Power and p-values

1. The intensity of light reflected by an object is measured. Suppose there are two types of possible objects, A and B. If the object is of type A, the measurement is normally distributed with mean 100 and standard deviation 25. If the object is of type B, the measurement is normally distributed with mean 125 and standard deviation 25. Researchers plan to take a single measurement X.

   Suppose the testing procedure δ has been formulated that declares the object to be of type B if $X > 125$.

   (a) Write out the hypotheses of this test. What is the implied parameter space Ω? Are the hypotheses simple or composite?

   (b) What is the level or size of this test δ?

   (c) We will learn a new definition:

   The **power** (not to be confused with power function) of a test is the probability of rejecting the null hypothesis if the alternate hypothesis is in fact true.

   What is the power of this test δ?

   (d) For end of class: suppose we observe $X = 120$. What is the p-value?