3.35 This problem asks for the determination of indices for several directions in a hexagonal unit cell.

For direction A, projections on the a_1, a_2, and z axes are $-a$, $-a$, and c, or, in terms of a and c the projections are –1, –1, and 1. This means that

$u' = -1$

$v' = -1$

$w' = 1$

Now, from Equations 3.6, the u, v, t, and w indices become

$$u = \frac{1}{3}(2u' - v') = \frac{1}{3}\big[(2)(-1) - (-1)\big] = -\frac{1}{3}$$

$$v = \frac{1}{3}(2v' - u') = \frac{1}{3}\big[(2)(-1) - (-1)\big] = -\frac{1}{3}$$

$$t = -(u + v) = -\left(-\frac{1}{3} - \frac{1}{3}\right) = \frac{2}{3}$$

$$w = w' = 1$$

Now, in order to get the lowest set of integers, it is necessary to multiply all indices by the factor 3, with the result that the direction A is a $[\bar{1}\bar{1}23]$ direction.

For direction B, projections on the a_1, a_2, and z axes are $-a$, $0a$, and $0c$, or, in terms of a and c the projections are –1, 0, and 0. This means that

$u' = -1$

$v' = 0$

$w' = 0$

Now, from Equations 3.6, the u, v, t, and w indices become

$$u = \frac{1}{3}(2u' - v) = \frac{1}{3}\big[(2)(-1) - 0\big] = -\frac{2}{3}$$

$$v = \frac{1}{3}(2v' - u') = \frac{1}{3}\big[(2)(0) - (-1)\big] = \frac{1}{3}$$

$$t = -(u + v) = -\left(-\frac{2}{3} + \frac{1}{3}\right) = \frac{1}{3}$$

$$w = w' = 0$$