

## 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  $\mu_1$  and standard deviation  $\sigma$  on trials where the signal is 1, and mean  $\mu_2$  and standard deviation  $\sigma$  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.