Activity 1

GY 402 Sedimentary Petrology (60 points)

Group Data Plotting Exercises (See website for due dates)

Part one: Grain Size Data (34 points total; 2 points each)

Determine the sediment grain size classification for the following samples using the Folk and the Sheppard or both classification schemes (Figures 1-3, attached). Given the narrow width of the columns, **please use the appropriate symbol(s) for each sample** rather than the name (e.g., cS).

Sample #	%Gravel	% Sand	%Silt	% Clay	Folk name	Sheppard name
1	0	100	0	0		
2	0	50	0	50		
3	0	25	50	25		
4	0	33	33	34		
5	0	22	18	60		
6	0	46	32	22		
7*	15	85	0	0		
8*	45	20	15	20		
9*	80	5	10	5		
10	0	0	33	67		

*use the Folk gravel scheme-Figure 3. Mud = silt+clay

Part two: Siliciclastic Rock Classification (18 points total; 2 points each)

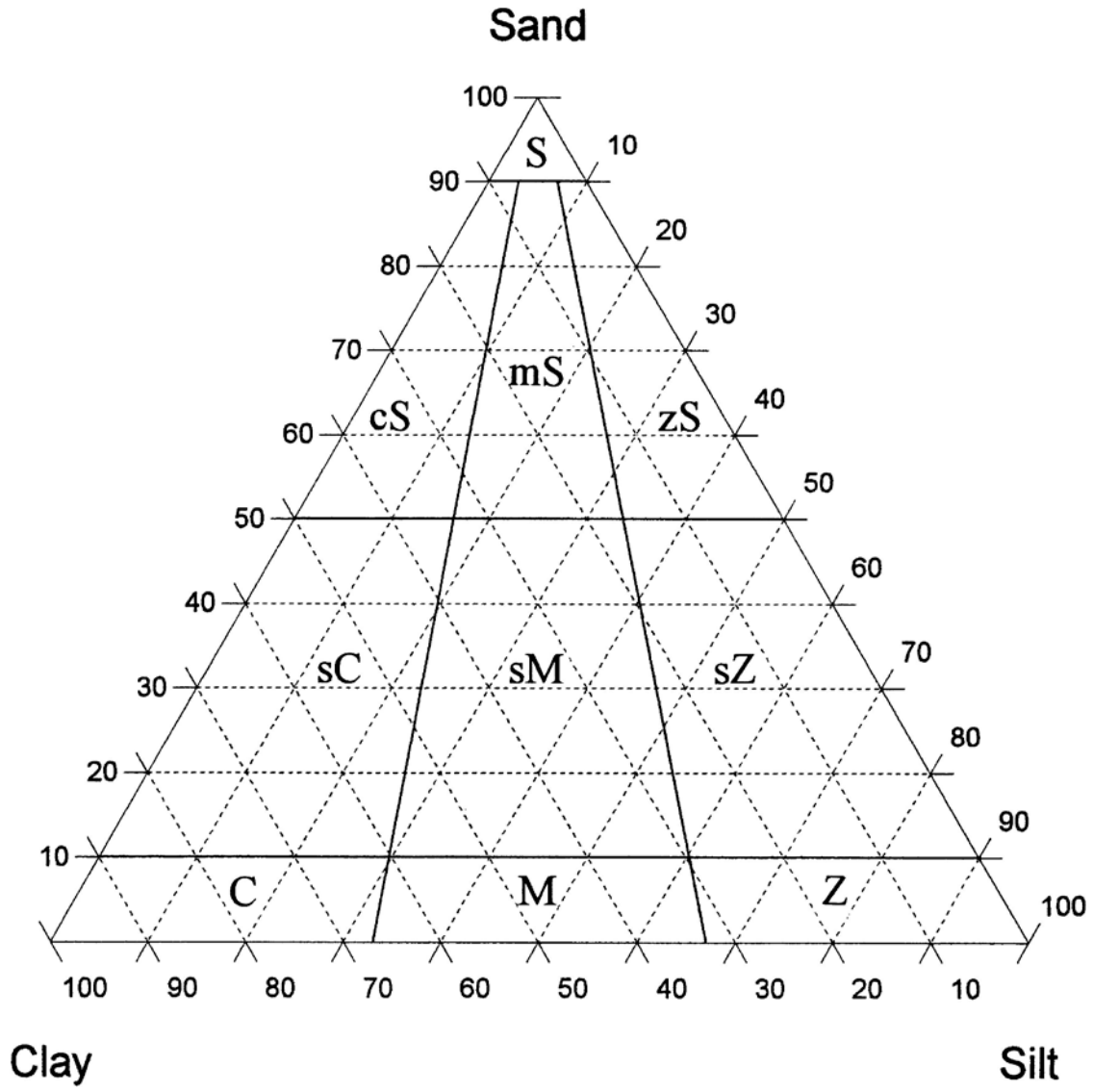
Determine the rock name for the following samples using Folk's siliciclastic rock classification scheme (Figure 4, attached). Write the name of the rock in the space provided; don't just use a number. A reminder – use only the Q, F and L components of the data sets. Normalize these data to 100% before you try to plot them. An example is given for the first data set.

