Quiz 3
Linear random intercept/slope models

Consider the example from the lecture notes on the effectiveness of schools in London. Using slightly different notation than the lecture, let:

Y_ij be the GCSE achievement score at age 16 for student j from school i
X_ij be the LRT reading score are age 11 for student j from school i

Note, both of these values are centered, meaning that we took the scores and subtracted off the mean. In doing so, the intercept from a simple linear regression of Y on X is the average Y at the average X.

The model of interest is:

Y_ij = b0 + u0_i + (b1 + u1_i) * X_ij + e_ij

u0_i ~ N(0, tau0^2)

u1_i ~ N(0, tau1^2)

Cov(u0_i, u1_i) = tau01

e_ij ~ N(0, sigma^2)

1. Describe in words the interpretation of the random effect u0_i.

2. Describe in words the interpretation of the random effect u1_i.

Below you will find the output from fitting this model. Answer the questions that follow.

	Random Intercept and Slope	
	Est	SE
Fixed		
b0	-0.12	0.40
b1	0.56	0.02
Random		
tau0	3.01	0.30
tau1	0.12	0.02
rho01	0.50	0.15
sigma	7.44	0.08

* where rho01 is the correlation between the random intercept and random slope.

3. Interpret the estimate of b1.

4. Interpret the estimate of tau0 (this is the standard deviation of the random school effect).

5. Interpret the estimate of tau1 (this is the standard deviation of the random slope).

6. Interpret the estimate of sigma (this is the standard deviation of the random student effect within school).