Q1. On the study of the effect of monthly income (MI) on monthly petrol consumption (MPC), given that MI is here on a scale with mean 0 and its standard deviation in this study is 3. A random slope of MI is added to the model, that is the effect of MI is allowed to differ between areas. Given that all variables are centred (have zero mean). The results can be read

Fixed effect	Coefficient	S.E.
γ_{00} = intercept	41.82	0.12
γ_{10} = coefficient of MI	2.45	0.06
γ_{01} = coefficient of $\overline{\text{MI}}$ (group mean)	1.02	0.25
Random part	Parameters	S.E.
Level-two random part:		
$\tau_0^2 = \text{var}(U_{oj})$	9.67	1.39
$\tau_1^2 = \text{var}(U_{1j})$	0.184	0.08
$\tau_{01} = \text{cov}(U_{0j}, U_{1i})$	-0.822	0.23
Level-one variance:		
$\sigma^2 = \text{var}(R_{ij})$	40.28	0.88
Deviance	23,068	

(a) Determine the slope standard deviation.
(b) Compute the correlation between random slope and random intercept.
(c) Interpret the result from part (b).
(d) Write down the estimated equation from the output.

Given that the standard deviation of the MI score is 3 and the mean is 0. Therefore people with an MI among the bottom few percent or the top few percent have MI scores of about ± 6. Compute the:

(e) variance of MPC, given $MI_{ij} = -6$.
(f) variance of MPC, given $MI_{ij} = 6$.
(g) covariance for MPC between two different individual in the same group.
(h) compute the correlation coefficient.

Q2. Discuss the different between the random intercept model and random slope model.