Mineral	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Quartz	22	90	50	12	0	30	15	5	75	20
Orthoclase	34	5	17	45	50	5	3	0	5	5
Plagioclase	15	0	8	17	45	27	15	0	7	10
Muscovite	5	0	20	3	5	10	22	45	0	5
Hornblende	0	0	5	5	0	5	18	40	0	5
Chert	7	5	0	10	0	3	4	0	10	37
Rock Frags	12	0	0	0	0	14	15	0	0	3
Clay	5	0	0	8	0	6	8	10	3	15
Name	**Lithic arkose**									

Example 1. Q = 22, F = 49 (orthoclase+plagioclase), L= 19 (chert + Rock Fragments)
Total Q+F+L = 22+49+19 (90)

Normalized Q = 22/90 = 24.4%;
Normalized F=49/90 = 54.4%; Using Figure 4, this rock is a **lithic arkose**
Normalized L= 19/90 = 21.1% (plotted on Figure 4 as ●1)
Total 99.9%

Figure 1: Grain Size Ternary Plot 1
Sand-Silt-Clay (Folk, 1954; 1980)



Symbol Index
C-clay; Z-silt; M-mud; S-sand;
sC-sandy clay; sM-sandy mud; sZ- sandy silt;
cS-clayey sand; mS-muddy sand; zS-silty sand

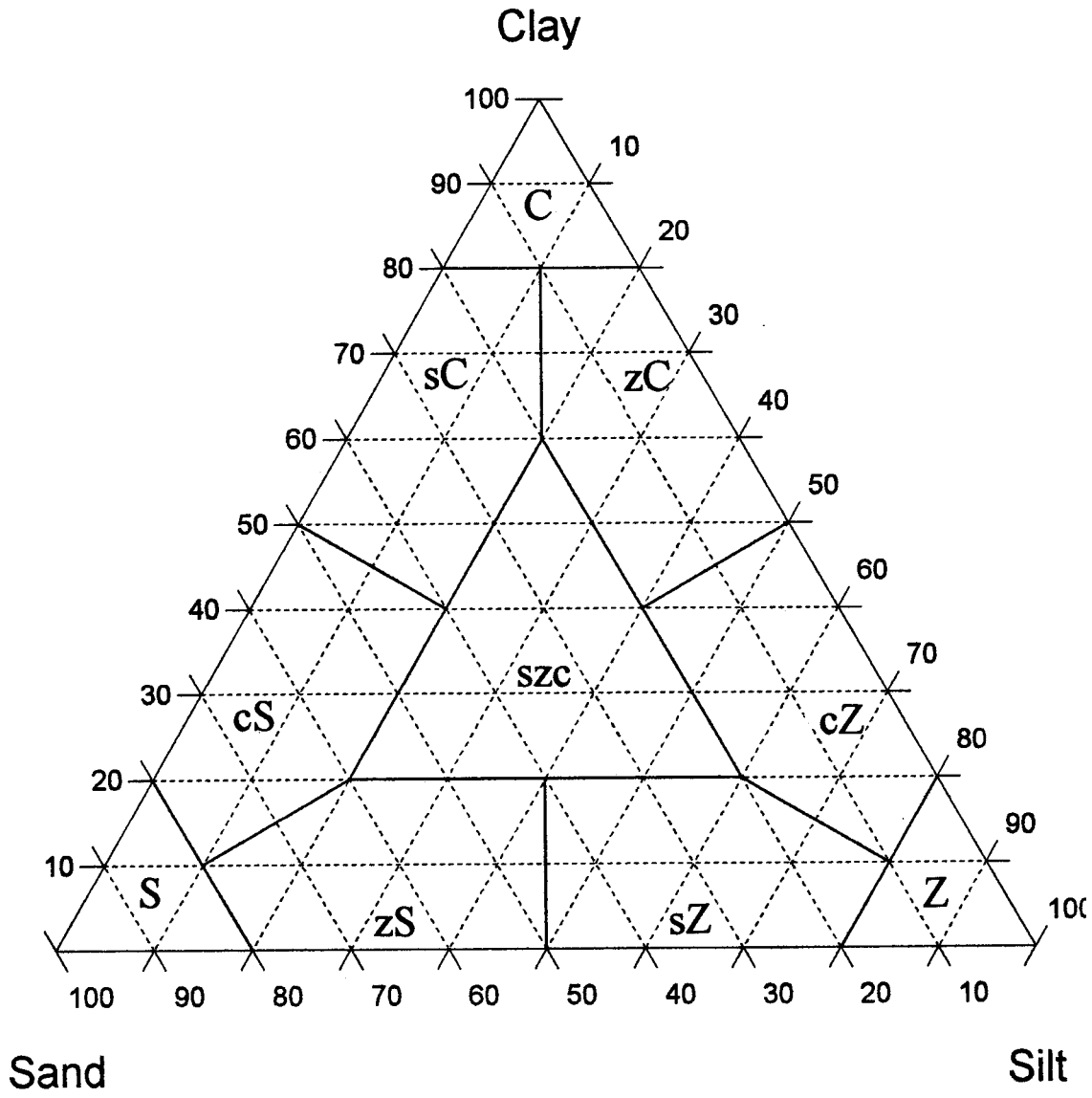
Folk, R.L., 1954. The distinction between grain size and mineral composition in sedimentary rocks. *Journal of Geology*, **62**, 344-359.

