重点：ANOVA步骤

※※ ANOVA步骤

一：检测使用条件 → normality of residuals

① 建模：model ← aov (A ~ B+C , data=)   ~左侧因变量,右侧自变量

    + 为 model without interaction

    ※ 为 model with interaction

② 检查：(1) 画图：hist (resid (model) , main = "residuals")

(三选一)

  (2) normal Q-Q图 (dots should be aligned along the diagonal
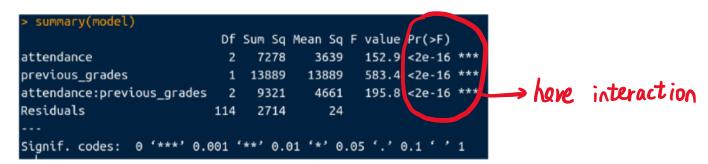   plot (model , 2)

  (3) shapiro.test (resid (model))
      H_0 ⇒ data is normally distributed

二. 检测条件 → equality of variances (var.test 只比较 2个样本,不适用) ※
    ⇒ plot (model,1) → look for similar heights of each columns

三. 做 ANOVA
    summary (model) 看 p-value

```
> summary(model)
                       Df Sum Sq Mean Sq F value Pr(>F)
attendance              2   7278    3639   152.9  <2e-16 ***
previous_grades         1  13889   13889   583.4  <2e-16 ***
attendance:previous_grades 2  9321    4661   195.8  <2e-16 ***
Residuals             114   2714      24
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```
→ have interaction

四：post-hoc test
    Tukey HSD (model) 查看每一组 t-test

⑤ 若检验未通过,则使用 non-parametric.
    ↳ kruskal.test (y~x , data= ~)

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two-way ANOVA 的 H0 与 HA

Hypotheses:
- H_0: There is no effect of class attendance or previous grades on course performance
- H_A: At least one of those factors (class attendance or previous grades) influences course performance.

Additional Hypotheses if we test for interactions:
- H_0: There is no interaction between class attendance and previous grades
- H_A: There is an interaction between class attendance and previous grades

ANOVA的 simulation
抽组内两样本与组间两样本,分别算差值
再对算出来的数据作 t-test/wilcox

inner_group = c(d1,d2 ⋯⋯)
diff_group = c(D1, D2 ⋯⋯)