

For each of the following, run all five steps of the hypotheses tests.

1. Dr. Olsen is concerned about her pH meter. She finds a neutral substance which should give meter readings of 7.0 on the pH scale. She conducts 10 sample measurements (data given below) of the substance on her balky meter. At the $\alpha=0.1$ level, test her hypothesis that the meter is faulty. Assume normality.

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|------|-----|-----|------|-----|------|------|------|------|------|
| 7.07 | 7.0 | 7.1 | 6.97 | 7.0 | 7.03 | 7.01 | 7.01 | 6.98 | 7.08 |
|------|-----|-----|------|-----|------|------|------|------|------|

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2. You are a consultant for a manufacturer who asks you to compare the abrasive wear for two types of lamination. For Laminate X, 12 pieces of material are tested and earn an average rating of 85 on a scale of 0-100 where 100 indicates "no visible wear" and 0 indicates "completely destroyed" (standard deviation = 4). For Laminate Z, 10 pieces are tested and an average of 81 with a standard deviation of 5 is found. Given that the two laminates cost roughly the same to produce, test the hypothesis that X is significantly better than Z at $\alpha=.01$. Assume normality.

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3. Researchers are wondering if hypnosis will influence mathematics test anxiety. They give 9 students a mathematics test un-hypnotized. Three weeks later, the participants take the same test after being hypnotized by a trained professional (folks, do NOT try this at home!). Their scores are given below. Test their hypothesis about hypnosis at the $\alpha=0.05$ level.

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|----------------|----|----|----|----|----|----|----|----|----|
| Test 1U | 58 | 67 | 79 | 59 | 66 | 71 | 70 | 52 | 65 |
| Test 2H | 59 | 70 | 78 | 66 | 68 | 66 | 81 | 71 | 71 |

4. The following data represents the running time of recent movies from two top motion-picture companies. Test the hypothesis that Company 2's movies have on average a longer running time at the $\alpha=0.025$ level.

| Company | Running Time (Minutes) | | | | | | |
|---------|------------------------|-----|----|-----|----|----|-----|
| 1 | 102 | 86 | 98 | 109 | 92 | | |
| 2 | 81 | 165 | 97 | 134 | 92 | 87 | 114 |

5. The average production of peanuts in Virginia is 3000 pounds per acre. A new plant food has been developed and is tested on 60 individual plots of land. The mean yield with the new plant food is 3120 pounds of peanuts per acre, and the population standard deviation is 578 pounds. At $\alpha=0.05$, can you conclude that the average production has increased?
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6. A researcher claims that high school girls miss more days of school than high school boys. A sample of 16 girls showed that they missed an average of 3.9 days of school per school year; a sample of 22 boys showed that they missed an average of 3.6 days of school per school year. The standard deviations are 0.6 and 0.8 respectively. Construct a 99% confidence interval for the true mean difference.