

Que: Find the value of 'p' for which one root of the quadratic equation $px^2 - 14x + 8 = 0$ is 6 times the other.

Solⁿ: The general formula of the quadratic equation is: $ax^2 + bx + c = 0$

comparing the given quadratic formula equation with the above general equation, we get

$$a = p; b = -14; c = 8$$

Now, we apply Shreedhar's Acharya formula to calculate the roots of the equation,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(-14) \pm \sqrt{(-14)^2 - 4 \cdot p \cdot 8}}{2p}$$

$$= \frac{14 + \sqrt{196 - 32p}}{2p}, \quad \frac{14 - \sqrt{196 - 32p}}{2p}$$

According to question,

$$\text{or, } 6 \left(\frac{14 - \sqrt{196 - 32p}}{2p} \right) = \frac{14 + \sqrt{196 - 32p}}{2p}$$

$$\text{or, } 84 - 6\sqrt{196 - 32p} = 14 + \sqrt{196 - 32p}$$

$$\text{or, } 84 - 14 = 6\sqrt{196 - 32p} + \sqrt{196 - 32p}$$

$$\text{or, } 10 = \sqrt{196 - 32p}$$

$$\text{or, } 100 = 196 - 32p \quad [\text{squaring both sides}]$$

$$\text{or, } 32p = 196 - 100$$

$$\text{or, } 32p = 96$$

$$\text{or, } p = \frac{96}{32} = 3$$

$$\therefore p = 3$$

\therefore The required value of p is 3 Ans.