chapter 8: t tests

- dependent samples t test (or paired samples, or repeated measures)
    - two matched samples
        - the two scores are statistically dependent
        - e.g., parent and child; or same person at two different times
    - convert it to a problem we know how to solve
        - define D = X - Y
    - do a one-sample t test on D, with H_0: $mu_D = 0$
        (or $mu_D >= 0$, $mu_D <= 0$)
    t = (dbar - 0) / s_{dbar} = dbar / s_{dbar}, df = n - 1

- example 2
    - compare fifth and sixth grade GPAs
    - paired samples t test, two-tailed, alpha = 0.05
    - null hypothesis: $mu_1 = mu_2$; or $mu_D = 0$
    - difference, D = X - Y: Dbar = 0.7312, s_D = 2.343, n = 689
    s_{Dbar} = s_D / sqrt(n) = 2.343 / sqrt(689) = 0.08926
    t = Dbar / s_{Dbar} = 0.7312 / 0.08926 = 8.1918, df = 688
    - appendix B shows critical t value is 1.98
    - testing for an extreme t value (high or low)
    - significant result; reject null hypothesis that means are the same

- another worked example: dependent samples t test
    - drug that improves memory
    - null hypothesis: muX >= muY, which means muX - muY >= 0
    - dependent samples, one-tailed, alpha = 0.05
    - before, xbar = 30; after, ybar = 32; n = 64
    - D = X - Y; dbar = -2; s_D = 4; s_{Dbar} = 4 / sqrt(64) = 0.5
    t = Dbar / s_{Dbar} = -2 / 0.5 = -4
    df = n - 1 = 63
    - critical t value (one-tailed, alpha = 0.05, df = 63): t_c = 1.671
    - testing for a low t value; reject null hypothesis

- independent samples t test
    - two samples X and Y, not paired
    - again, want to test for significant differences between mu_X and mu_Y
    - not paired, so doesn't make sense to test the difference D = X – Y
        - samples may even be different sizes
    - need a new method; will be covered in Statistical Methods II