

## Assignment

Find the values of  $k$  for which roots of the equation  $X^2 - 8kx + 2k = 0$  are equal.

### Solution

To solve this problem, you can use the theorem of Vieta.

If  $X_1$  and  $X_2$  - the roots of a quadratic equation  $ax^2 + bx + c = 0$ , we can use these formulas:

$$\begin{cases} X_1 + X_2 = \frac{-b}{a} \\ X_1 \cdot X_2 = \frac{c}{a} \end{cases}$$

If  $X_1 = X_2$ , we can create a new variable  $X_1 = X_2 = X_k$ . Put this new variable in the formulas of the theorem of Vieta:

$$\begin{cases} X_k + X_k = -8k \\ X_k \cdot X_k = 2k \end{cases}$$

We solve this system of equations:

$$X_k^2 = 2k$$

$$k = X_k^2 / 2$$

We substitute this into the first equation:

$$X_k + X_k = -8 \cdot X_k^2 / 2$$

$$2X_k = -4 \cdot X_k^2$$

$$X_k = -2 \cdot X_k^2$$

$$-2 = 1 / X_k$$

$$X_k = -\frac{1}{2}$$

Find the value of  $k$  using this formula:  $k = X_k^2 / 2$

$$k = \left(-\frac{1}{2}\right)^2 / 2 = \frac{1}{4 \cdot 2} = \frac{1}{8} = 0,125$$

**Answer:**  $k = \frac{1}{8} = 0,125$