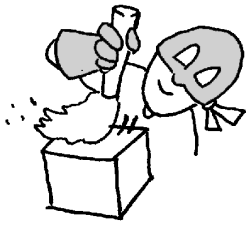
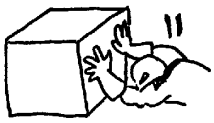
THE JOY OF STRESS TRANSFORMATION

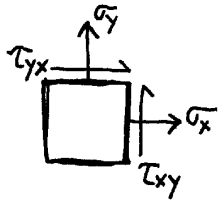
BROUGHT TO YOU BY VECTOR & SCALAR



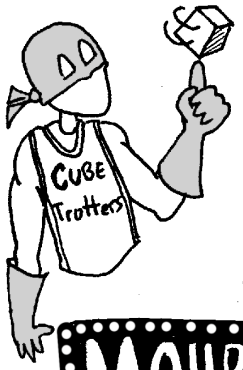
SHEAR STRESS τ



AXIAL STRESS σ

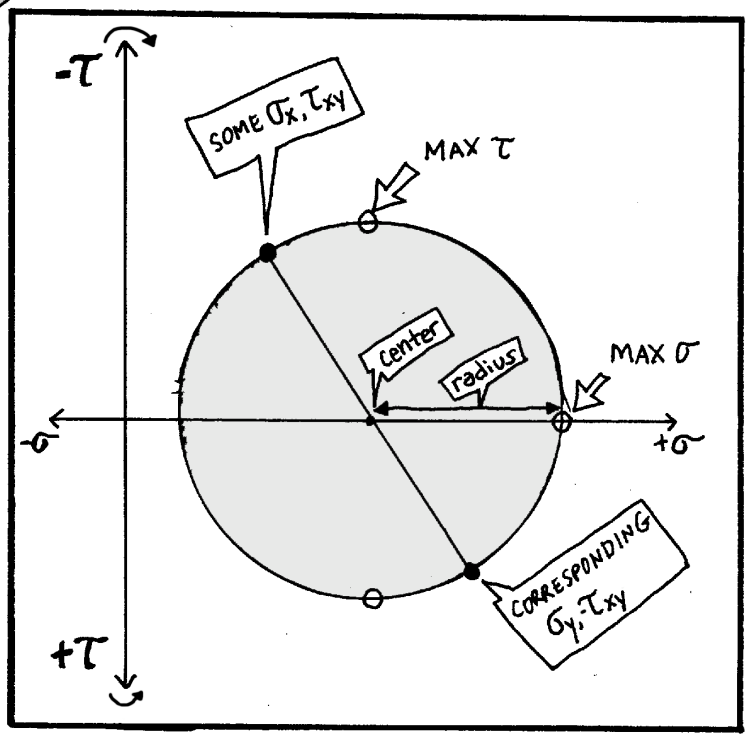


REMEMBER,
$\tau_{xy} = \tau_{yx}$



THIS CUBE CAN BE ROTATED IN MANY DIRECTIONS - WE WANT TO FIND THE DIRECTION AND VALUES WHEN THE STRESSES ARE **MAX**
(a.ka. principal stresses!)

MOHR'S CIRCLE



IT HAS A τ AND σ AXIS.
(σ_x, τ_{xy}) AND (σ_y, τ_{yx}) ARE POINTS ON THE CIRCLE.
YOU JUST NEED THE **RADIUS** AND THE **CENTER** AND YOU'RE ALL SET!

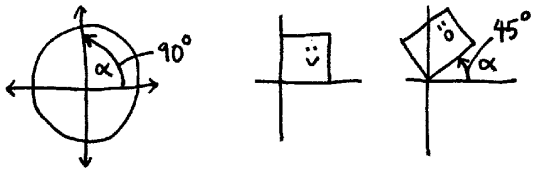
$$\text{RADIUS} = \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau_{xy}^2}$$

$$\text{CENTER} = \left(\frac{\sigma_x + \sigma_y}{2}\right)$$

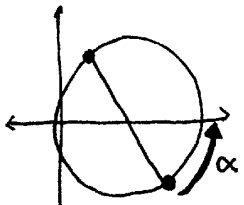
MAX σ = (CENTER + RADIUS) OR (CENTER - RADIUS)

MAX τ = (RADIUS)

REMEMBER, MOVING θ IN THE PHYSICAL WORLD TRANSLATES INTO 2θ IN THE MOHR CIRCLE WORLD.



LET'S SAY YOUR GIVEN STRESSES LEAD YOU TO THIS PLOT...



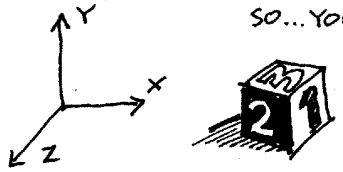
AND YOU WANT TO KNOW WHAT ORIENTATION GIVES YOU MAX σ STRESS.... WHY, IT'S JUST WHAT THE GRAPH SHOWS, α ! (BUT IT WOULD BE $\alpha/2$ IN THE REAL WORLD!)

AND DON'T FORGET THE

3D MOHR CIRCLE

YOU'VE GOT 3 PLANES RIGHT?

SO... YOU NEED 3 CIRCLES!



YOU BASICALLY ONLY NEED TO KNOW 2 CIRCLES' INFO, THEN YOU CAN FIND THE THIRD'S. THE 3D MOHR CIRCLE USES THE SAME AXIS AS 2D. IT JUST HAS "MOHR" CIRCLES. (ha ha)