

中学数学 3

## 1 章 式の計算

年

組

番

名前

1 次の計算をなさい。

(1)  $3x(2x+y)$

$$= 3x \times 2x + 3x \times y$$

$$= 6x^2 + 3xy$$

(2)  $-3a(2a-5b)$

$$= -3a \times 2a - (-3a) \times 5b$$

$$= -6a^2 + 15ab$$

(3)  $(x-3y) \times (-2y)$

$$= x \times (-2y) - 3y \times (-2y)$$

$$= -2xy + 6y^2$$

(4)  $(6ab+3b) \div 3b$

$$= \frac{6ab+3b}{3b}$$

$$= \frac{6ab}{3b} + \frac{3b}{3b}$$

$$= 2a + 1$$

(5)  $(12x^2-10xy) \div (-2x)$

$$= \frac{12x^2-10xy}{-2x}$$

$$= -\frac{12x^2}{2x} + \frac{10xy}{2x}$$

$$= -6x + 5y$$

(6)  $(-6a^2-9ab) \div (-3a)$

$$= \frac{-6a^2-9ab}{-3a}$$

$$= \frac{6a^2}{3a} + \frac{9ab}{3a}$$

$$= 2a + 3b$$

2 次の式を展開しなさい。

(1)  $(x+5)(y-2)$

$$= xy - 2x + 5y - 10$$

(2)  $(2a-3)(a+1)$

$$= 2a^2 + 2a - 3a - 3$$

$$= 2a^2 - a - 3$$

(3)  $(2x+y)(x-3y)$

$$= 2x^2 - 6xy + xy - 3y^2$$

$$= 2x^2 - 5xy - 3y^2$$

(4)  $(3a-b)(2a-3b)$

$$= 6a^2 - 9ab - 2ab + 3b^2$$

$$= 6a^2 - 11ab + 3b^2$$

(5)  $(x+y)(2x+y-1)$

$$= x(2x+y-1) + y(2x+y-1)$$

$$= 2x^2 + xy - x + 2xy + y^2 - y$$

$$= 2x^2 + 3xy - x + y^2 - y$$

(6)  $(2a+3b-4)(a-b)$

$$= (2a+3b-4) \times a - (2a+3b-4) \times b$$

$$= 2a^2 + 3ab - 4a - 2ab - 3b^2 + 4b$$

$$= 2a^2 + ab - 4a - 3b^2 + 4b$$

**3** 次の式を展開しなさい。

(1)  $(x+1)(x+3)$

$$=x^2+(1+3)x+1\times 3$$

$$=x^2+4x+3$$

(2)  $(x-3)(x+2)$

$$=x^2+(-3+2)x+(-3)\times 2$$

$$=x^2-x-6$$

(3)  $(a+5)(a-4)$

$$=a^2+(5-4)a+5\times(-4)$$

$$=a^2+a-20$$

(4)  $(a-1)(a-5)$

$$=a^2+(-1-5)a+(-1)\times(-5)$$

$$=a^2-6a+5$$

(5)  $(x+2)^2$

$$=x^2+2\times 2\times x+2^2$$

$$=x^2+4x+4$$

(6)  $(a-5)^2$

$$=a^2-2\times 5\times a+5^2$$

$$=a^2-10a+25$$

(7)  $\left(y-\frac{1}{2}\right)^2$

$$=y^2-2\times\frac{1}{2}\times y+\left(\frac{1}{2}\right)^2$$

$$=y^2-y+\frac{1}{4}$$

(8)  $\left(a+\frac{3}{2}\right)^2$

$$=a^2+2\times\frac{3}{2}\times a+\left(\frac{3}{2}\right)^2$$

$$=a^2+3a+\frac{9}{4}$$

(9)  $(a-4)(a+4)$

$$=a^2-4^2$$

$$=a^2-16$$

(10)  $\left(x+\frac{1}{4}\right)\left(x-\frac{1}{4}\right)$

$$=x^2-\left(\frac{1}{4}\right)^2$$

$$=x^2-\frac{1}{16}$$

**4** 次の式を展開しなさい。

(1)  $(3a+2)^2$

$$=(3a)^2+2\times 2\times 3a+2^2$$

$$=9a^2+12a+4$$

(2)  $(5x+1)(5x+2)$

$$=(5x)^2+(1+2)\times 5x+1\times 2$$

$$=25x^2+15x+2$$

(3)  $(3y-1)(3y+5)$

$$=(3y)^2+(-1+5)\times 3y+(-1)\times 5$$

$$=9y^2+12y-5$$

(4)  $(3a-4)(3a+4)$

$$=(3a)^2-4^2$$

$$=9a^2-16$$

(5)  $(2x-3y)^2$

