Hardness

6.46 (a) We are asked to compute the Brinell hardness for the given indentation. It is necessary to use the equation in Table 6.5 for HB, where P = 1000 kg, d = 2.50 mm, and D = 10 mm. Thus, the Brinell hardness is computed as

$$\text{HB} = \frac{2P}{\pi D \left[D - \sqrt{D^2 - d^2} \right]}$$

$$= \frac{(2)(1000 \ \text{kg})}{(\pi)(10 \ \text{mm}) \left[10 \ \text{mm} - \sqrt{(10 \ \text{mm})^2 - (2.50 \ \text{mm})^2} \right]} = 200.5$$

(b) This part of the problem calls for us to determine the indentation diameter d which will yield a 300 HB when P = 500 kg. Solving for d from the equation in Table 6.5 gives

$$d = \sqrt{D^2 - \left[D - \frac{2P}{(\text{HB})\pi D} \right]^2}$$

$$= \sqrt{(10 \ \text{mm})^2 - \left[10 \ \text{mm} - \frac{(2)(500 \ \text{kg})}{(300)(\pi)(10 \ \text{mm})} \right]^2} = 1.45 \ \text{mm}$$