Folk, R.L., 1980. Petrology of Sedimentary Rocks. Hemphill Publishing, Austin, TX, 184p.

Figure 2: Grain Size Ternary Plot 2

Sand-Silt-Clay

(Derived from Sheppard, 1954, Krumbein and Sloss, 1963; Picard, 1971 and others)



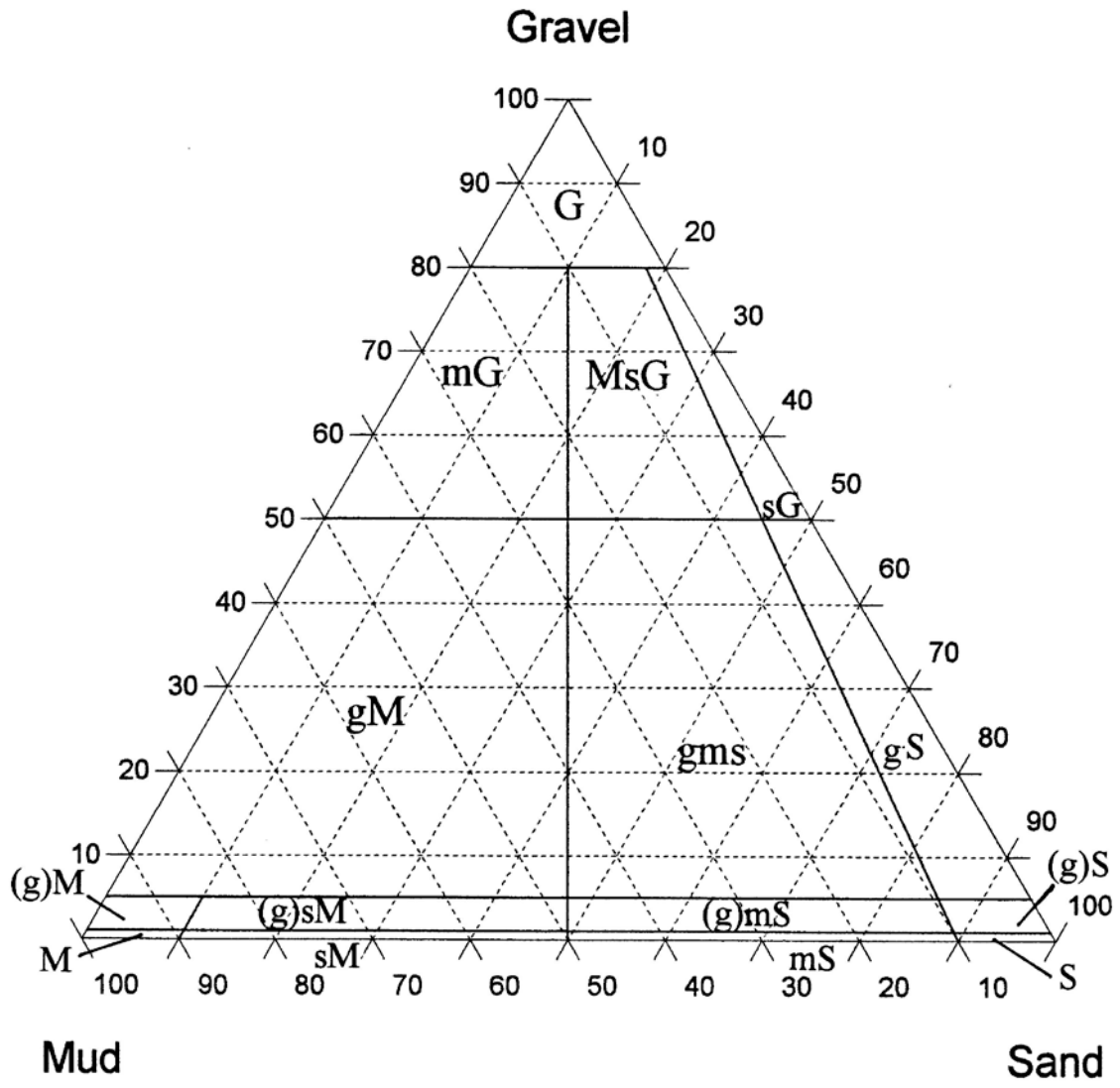
Symbol Index

C-clay; Z-silt; S-sand;
sC-sandy clay; zS-silty sand; sZ- sandy silt; zC- silty clay
cS-clayey sand; szc-sand-silt-clay; cZ-clayey silt

Krumbein, W.C., & Sloss, 1963. Stratigraphy and Sedimentation (2nd edition), W.H. Freeman and Co. 660p.

Picard, M.D. 1971. Classification of fine-grained sedimentary rocks. *Journal of Sedimentary Petrology*. **41**, 179-195.

Figure 3: Grain Size Ternary Plot 3
Gravel-Sand-Mud (Folk, 1954;1980)



