Solution to in-class-exercises on topic "multiple regression"

```
Call:
lm(formula = activity ~ treated * dosage + observed + insecticide
    data = cricket)

Residuals:
    Min      1Q  Median      3Q     Max
-44.030 -10.925   0.285   9.691  53.162

Coefficients:
                    Estimate Std. Error t value Pr(>|t|)
(Intercept)          -0.7151     9.6816  -0.074    0.941
treated              -8.9302     1.6275  -5.487 1.73e-07 ***
dosage0.8           -18.8747    11.5106  -1.640    0.103
dosage1.0           -13.9843    11.5106  -1.215    0.226
observed             17.8840     0.9970  17.937  < 2e-16 ***
insecticidepropoxur   1.8077     2.8506   0.634    0.527
treated:dosage0.8     2.6620     2.2279   1.195    0.234
treated:dosage1.0     1.4265     2.2279   0.640    0.523
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 17.8 on 148 degrees of freedom
Multiple R-squared: 0.6892,        Adjusted R-squared: 0.6745
F-statistic: 46.88 on 7 and 148 DF,  p-value: < 2.2e-16
```

i) The activity of the enzyme increases by approximately 17.9 when the age of the egg at the time of observation increases by one day.
☒ True ☐ False

ii) The activity of the enzyme after the treatment with propoxur is significantly higher than after the treatment with carbaryl.
☐ True ☒ False

iii) The age of the egg at the moment of the treatment (`treated`) has become a valuable predictor for the enzyme activity only after having included the other predictors into the model.
☒ True ☐ False

iv) A significant interaction between `treated` and `dosage` would mean that the influence of the dosage of the insecticide depends on age of the eggs at the time of the treatment.
☒ True ☐ False

v) The 156 cricket eggs in the study come from 15 different *egg masses* (Gelege), i.e., were laid by 15 different cricket mothers. Why could this be a problem for the fitted linear model above?

☐ Because there could be a different number of eggs in each mass.
☐ This constitutes a multiple testing problem. The number of masses should be considered to adjust the significance levels of the fitted parameters.
☐ We could have too few degrees of freedom in this case.
☒ The mass an egg comes from could have an effect on enzyme activity; this effect would be neglected in the fitted model above.