

中学3年数学講座

第2章 平方根

7. 乗法公式の利用 (教科書レベル)

基本問題



講師: 高山よしなり

乗法公式の利用

POINT

√ を含む式の計算も乗法公式を利用して計算できる。

$$\textcircled{1} \quad (x+a)(x+b) = x^2 + (a+b)x + ab$$

$$\textcircled{2} \quad (a+b)^2 = a^2 + 2ab + b^2$$

$$\textcircled{3} \quad (a-b)^2 = a^2 - 2ab + b^2$$

$$\textcircled{4} \quad (a+b)(a-b) = a^2 - b^2$$

例題 次の計算をなさい。

$$\begin{aligned}(1) (\sqrt{5} + 3)(\sqrt{5} + 4) &= (\sqrt{5})^2 + (3 + 4)\sqrt{5} + 3 \times 4 \\ &= 5 + 7\sqrt{5} + 12 \\ &= 17 + 7\sqrt{5}\end{aligned}$$

$$\begin{aligned}(2) (\sqrt{2} - \sqrt{5})^2 &= (\sqrt{2})^2 - 2 \times \sqrt{2} \times \sqrt{5} + (\sqrt{5})^2 \\ &= 2 - 2\sqrt{10} + 5 \\ &= 7 - 2\sqrt{10}\end{aligned}$$

$$(3) (\sqrt{7} + \sqrt{2})(\sqrt{7} - \sqrt{2}) = (\sqrt{7})^2 - (\sqrt{2})^2 = 7 - 2 = 5$$

$$\textcircled{1} (x+a)(x+b) = x^2 + (a+b)x + ab$$

$$\textcircled{2} (a+b)^2 = a^2 + 2ab + b^2$$

$$\textcircled{3} (a-b)^2 = a^2 - 2ab + b^2$$

$$\textcircled{4} (a+b)(a-b) = a^2 - b^2$$

基本問題 次の計算をなさい。

$$(1) (\sqrt{2} - 2)^2$$

$$(5) (\sqrt{3} + 3)^2$$

$$(2) (\sqrt{5} + \sqrt{2})(\sqrt{5} - \sqrt{2})$$

$$(6) (\sqrt{3} - 2)(\sqrt{3} + 2)$$

$$(3) (\sqrt{3} + 4)(\sqrt{3} + 2)$$

$$(7) (\sqrt{5} + 2)(\sqrt{5} - 4)$$

$$(4) (\sqrt{2} - 2)(\sqrt{2} - 5)$$

$$(8) (\sqrt{2} - 3)(\sqrt{2} + 3)$$

$$\begin{aligned}
 (1) \quad (\sqrt{2} - 2)^2 &= (\sqrt{2})^2 - 2 \times \sqrt{2} \times 2 + 2^2 \\
 &= 2 - 4\sqrt{2} + 4 \\
 &= 6 - 4\sqrt{2}
 \end{aligned}$$

$$\begin{aligned}
 (2) \quad (\sqrt{5} + \sqrt{2})(\sqrt{5} - \sqrt{2}) &= (\sqrt{5})^2 - (\sqrt{2})^2 \\
 &= 5 - 2 \\
 &= 3
 \end{aligned}$$

$$\begin{aligned}
 (3) \quad (\sqrt{3} + 4)(\sqrt{3} + 2) &= (\sqrt{3})^2 + (4 + 2) \times \sqrt{3} + 4 \times 2 \\
 &= 3 + 6\sqrt{3} + 8 \\
 &= 11 + 6\sqrt{3}
 \end{aligned}$$

$$(4) \quad (\sqrt{2} - 2)(\sqrt{2} - 5) = (\sqrt{2})^2 + (-2 - 5) \times \sqrt{2} + (-2) \times (-5)$$

$$\textcircled{1} \quad (x+a)(x+b) = x^2 + (a+b)x + ab \quad = 2 - 7\sqrt{2} + 10$$

$$\textcircled{2} \quad (a+b)^2 = a^2 + 2ab + b^2 \quad = 12 - 7\sqrt{2}$$

$$\textcircled{3} \quad (a-b)^2 = a^2 - 2ab + b^2$$

$$\textcircled{4} \quad (a+b)(a-b) = a^2 - b^2$$

$$\begin{aligned}
 (5) \quad (\sqrt{3} + 3)^2 &= (\sqrt{3})^2 + 2 \times \sqrt{3} \times 3 + 3^2 \\
 &= 3 + 6\sqrt{3} + 9 \\
 &= 12 + 6\sqrt{3}
 \end{aligned}$$

$$\begin{aligned}
 (6) \quad (\sqrt{3} - 2)(\sqrt{3} + 2) &= (\sqrt{3})^2 - 2^2 \\
 &= 3 - 4 \\
 &= -1
 \end{aligned}$$

$$\begin{aligned}
 (7) \quad (\sqrt{5} + 2)(\sqrt{5} - 4) &= (\sqrt{5})^2 + (2 - 4) \times \sqrt{5} + 2 \times (-4) \\
 &= 5 - 2\sqrt{5} - 8 \\
 &= -3 - 2\sqrt{5}
 \end{aligned}$$

$$(8) \quad (\sqrt{2} - 3)(\sqrt{2} + 3) = (\sqrt{2})^2 - 3^2$$

$$\textcircled{1} \quad (x+a)(x+b) = x^2 + (a+b)x + ab \quad = 2 - 9$$

$$\textcircled{2} \quad (a+b)^2 = a^2 + 2ab + b^2 \quad = -7$$

$$\textcircled{3} \quad (a-b)^2 = a^2 - 2ab + b^2$$

$$\textcircled{4} \quad (a+b)(a-b) = a^2 - b^2$$

応用問題 次の計算をなさい。

章末問題レベル

$$(1) (2\sqrt{2} - 1)^2$$

$$(5) (\sqrt{6} + 3\sqrt{2})^2$$

$$(2) (2\sqrt{3} + \sqrt{2})(2\sqrt{3} - \sqrt{2})$$

$$(6) (2\sqrt{6} - 2\sqrt{3})(2\sqrt{6} + 2\sqrt{3})$$

$$(3) (3\sqrt{2} + 2)(3\sqrt{2} + 1)$$

$$(7) (1 + 2\sqrt{5})(2 + 2\sqrt{5})$$

$$(4) (2 - \sqrt{2})(\sqrt{2} + 2)$$

$$(8) (\sqrt{2} - 3\sqrt{5})(\sqrt{2} + 2\sqrt{5})$$

ではまた次回も頑張りましょう。