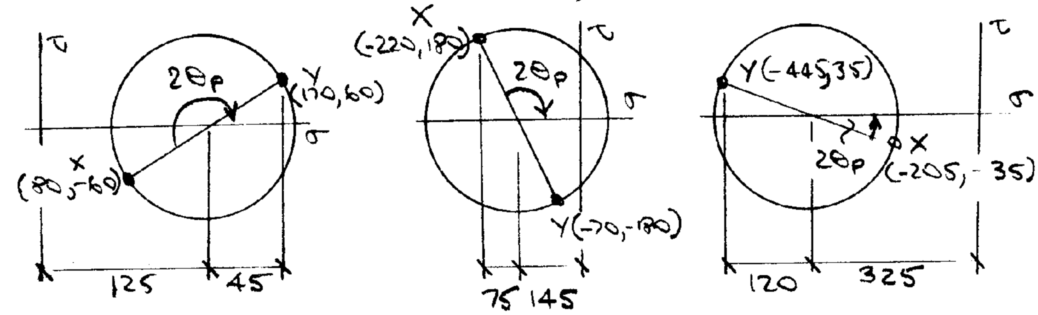
14 Implementing the shear stress convention:

	(i)	(ii)	(iii)
σ_x	80	-220	-205
σ_y	170	-70	-445
τ_{xy}	-60	180	-35

MPa

The Mohr's circles (not to scale) are thus:–

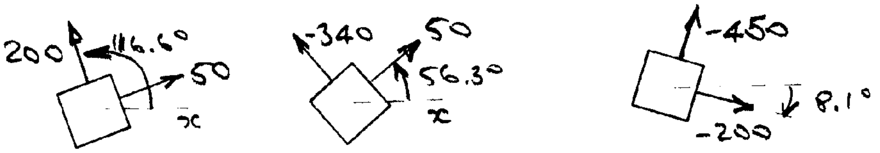


By inspection from Mohr's circles:–

$\bar\sigma$	125	-145	-325
$\tilde\sigma$	$\sqrt{(45^2+60^2)}=75$ (3:4:5 △)	$\sqrt{(75^2+180^2)}=195$ (5:12:13 △)	$\sqrt{(35^2+120^2)}=125$ (7:24:25 △)
$2\theta_p$	$180^\circ+\arctan 4/3 = 233.1^\circ$ ↻	$180^\circ-\arctan 12/5 = 112.6^\circ$ ↻	$\arctan 7/24 = 16.3^\circ$ ↺
∴ on element θ_p	$= 116.6^\circ$ ↺	$= 56.3^\circ$ ↺	$= 8.1^\circ$ ↻
$\check\sigma, \hat\sigma = \bar\sigma \pm \tilde\sigma$	50, 200	-340, 50	-450, -200

& finally sketch:

MPa



15 a) The triaxial components are, for plane stress

(MPa)	0, 50, 200	-340, 0, 50	-450, -200, 0
σ_E (D.E.T. eq 8)	180	368	391
∴ $n = 500/\sigma_E$	2.77	1.36	1.28
σ_E (M.S.S.T. eq 9)	200	390	450
∴ $n = 500/\sigma_E$	2.50	1.28	1.11

b) If plane strain, say $\epsilon_z = 0$, then $\epsilon_z = \frac{1}{E}(\sigma_z - \nu(\sigma_x+\sigma_y)) = 0$

or $\sigma_z = \nu(\sigma_x+\sigma_y)$, $\nu = 0.3$

– so from given principals in Ex 9, the 3rd principal follows

	50, 75, 200	-340, -87, 50	-450, -200, -195
σ_E (D.E.T.)	139	343	253
& n	3.59	1.46	1.98
σ_E (M.S.S.T)	150	390	255
& n	3.33	1.28	1.96

Note how the max. shear stress theory is consistently more conservative than the distortion-energy theory.