Exercise 3.4

While examining the sulphur emission in Europe one has estimated the yearly emission for 3 regions by means of an ordinary general linear model. These estimates are given together with their standard errors and the correlations between them in the table below.

Region	Emission in $\frac{10^3\ ts\ S}{127^2 km^2}$	Standard Error	Correlation		
Denmark	48	8	1		
East Germany	70	8	0.0	1	
Benelux, Ruhr & South Germany	192	7	0.0	-0.2	1

The estimate of the residual standard deviation was 18. Emissions are the unknown parameters in the model. The observations are measurements of the SO_4-content in the air at a number of measuring stations in Europe, and the model is a linear relationship between emissions and measurements. The estimates are based on approx. 10000 observations.

Using the model at a given measuring station, under certain meteorological conditions one finds that the measurement of SO_2-content in air volumes which have passed Denmark, crossed the Baltic, crossed East Germany, South Germany and Ruhr, can be estimated by the following linear combination of the estimated emissions

$$48 \times 0.4 + 70 \times 0.6 + 192 \times 0.8 = 214.80$$

where the the figures 0.4, 0.6 and 0.8 are the independent variables and the unit on them makes the result equal $SO_2 \mu g/m^3\ air.$ 214.80 is the dependent variable.

1) Find - assuming 0.4, 0.6 and 0.8 are exact - a 95% confidence interval for the expected value corresponding to 0.4, 0.6 and 0.8.

2) Find a 95% prediction interval for an observation corresponding to the above mentioned values.

3) Comment the two results found under 1) and 2).