

Patients with coronary artery disease were randomly assigned to one of four treatment groups: placebo, probucol (a drug), multivitamins, or probucol with multivitamins. Each patient underwent balloon angioplasty. Later, the “minimal luminal diameter” (a measure of the success of the angioplasty in dilating the artery) was recorded for each patient. Here is a summary of the data. The sample sizes were not identical, but were between 50 and 65 for each group.

	Placebo	Probucol	Multivitamins	Combined
Mean	1.43	1.79	1.40	1.54
SD	0.58	0.45	0.55	0.61

- (a) Complete the following ANOVA table.

Solution:

Source	df	SS	MS	F	<i>p</i> -value
Between	3	5.4336	1.8112	5.97	0.00064
Within	226	68.5609	0.3034		
Total	229	73.9945			

- (b) How many total subjects are in the study?

Solution: There are 230 total subjects in the study.

- (c) Estimate the common population standard deviation.

Solution: The estimate is 0.55.

- (d) Summarize the results in the context of the problem.

Solution: There is very strong evidence that the treatments have different mean effects on minimal luminal diameter for a population of similar patients who have undergone angioplasty.

- (e) Side-by-side boxplots of the data show that the measurements in each group are moderately skewed to the right, but that there are no extreme outliers. Does this invalidate the ANOVA procedure? Briefly explain.

Solution: This does not invalidate the analysis. The sample sizes are large enough for the sampling distributions to be approximately normal and the procedure will be valid. The central limit theorem implies that the sampling distribution of each sample mean will be approximately normal.

- (f) (This question does not directly apply to the ANOVA table.) In a random sample of 62 individuals from a normal population with population mean 1.46 and standard deviation 0.60, what is the probability that the sample mean would be 1.43 or less?

Solution: The sampling distribution of the sample mean is normal with mean 1.46 and standard deviation $0.60/\sqrt{62}$. The *z*-score is -0.39. The probability is the area to the left of -0.39 under a standard normal curve, or 0.3483.