

1. A population of dandelions is normally distributed with respect to root depth, with $\mu = 60.0$ cm and $\sigma = 10.0$ cm.

- If you select a dandelion at random from this population, what is the probability that its root depth will be greater than 60.0 *or* less than 40.0?
- If you select two more dandelions at random, what is the probability that the root depth of the first will be greater than 60.0 cm *and* the root depth of the second will be less than 40.0 cm?

2. Research question: "Does stream restoration affect growth rates of juvenile coho salmon?" You decide to address this question by measuring growth rates in years before vs. after stream restoration activities. Your null hypothesis is that mean growth rates before vs. after restoration are equal, $H_0: \mu_1 = \mu_2$. Explain in terms of the research question the meaning of $\alpha = 0.05$.

3. For samples of 10 paired measurements, the mean difference (\bar{d}) is 21.0, and the variance (s^2) is 250.00.

What are the 95% confidence limits for the mean difference (μ_d)?

4. Research question: was summer 2008 significantly wetter than summer 2007? Cumulative precipitation during the months of June-Sept. was recorded in 20 western Washington cities during both summers. Examination of independent data suggests that the precipitation levels were normally distributed.

- Which statistical test is most appropriate?
- Why?
- State suitable null and alternative hypotheses that could be used to address the research question.

5. Research question: do bigleaf maples produce leaves in high light environments that differ in size from leaves produced in low light? You recorded the area of ten randomly selected sun leaves and 16 randomly selected shade leaves. Independently collected data suggest that leaf areas were normally distributed, with equal variances among leaves in high and low light environments.

$$\begin{array}{lll} H_0: \mu_1 = \mu_2 & \bar{X}_1 = 211.0 & (1=\text{shade}) \\ H_A: \mu_1 \neq \mu_2 & \bar{X}_2 = 208.0 & (2=\text{sun}) \\ \alpha = 0.05 & s_{\bar{X}_1 - \bar{X}_2} = 1.2 & \end{array}$$

Complete a statistical analysis to answer the research question. For full credit, include the following:

- Calculate the test statistic, t_{calc} . Show all formulas and values used.
- State your statistical decision about the null hypothesis.
- State your conclusion, in words, about the research question.

6. Suppose independently collected data suggest that the distribution of leaf areas in problem 4 deviates severely from normality.

- Which test would provide greatest power to answer the research question?
- State the hypotheses appropriate for that test.

7. During the m&m example in class, I instructed one of your peers to select ten plain m&ms randomly relative to their positions. Describe how you could have selected those ten m&ms in a way that would have been random relative to position.