Topic 4 solutions

1. (a) $d' = 1.30$, $c =$ -0.52
   (b) $d' = 1.91$, $c =$ -0.60
   (c) $d' = 0.15$, $c = 0.60$
   (d) $d' = 0.61$, $c =$ -1.34

2. Suppose the decision variable has mean μ_1 and standard deviation σ on trials where the signal is 1, and mean μ_2 and standard deviation σ on trials where the signal is 2. As in the derivation of d', we set the scale of the decision variable axis by setting $\sigma = 1$. The observer uses a criterion x, responding "1" if the decision variable is less than x and responding "2" otherwise.

   First, the distance of the criterion above the mean of the signal 1 distribution, $x - \mu_1$, is given by $z(CR)$, or equivalently $-z(FA)$. (Recall that $z(1-p) = -z(p)$).

   Second, we already know that $d' = (\mu_2 - \mu_1)/\sigma = z(H) - z(FA)$.

   The bias parameter c is defined as the position of the criterion x relative to the midpoint between the two means. So,

$$\begin{aligned} c &= x - (\mu_1 + \mu_2)/2 \\ &= (x - \mu_1) - (\mu_2 - \mu_1)/2 \\ &= -z(FA) - (z(H) - z(FA))/2 \\ &= -0.5(z(H) + z(FA)) \end{aligned}$$

3. See `problem3.R`.