1.

Test Used: Two-tailed Z-test

$$H_0 : \mu = 500$$

$$H_a : \mu \neq 500$$

Test statistic: z = 1.885618

Critical Value: 2.575829

Rejection Region: (z < -2.575829, z > 2.575829)

p-value: 0.5865993

Decision: Fail to reject H0 because it is within the rejection region and p value is greater than alpha.

Conclusion: There is not enough evidence to conclude that the sample mean is different than 500.

a.

Test statistic: 1.885618

Critical Value: 2.575829

Not enough evidence to reject because z is not greater than 2.5758.

b.

Probability of Type II Error: 0.5866

mu	Power

c.

mu	Power
450	0.98375039
460	0.88403595
470	0.59971053
480	0.24503475
490	0.05144925
510	0.05144925
520	0.24503475
530	0.59971053
540	0.88403595
550	0.98375039

d.

Probability of Type II Error: 0.224374

e.

Required Sample Size to achieve Beta <= 0.04: 169

2.

Test Used: Right tail Z-test

$$H_0 : \mu = 41$$

$$H_a : \mu > 41$$

Test statistic: z = 1.084209

Critical Value: 1.644854

Rejection Region: (z <= -1.644854, z => 1.644854)

p-value: 0.139136

Decision: Fail to reject H0 due to the p-value being greater than alpha and z being within the rejection region.

Conclusion: There is not enough evidence at the 0.05 significance level to conclude that mean sunspot activity was greater than 41.

a.

95% Confidence Interval: (36.15359 , 57.84641)

b.

z = 1.084209

Critical Value = 1.644854

p-value = 0.139136

3.

Test Used: Paired T-test

$$H_0 : \mu_0 - \mu_1 \leq 0$$

$$H_a : \mu_0 - \mu_1 > 0$$

Test statistic: t = 1.8824

Critical Value: 1.689572

Rejection Region: t >= 1.689572

p-value: 0.03406

Decision: Reject H0 because the value of 't' is greater than the critical value and alpha is greater than the p-value.

Conclusion: There is sufficient evidence to conclude that the mean cost of living index for housing is higher than that for groceries in these metropolitan areas.

a.

There is sufficient evidence to conclude that the mean cost of living index for housing is higher than that for groceries in these metropolitan areas.

b.

The mean lies within the (0.4381481, 8.117408) interval.

4.

a.

Test Used: Two-sample T-test

$$H_0 : \mu_a \geq \mu_b$$

$$H_a : \mu_a < \mu_b$$

Test statistic: t = -2.0059

Critical Value: -1.701131

Rejection Region: t < -1.701131

p-value: 0.0274

Decision: Fail to reject H0, the p-value is greater than alpha, and the test statistic is not in the rejection region.

Conclusion: At the 0.05 significance level, there is not sufficient evidence to conclude that field A has, on average, a lower soil water content than field B.

b.

(−0.334, 4.178). We can be 95% confident that the true difference in mean water content is between -0.334% and 4.178%. Since this interval contains zero, this agrees with our hypothesis test conclusion that we cannot conclude there is a significant difference in mean water content between the fields.

5.

a.

Test Used: Two-sample T-test

$$H_0 : \mu_d \geq \mu_s$$

$$H_a : \mu_d < \mu_s$$

Test statistic: t = -2.6804

Critical Value: -2.554701

Rejection Region: t < -2.554701

p-value: 0.007679

Decision: Reject H0 due to alpha being greater than p-value and test statistic is in the rejection region.

Conclusion: There is enough evidence to reject the claim that the mean operative time of the dynamic system is lass than with the static.

b.

(-166.9086, 19.5276)

Since the mean difference includes 0, we cannot conclude that there is a significant difference between the operative times of the systems at the 99% confidence level.