Quick Intro to Tensor Notation:

For our purposes, it is perhaps best to think of a tensor as a special kind of matrix for describing the multi-dimensional state (stresses, strains, elastic properties, etc.) acting on some object. Tensor's have some other special mathematical properties, but they aren't relevant for now.

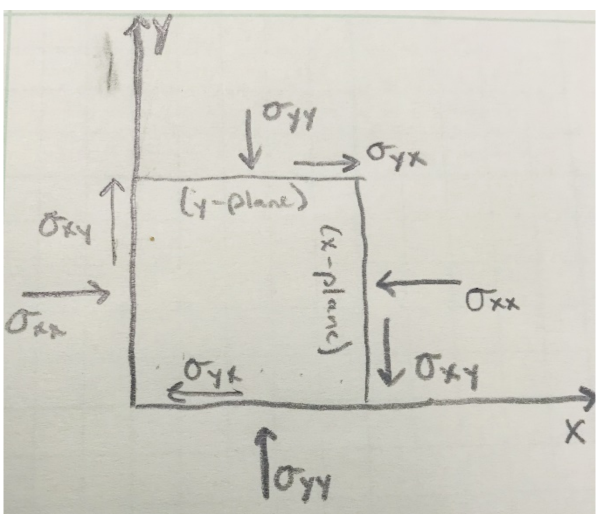
$$\sigma = \begin{bmatrix} \sigma xx & \sigma xy \\ \sigma yx & \sigma yy \end{bmatrix} = \begin{bmatrix} \lambda\Theta+2\,\mu exx & 2\,\mu exy \\ 2\,\mu eyx & \lambda\Theta+2\,\mu eyy \end{bmatrix}$$

This is the stress tensor, which describes the stress acting in multiple dimensions (in this case, 2D) on an object. The tensor is comprised of ***components*** that follow ***"on-in"*** notation. For example, σ_{xx} describes the stress component acting ***on*** the x-plane (note the x-plane is the plane perpendicular to the x-axis), ***in*** the x-direction. σ_{xy} describes the stress acting on the y-plane, but the x-direction. Both σ_{xx} and σ_{xx} are oriented perpendicular to some plane (that's a ***normal stress***, right?). σ_{xy} and σ_{yx} are acting parallel to some plane (which would be a ***shear stress***, correct?).

The strain tensor, is as follows,

$$e = \begin{bmatrix} exx & exy \\ eyx & eyy \end{bmatrix} = \begin{bmatrix} \dfrac{\partial ux}{\partial x} & \dfrac{1}{2}\left(\dfrac{\partial ux}{\partial y}+\dfrac{\partial uy}{\partial x}\right) \\ \dfrac{1}{2}\left(\dfrac{\partial ux}{\partial y}+\dfrac{\partial uy}{\partial x}\right) & \dfrac{\partial uy}{\partial y} \end{bmatrix}$$

Similar to the stress tensor, e_{xx} and e_{yy} are normal strains (i.e., lengthening or shortening in a direction), and e_{yx} and e_{xy} are shear strains (think box becoming a parallelogram).



Glossary of other variables:

λ	Lamé constant, related to other material moduli in a variety of ways
μ	The second Lamé constant, also known as shear modulus. Describes response to an imposed shear stress.
υ	Poisson's ratio, describes relationship of stress-parallel and -perpendicular strains. Think of a box compressing in one direction, and then lengthening in the other, it's the ratio of those two values
θ	Dilation (HW p#2). Volume change in an object.
Θ_c	Critical angle. Angle between incident ray and a line perpendicular to that surface
ρ	Density
A	Wave amplitude. Displacement of particle above or below a "reference" plane from the undisturbed object
K	Bulk modulus. Measure of resistance to compression under a *uniform* stress field (like underwater or even lithostatic).
k	Wave number. Wavelengths per unit distance (2π/wavelength).
ω	Angular frequency. Angular displacement per unit time (2π/frequency in Hertz).
u_x	Displacement in the x-direction
u_y	Displacement in the y-direction
V_p, V_s	P- and S-wave velocity, respectively
ê	Average kinetic energy density (J/m^3). The energy associated with particle motions as a wave passes through a material
û	Average potential (strain) energy (J/m^3). The energy stored within an object as it resists motion.
ê	Average total energy density (J/m^3)