Q1. As a variable at the student level that is essential for explaining Economics score, we use the measure for revision hours per month taken from a study. The revision hours has been centered, so that its mean is 0. The results are presented below.

Fixed effect	Coefficient	S.E.
γ_{00} = intercept	43.45	0.28
γ_{10} = coefficient of revision hour	2.457	0.126
γ_{01} = coefficient of $\overline{\text{RH}}$ (group mean)	1.386	0.235
Random part	Variance component	S.E.
Level-two variance: $\tau_0^2 = \text{var}(U_{oj})$	9.27	1.36
Level-one variance: $\sigma^2 = \text{var}(R_{ij})$	44.23	0.86
Deviance	25,076	

*RH = revision hours

Revision hours here is the variable with overall centering but no group centering. Construct the confidence interval for the standard deviations and variance and interpret the results.

Q2 To study the effect of productivity (PDT) on total income (INC) of employees, a researcher surveyed 80 listed companies in Malaysia and 15 employees chosen from the selected 80 listed companies. Seniority (SRT) is considered to be the important control variable in this study. Two random slope models are estimated and presented in the table in next page. The first model contains the raw (grand-mean-centered) PDT variable along with the group mean, the second contains the within-group deviation variable, $\widetilde{PDT}$ which is define as $\widetilde{PDT}_{ij} = PDT_{ij} - \overline{PDT_{.j}}$.

	Model 1		**Model 2**	
Fixed effects	*Coefficient*	*S.E.*	*Coefficient*	*S.E.*
γ_{00} = intercept	35.05	0.19	45.09	0.90
γ_{10} = coefficient of PDT	2.90	0.12		
γ_{20} = coefficient of $\widetilde{\text{PDT}}$			2.98	0.452
γ_{30} = coefficient of SRT	0.178	0.098	0.196	0.017
γ_{01} = coefficient of $\overline{\text{PDT}}$	0.568	0.190	3.137	0.281
Random part	*Parameter*	*S.E.*	*Parameter*	*S.E.*
Level-two parameters:				
$\tau_0^2 = \text{var}(U_{oj})$	9.67	1.37	9.05	1.09
$\tau_1^2 = \text{var}(U_{1j})$	0.2033	0.034	0.243	0.076
$\tau_{01}^2 = \text{cov}(U_{oj}, U_{1j})$	-0.904	0.097	-0.904	0.097
Level-one variance:				
$\sigma^2 = \text{var}(R_{ij})$	39.07	0.87	39.05	0.93
Deviance	24,890.2		24,890.2	

You are required to:

(i) test whether between-group and within-group regression of PDT on INC are different from one another, after controlling for the seniority.

(ii) test whether the within-group regression is zero.

(iii) test whether the between-group regression is zero.