

STRUCTURAL GEOLOGY
Final Exam Questions
26th May 2012

- 1) The orientation of two conjugate faults are: 18/86SE and 151/81SW
- Plot the faults on a stereographic projection as great circles (β -diagram).
 - Show the principal stress directions σ_1 , σ_2 and σ_3 on the projection.
 - Find out the trend and plunge of σ_1 , σ_2 and σ_3 .
 - Find out the angle between the conjugate faults.
 - What is the type of faulting? Give reasons for your choice.

2) Answers the following questions with the help of diagrams:

- What is the relation between cleavage plane, mineral stretching lineation and the axes of the finite strain ellipsoid.
- What controls whether a rock behaves in a ductile or brittle manner?
- What is transpression? Show faults in map view, where transtension will occur.
- Draw a block diagram of a fault, showing hangingwall and footwall blocks, fault plane, fault striations and amount of slip.
- Explain pure shear and simple shears with the help of diagrams.
- What is an active fault and a blind fault?

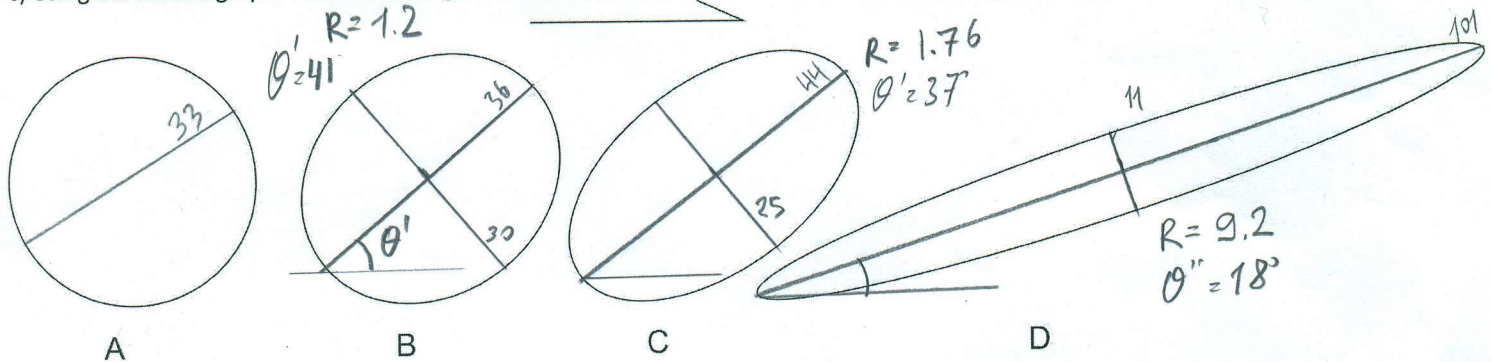
3. The following maximum, intermediate and minimum axes of ooids have been measured in a deformed limestone:

max	interm	min
0.24 mm	0.21 mm	0.05 mm
0.75 mm	0.69 mm	0.31 mm
1.76 mm	1.58 mm	0.47 mm

- Determine the principal axial ratios and show them on a Flinn diagram.
- Assuming that there has been no volume change during deformation calculate e_1 , e_2 and e_3 values.

3. The diagram below shows a circle A, deformed progressively by simple shear into three ellipses B, C and D.

- Find out the R (ellipticity) and θ' values for each of the ellipses B, C and D.
- Calculate the extension e along the long and short axis of the deformed ellipses. What are their specific names?
- Using the second graph find out the angular shear strain and shear strain for the ellipses B, C and D.



