# 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

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

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

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

$$H_0: \mu_d \ge \mu_s$$

$$H_a: \mu_d < \mu_s$$

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.