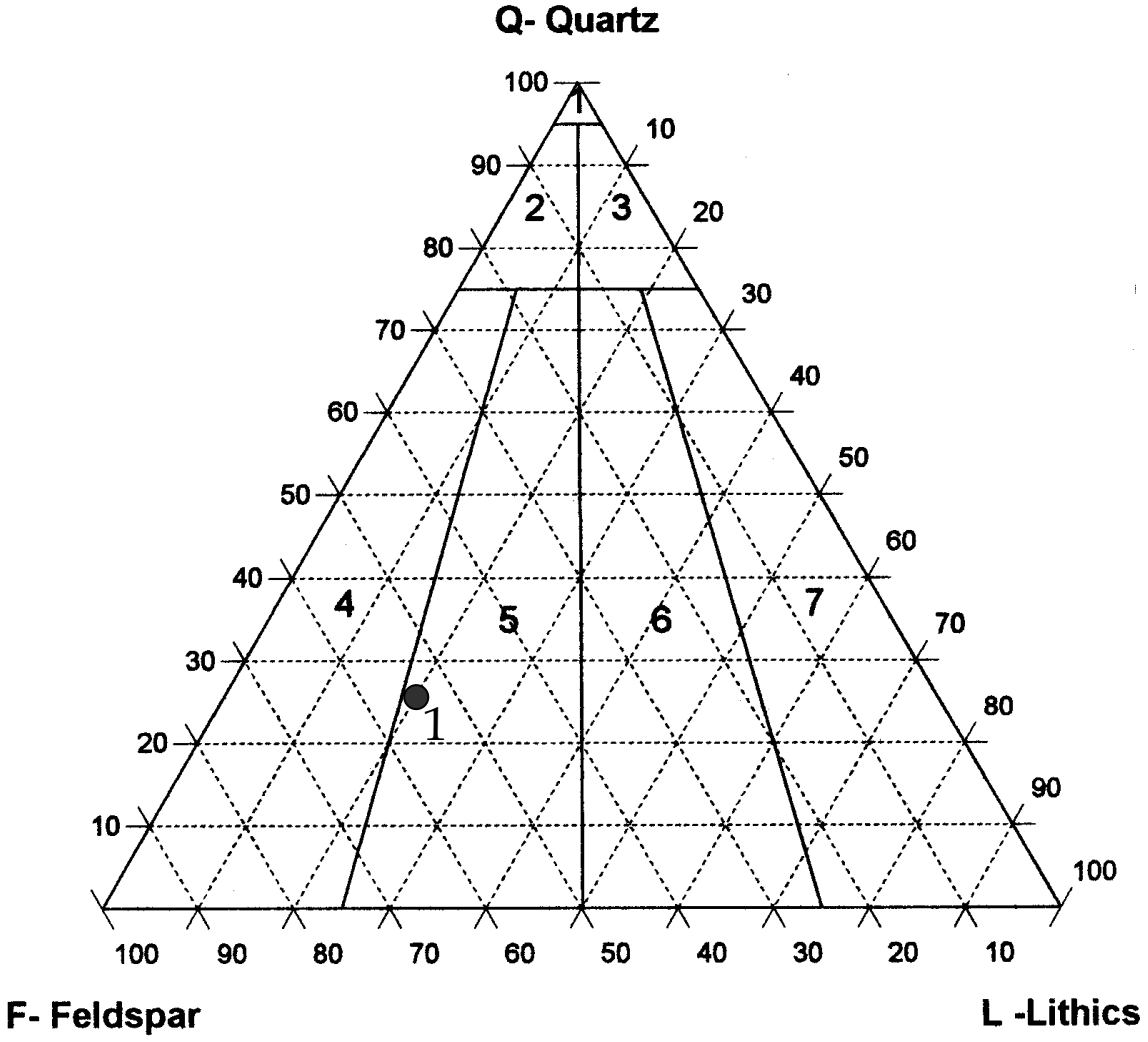
Symbol Index

M-mud; G-gravel; S-sand; sM –sandy mud; mS-muddy sand;
(g)M-slightly gravelly mud; (g)S-slightly gravelly sand;
(g)sM-slightly gravelly sandy mud; (g)mS-slightly gravelly muddy sand;
gM-gravelly mud; gms-gravelly muddy sand; gS-gravelly sand;
mG-muddy gravel; MsG-muddy sandy gravel; sG sandy gravel

Folk, R.L., 1954. The distinction between grain size and mineral composition in sedimentary rocks. *Journal of Geology*, **62**, 344-359.

Folk, R.L., 1980. Petrology of Sedimentary Rocks. Hemphill Publishing, Austin, TX, 184p.

Figure 4: Sedimentary Rock Classification (QFL) Ternary Plot
(Folk, 1980)



Field Index:

1 – Quartz Arenite
2 – Subfeldsarenite
3 – Sublitharenite
4- Feldsarenite
5 – Lithic Arkose
6 – Feldspathic Litharenite
7- Litharenite

Folk, R.L., 1980. Petrology of Sedimentary Rocks. Hemphill Publishing, Austin, TX, 184p.

Name: _____

Part three: Cumulative Data Plot (8 points total; 2 each)

Figure 5 (below) is a cumulative plot that is used for statistical analysis of data. In this case, it shows grain size data for a sample analyzed via the hydrometer and sieve method. This plot is particularly useful for determining parameters like the mean, median, sorting, skewness and kurtosis of a population (see Lecture 2 handouts). The methodology for doing this is pretty easy. For example, the median is defined as Φ_{50}. This value is read on the vertical axis (50% finer). Follow this line along until it intersects the curve, then drop straight down. Read the grain size on the horizontal axis (note: it's logarithmic). For the well sorted sample below, the median grain size is: about 2.6 mm. For parameters like the mean, you will have to determine 2 or more grain sizes (e.g., Φ_{16}, Φ_{50} and Φ_{84}) and put them through a simple mathematical operation in order to solve them.