$$B - e_1 = \frac{36-33}{33} = 0.09$$

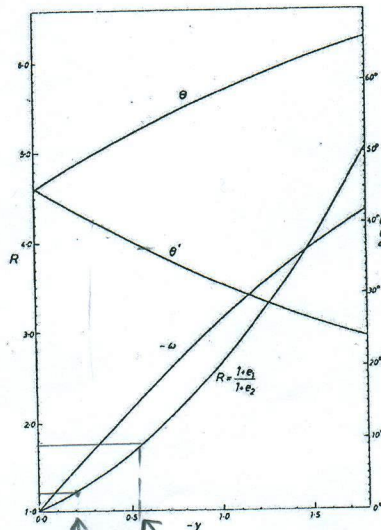
$$e_2 = \frac{30-33}{33} = -0.09$$

$$C - e_1 = \frac{44-33}{33} = 0.33$$

$$e_2 = \frac{25-33}{33} = -0.24$$

$$D - e_1 = \frac{101-33}{33} = 2.06$$

$$e_2 = \frac{11-33}{33} = -0.67$$

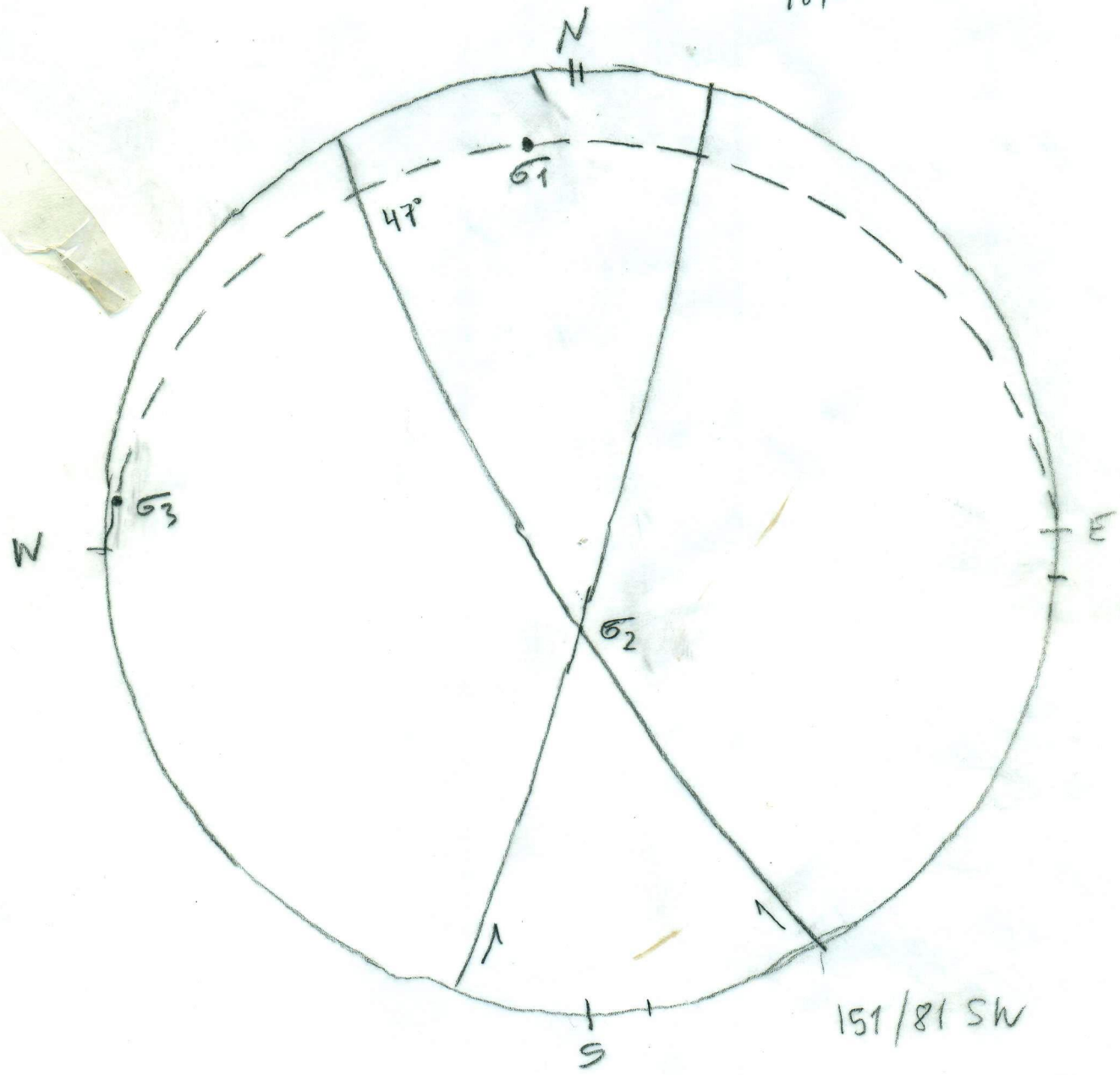


$$-\gamma = 0.21 \quad -\gamma = 0.53$$

$$\psi = 12^\circ \quad \psi = 28^\circ$$

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Answer 1

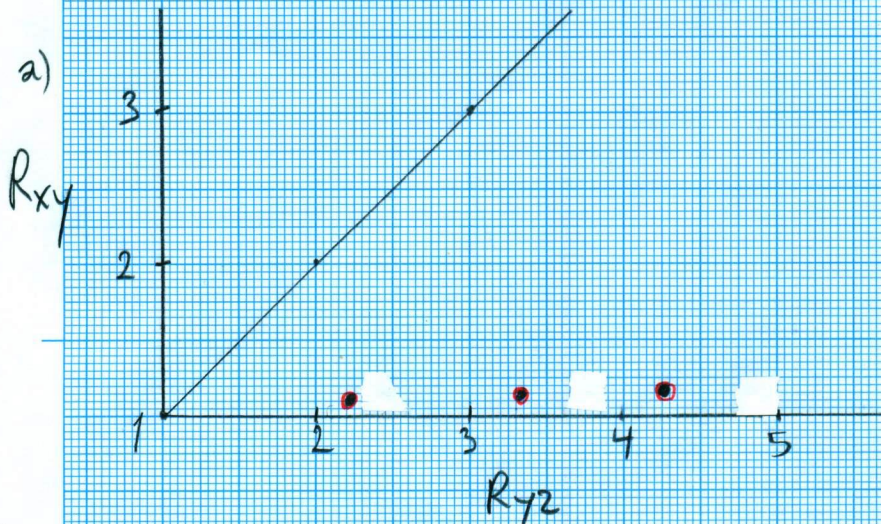
18/86SE



- σ_2 01/75S
- σ_1 172/17N
- σ_3 96/01W

3.

R_{xy}	R_{xz}	R_{yz}
1.14	4.8	4.2
1.09	2.42	2.23
1.11	3.75	3.36



b)

$$\sqrt[3]{0.24 \times 0.21 \times 0.05} = 0.14 \text{ mm} - \text{initial diameter of the drill}$$

$$\sqrt{0.75 \times 0.69 \times 0.31} = 0.54 \text{ mm}$$

$$\sqrt{1.76 \times 1.58 \times 0.47} = 1.09 \text{ mm}$$

for the first one $e_1 = \frac{0.24 - 0.14}{0.14} = 0.71$ $e_2 = \frac{0.21 - 0.14}{0.14} = 0.50$ $e_3 = \frac{0.05 - 0.14}{0.14} = -0.64$

second one $e_1 = \frac{0.75 - 0.54}{0.54} = 0.39$ $e_2 = \frac{0.69 - 0.54}{0.54} = 0.28$ $e_3 = \frac{0.31 - 0.54}{0.54} = -0.42$

third one $e_1 = \frac{1.76 - 1.09}{1.09} = 0.61$ $e_2 = \frac{1.58 - 1.09}{1.09} = 0.45$ $e_3 = \frac{0.47 - 1.09}{1.09} = -0.57$