

ANOVA

1. We are interested in estimating the effect of a multi-vitamin on the iron levels of pregnant women. We take a sample of 50 pregnant women, randomly administer the multi-vitamin to 25 of them and measure blood iron levels before and after taking the vitamin for all 50 women.

Match the following:

- Blood iron level - (Experimental Unit, Response, Treatment, Factor)
 - Vitamin use - (Experimental Unit, Response, Treatment, Factor)
 - A pregnant woman - (Experimental Unit, Response, Treatment, Factor)
 - Taking the vitamin - (Experimental Unit, Response, Treatment, Factor)
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2. Which of the following statements is true?

- ANOVA involves the same assumptions as the pooled variance t-test
 - ANOVA can only be used to test differences between 3 or more groups
 - The one-way ANOVA alternative hypothesis can be stated as "all group means are different from each other"
 - We can use one-way ANOVA to check the impact of exercise and diet on blood sugar levels of adults
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3. We want to compare the packing speeds of 4 different machines in a toothpaste factory. We collect data on the time taken to pack 100 tubes of toothpaste from each type of machine.

Match with the correct degrees of freedom:

- Mean Square Within – (399, 3, 396)
 - Mean Square Among (between) – (399, 3, 396)
 - Mean Square Total – (399, 3, 396)
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4. You are given the following ANOVA table for testing differences between the impact of three types of fertilizer, where you have a sample of 4 land parcels for each type of fertilizer:

Source	Degrees of Freedom	Sum of Squares	Mean sum of Squares	F
Among groups	x	8	u	w
Within groups	y	6	v	
Total	11	14		

The critical value from the F-table for 5% significance is given to you as 4.26.

Which of the following is correct?

- We can reject the null hypothesis of equal means at 1% significance.
- We reject the null hypothesis of equal means at 5% significance in favor of the alternative hypothesis that all means are different from each other.
- We cannot reject the null hypothesis of unequal means at 5% significance.
- We reject the null hypothesis of equal means at 5% significance.

5. Match the following examples with the type of experimental design.

- We want to study the effect of remedial classes on maths scores so we select 25 students who are performing poorly in class and randomly assign some of them for remedial classes. - (Completely Randomized Design / Factorial Design / Randomized Block Design)
- We want to study the effect of remedial classes and interactive whiteboards on maths scores so we select 100 students and randomly assign them to one of four groups: remedial classes and interactive whiteboard, remedial classes and no interactive whiteboard, no remedial classes and interactive whiteboard, no remedial classes and no interactive whiteboard. - (Completely Randomized Design / Factorial Design / Randomized Block Design)

- We want to study the effect of remedial classes on maths scores but suspect that boy and girls respond differently to remedial classes. Therefore, we take a sample of boys and a sample of girls and within each sample, assign the remedial classes randomly. - (Completely Randomized Design / Factorial Design / Randomized Block Design)
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Significant Figures by Ushan