Median	$Md_\phi = \phi_{50}$
Mean	$M_z = \frac{\phi_{16} + \phi_{50} + \phi_{84}}{3}$
Dispersion (sorting)	$\sigma_I = \frac{\phi_{84} - \phi_{16}}{4} + \frac{\phi_{95} - \phi_5}{6.6}$
Skewness	$Sk_I = \frac{\phi_{16} + \phi_{84} - \phi_{50}}{2(\phi_{84} - \phi_{16})} + \frac{\phi_5 + \phi_{95} - 2\phi_{50}}{2(\phi_{95} - \phi_5)}$
Kurtosis	$K_G = \frac{\phi_{95} - \phi_5}{2.44(\phi_{75} - \phi_{25})}$

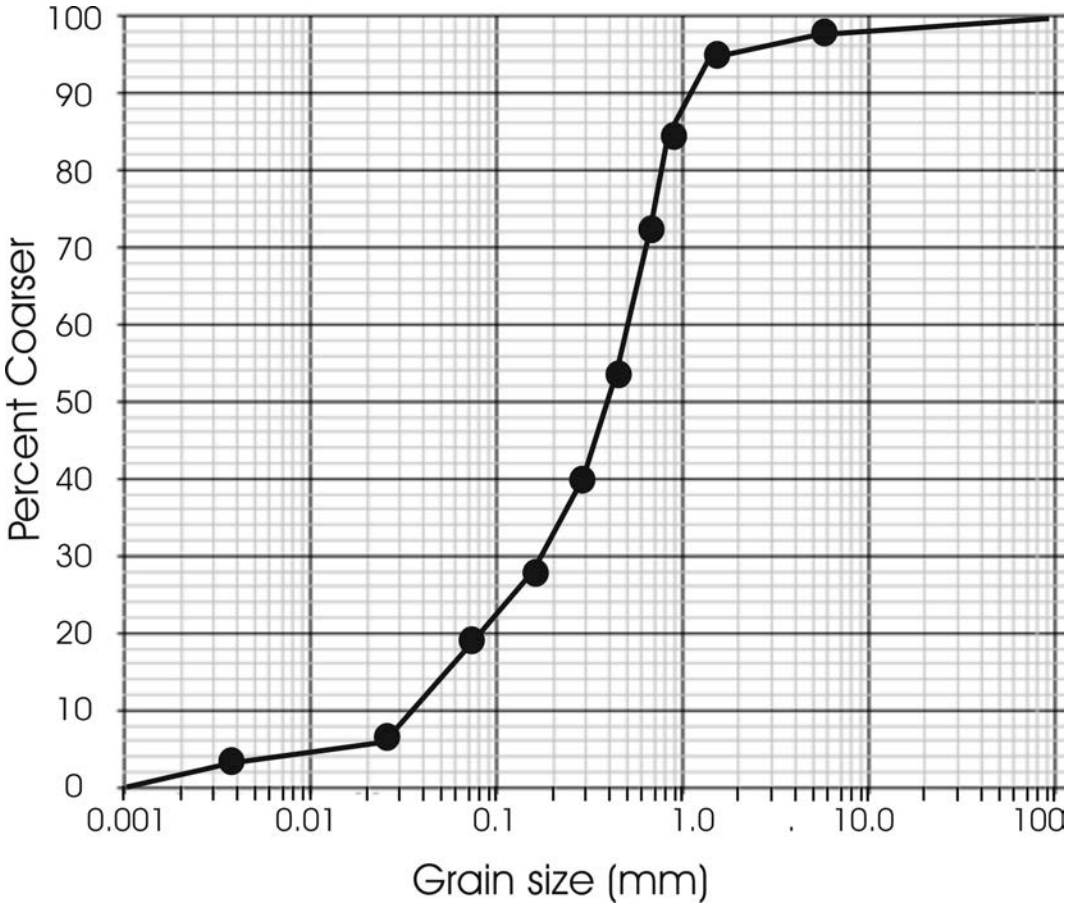


Figure 5: Cumulative Grain Size Plot (2 points each)

Well Sorted Sample: A) Mean = _____ B) Sorting = _____

C) Skewness = _____ D) Kurtosis = _____