Sixty students were involved in a particular weekly after school tutoring program that had two new methods of teaching they wanted to test against their current method. The students were tracked over four weeks by taking a quiz at the end of the tutoring session. FFor the first two weeks everyone was tutored using the current method, but for the last two weeks, students were randomly assigned to a method and tutored using that method for both of the last two weeks.
We'll explore three potential models to this data set, which is available as a `csv` file on the class website and can be read in using:

```
> d <- read.csv("http://www.stat.umn.edu/~arendahl/Teaching/EPSY8282/hw/hw4data.csv")
```

Here is a subset of the data for two individuals. Notice that the treatment variable is recorded as the method they were assigned to, even though they were only tutored using this method for the last two weeks.

id	treatment	time	score
1	control	1	149
1	control	2	151
1	control	3	156
1	control	4	158
21	methodA	1	157
21	methodA	2	156
21	methodA	3	168
21	methodA	4	173

Data Exploration: Make a profile plot of this data, separately for the three treatment groups. Tell me what you see in it. Does it look like there are differences between groups? Is there a time trend? Are there any outliers?

Model 1: First let's assume there is no increasing trend over time and test for an increase in score when using methods A and B.

- Make a new variable `trt` that has the treatment that was actually given to each subject at each time; that is, for the first two times all subjects have `control`, and for the last two times they have their assigned method.
- Fit a mixed model with `score` as the response and `trt` as the predictor, adding a random intercept for each subject. What are the fitted coefficients? How do you interpret them.
- Compare this model to a model without `trt`. (To do so, put just a `1` on the right side of the formula.) Is there evidence for a treatment effect?
- Using the `multcomp` library, calculate means and confidence intervals for each of the three group means.
- Using the `multcomp` library, do pairwise comparisons between these means, ussing a correction for multiple comparisons. Which methods are different?

Model 2: Now let's assume there is an increasing trend over time, and that the new methods cause a jump in the score, but that the trend remains the same.

- This is an additive model of `time` and `trt`; fit a mixed model as before with the same random effect, but now add in a linear time effect. What are the fitted coefficients? Interpret them.
- Compare this model to the model without `trt`. Is there evidence for a treatment effect?
- Using the `multcomp` library, do pairwise comparisons between the jump due to A, B, and the control (no jump). Which methods are different?

Model 3: Now let's assume that the methods cause the trend to change as well as a jump.

- This is a model with an interaction between `time` and `trt`; fit a mixed model as before but include this interaction. What are the coefficients? Interpret them.
- Compare this model to the additive model. Is there evidence for the interaction?
- Using the `multcomp` library, do pairwise comparisons between the jump due to A, B, and the control (no jump) at time 3 and at time 4, separately. At each time, which methods are different?

Conclusion: Compare the models you investigated. Which do you prefer? What's your final conclusion about the differences between the methods?