{Q}in - \dot{Q}out = dE_{wall}$$

Simplified conclusions of **FOURIER'S LAW**

$$\dot{Q} = kA\frac{\Delta T}{L}$$

What to consider for calculating heat?
- The material of the wall
- The area
- The thickness

Heat transfer through a wall is proportional to its area.
Heat transfer is proportional to the difference of temperature and conductivity (=willingness of material to tranfer heat)
Heat transfer is inversely proportional to thickness. The thicker the wall, the less heat goes through it.

THERMAL RESISTANCE CONCEPT

$$\dot{Q}cond, wall = kA\,\frac{T_1 - T_2}{L}$$

$$\dot{Q}cond, wall = kA\,\frac{T_1 - T_2}{R_{wall}}\,(W)$$

$$R_{wall} = \frac{L}{kA}$$

- Conduction resistance of the wall: thermal resistance of the wall against heat conduction
- Thermal resistance of a medium depends on the geometry and the thermal properties of the medium

Analogy between thermal and electrical resistance concept:

Rate of heat --> Electric current

Therml resistance --> Electrical resistance

Temperature difference --> Voltage difference

SOLVE THE EXCERCISE
Find the rate of heat transfer through the wall with L=0,4m, A=20m2, DeltaT=25 and k=0,78W/mK

1 - Faster way:

$$\dot{Q} = kA\frac{\Delta T}{L} = 0{,}78 * 20 * \frac{25}{0{,}4} = 15{,}6 * 62{,}5 = 975W$$

2 - Harder way:

$$R_{wall} = \frac{L}{kA} = \frac{0{,}4}{0{,}78 * 20} = \frac{0{,}4}{15{,}6} = 0{,}0256\,{}^\circ\frac{C}{W}$$

$$\dot{Q} = \frac{\Delta T}{R_{wall}} = \frac{25}{0{,}0256} = 976{,}5625\ W$$

(the difference from the 1st one is because of roundings)