

Condition of the problem: α, β are the roots of $3x^2 + kx + 8$ and $\alpha/\beta=2/3$. Find value of k , $k \geq 0$.

Solution: Use the Vieta's formulas:

$$\begin{cases} \alpha + \beta = -\frac{k}{3} \quad (1) \\ \alpha\beta = \frac{8}{3} \quad (2) \end{cases}$$

$$\frac{\alpha}{\beta} = \frac{2}{3} \Rightarrow \alpha = \frac{2}{3}\beta \quad (3)$$

Substitute (3) to (2):

$$\frac{2}{3}\beta^2 = \frac{8}{3} \Rightarrow \beta = \pm 2 \quad (4)$$

Substitute (3) to (1):

$$\alpha + \beta = \frac{2}{3}\beta + \frac{5}{3}\beta = -\frac{k}{3} \Rightarrow k = -5\beta \Rightarrow k = \mp 10$$

As $k \geq 0$ $k = 10$

Answer: $k=10$.