

AP Statistics Homework One-sample t-test for means

1. Sweet corn of a certain variety is known to produce individual ears of corn with a mean weight of 8 ounces. A farmer is testing a new fertilizer designed to produce larger ears of corn, as measured by their weight. He finds that 28 randomly-selected ears of corn grown with this fertilizer have a mean weight of 8.25 ounces and a standard deviation of 0.8 ounces. There are no outliers in the data.

- (a) Do these samples provide convincing evidence at the $\alpha = 0.05$ level that the fertilizer had a positive impact on the weight of the corn ears? Justify your answer.
- (b) How would your conclusion change if your sample mean had been 8.26 ounces? What point does this make about statistical significance?

2. The developer of a new filter for filter-tipped cigarettes claims that it leaves less nicotine in the smoke than does the current filter. Because cigarette brands differ in a number of ways, he tests each filter on one cigarette of each of nine brands and records the difference in nicotine content. His results are given in the table below.

Brand	A	B	C	D	E	F	G	H	J
Old Filter nicotine, mg	0.7	0.8	0.8	0.9	0.9	1.0	1.2	1.2	1.8
New Filter nicotine, mg	0.6	0.6	0.7	0.8	0.7	1.0	0.8	0.9	1.5

- a) Is this study a matched pairs experiment? Explain.
- b) Is there evidence that the new filter leaves less nicotine in the smoke than in the current filter? Support your evidence with statistical evidence.

3. Insurance companies track life expectancy information to assist in determining the cost of life insurance policies. The insurance company knows that, last year, the life expectancy of its policy holders was 77 years. They want to know if their clients this year have a longer life expectancy, on average, so the company randomly samples some of the recently paid policies to see if the mean life expectancy of policyholders has increased. The insurance company will only change their premium structure if there is evidence that people who buy their policies are living longer than before.

86	75	83	84	81	77	78	79	79	81
76	85	70	76	79	81	73	74	72	83

- a) Does this sample indicate that the insurance company should change its premiums because life expectancy has increased? Test an appropriate hypothesis and state your conclusion.
- b) In this context describe a Type I error and the impact such an error would have on the company.
- c) In this context describe a Type II error and the impact such an error would have on the company.