展開と因数分解 [乗法公式を活用した展開 (2)]

＜演習問題＞
次の式を展開せよ。

(1)　$(x+y+1)(x+y+3)$

(2)　$(x+y+5)(x+y-2)$

(3)　$(x+y-3)(x+y-4)$

(4)　$(x+y+2)(x+y-4)$

(5)　$(x+y+2)^2$

(6)　$(x+y-5)^2$

(7)　$(x+y+4)(x+y-4)$

(8)　$(x+y-3)(x+y+3)$

(9)　$(x+y-2)(x-y-2)$

(10)　$(x+y+3)(x-y+3)$

(11)　$(x+y-3)(x-y+3)$

展開と因数分解 [乗法公式を活用した展開 (2)]

＜演習問題＞

次の式を展開せよ。

(1)　$(x+y+1)(x+y+3)$

$x+y=M$ とおくと

$$\begin{aligned}(x+y+1)(x+y+3) &= (M+1)(M+3)\\ &= M^2+4M+3\\ &= (x+y)^2+4(x+y)+3\\ &= x^2+2xy+y^2+4x+4y+3\end{aligned}$$

(2)　$(x+y+5)(x+y-2)$

$x+y=M$ とおくと

$$\begin{aligned}(x+y+5)(x+y-2) &= (M+5)(M-2)\\ &= M^2+3M-10\\ &= (x+y)^2+3(x+y)-10\\ &= x^2+2xy+y^2+3x+3y-10\end{aligned}$$

(3)　$(x+y-3)(x+y-4)$

$x+y=M$ とおくと

$$\begin{aligned}(x+y-3)(x+y-4) &= (M-3)(M-4)\\ &= M^2-7M+12\\ &= (x+y)^2-7(x+y)+12\\ &= x^2+2xy+y^2-7x-7y+12\end{aligned}$$

(4)　$(x+y+2)(x+y-4)$

$x+y=M$ とおくと

$$\begin{aligned}(x+y+2)(x+y-4) &= (M+2)(M-4)\\ &= M^2-2M-8\\ &= (x+y)^2-2(x+y)-8\\ &= x^2+2xy+y^2-2x-2y-8\end{aligned}$$

(5)　$(x+y+2)^2$

$x+y=M$ とおくと

$$\begin{aligned}(x+y+2)^2 &= (M+2)^2\\ &= M^2+4M+4\\ &= (x+y)^2+4(x+y)+4\\ &= x^2+2xy+y^2+4x+4y+4\end{aligned}$$

(6)　$(x+y-5)^2$

$x+y=M$ とおくと

$$\begin{aligned}(x+y-5)^2 &= (M-5)^2\\ &= M^2-10M+25\\ &= (x+y)^2-10(x+y)+25\\ &= x^2+2xy+y^2-10x-10y+25\end{aligned}$$

(7)　$(x+y+4)(x+y-4)$

$x+y=M$ とおくと

$$\begin{aligned}(x+y+4)(x+y-4) &= (M+4)(M-4)\\ &= M^2-16\\ &= (x+y)^2-16\\ &= x^2+2xy+y^2-16\end{aligned}$$

(8)　$(x+y-3)(x+y+3)$

$x+y=M$ とおくと

$$\begin{aligned}(x+y-3)(x+y+3) &= (M-3)(M+3)\\ &= M^2-9\\ &= (x+y)^2-9\\ &= x^2+2xy+y^2-9\end{aligned}$$

(9)　$(x+y-2)(x-y-2)$

$x-2=M$ とおくと

$$\begin{aligned}(x+y-2)(x-y-2) &= (M+y)(M-y)\\ &= M^2-y^2\\ &= (x-2)^2-y^2\\ &= x^2-4x-y^2+4\end{aligned}$$

(10)　$(x+y+3)(x-y+3)$

$x+3=M$ とおくと

$$\begin{aligned}(x+y+3)(x-y+3) &= (M+y)(M-y)\\ &= M^2-y^2\\ &= (x+3)^2-y^2\\ &= x^2+6x-y^2+9\end{aligned}$$

(11)　$(x+y-3)(x-y+3)$

$y-3=M$ とおくと

$$\begin{aligned}(x+y-3)(x-y+3) &= \{x+(y-3)\}\{x-(y-3)\}\\ &= (x+M)(x-M)\\ &= x^2-M^2\\ &= x^2-(y-3)^2\\ &= x^2-y^2+6y-9\end{aligned}$$