$$=(2x)^2-2\times 3y\times 2x+(3y)^2$$

$$=4x^2-12xy+9y^2$$

(6)  $(2a+5b)(2a-5b)$

$$=(2a)^2-(5b)^2$$

$$=4a^2-25b^2$$

**5** 次の式を展開しなさい。

(1)  $(a+b+2)^2$

$a+b=M$  とおくと,

$$\begin{aligned}(a+b+2)^2 &= (M+2)^2 \\ &= M^2 + 4M + 4\end{aligned}$$

$M$  を  $a+b$  に戻すと,

$$\begin{aligned}M^2 + 4M + 4 &= (a+b)^2 + 4(a+b) + 4 \\ &= a^2 + 2ab + b^2 + 4a + 4b + 4\end{aligned}$$

(2)  $(x+y-4)(x-y-4)$

$x-4=M$  とおくと,

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

$M$  を  $x-4$  に戻すと,

$$\begin{aligned}M^2 - y^2 &= (x-4)^2 - y^2 \\ &= x^2 - 8x + 16 - y^2\end{aligned}$$

(3)  $(x+2y+1)(x+2y-2)$

$x+2y=M$  とおくと,

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

$M$  を  $x+2y$  に戻すと,

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

**6** 次の計算をしなさい。

(1)  $(a-3)(a+2) + (a+2)^2$

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

(2)  $(x-3)(x+5) - (x-4)(x+4)$

$$\begin{aligned}&= x^2 + 2x - 15 - (x^2 - 16) \\ &= x^2 + 2x - 15 - x^2 + 16 \\ &= 2x + 1\end{aligned}$$

(3)  $(2x+y)(2x-y) - (x+2y)(x-2y)$

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

**7** 次の式を因数分解しなさい。

(1)  $4ax + 8ay$

$$= 4a(x+2y)$$

(2)  $3xy - 6x$

$$= 3x(y-2)$$

(3)  $2x^2y + 4xy^2$

$$= 2xy(x+2y)$$

(4)  $3a^2b - 2ab^2 + ab$

$$= ab(3a - 2b + 1)$$

8 次の式を因数分解しなさい。

$$(1) \quad x^2 + 7x + 10 \\ = (x+2)(x+5)$$

$$(3) \quad a^2 + a - 12 \\ = (a+4)(a-3)$$

$$(5) \quad x^2 - 15x + 56 \\ = (x-7)(x-8)$$

$$(7) \quad a^2 + 10a + 25 \\ = a^2 + 2 \times 5 \times a + 5^2 \\ = (a+5)^2$$

$$(9) \quad 16 - a^2 \\ = 4^2 - a^2 \\ = (4+a)(4-a)$$

$$(2) \quad x^2 + 10x + 21 \\ = (x+3)(x+7)$$

$$(4) \quad y^2 - 2y - 24 \\ = (y+4)(y-6)$$

$$(6) \quad x^2 + x - 72 \\ = (x+9)(x-8)$$

$$(8) \quad y^2 - 16y + 64 \\ = y^2 - 2 \times 8 \times y + 8^2 \\ = (y-8)^2$$

$$(10) \quad y^2 - \frac{36}{25} \\ = y^2 - \left(\frac{6}{5}\right)^2 \\ = \left(y + \frac{6}{5}\right)\left(y - \frac{6}{5}\right)$$

9 次の式を因数分解しなさい。

$$(1) \quad x^2y - 4y \\ = y(x^2 - 4) \\ = y(x+2)(x-2)$$

$$(3) \quad 5y^2 - 10y - 40 \\ = 5(y^2 - 2y - 8) \\ = 5(y+2)(y-4)$$

$$(5) \quad 9x^2 - 30x + 25 \\ = (3x)^2 - 2 \times 5 \times 3x + 5^2 \\ = (3x-5)^2$$

$$(2) \quad 3x^2 + 12x - 15 \\ = 3(x^2 + 4x - 5) \\ = 3(x+5)(x-1)$$

$$(4) \quad 200a^2 - 2b^2 \\ = 2(100a^2 - b^2) \\ = 2(10a+b)(10a-b)$$

$$(6) \quad 16x^2 + 48xy + 36y^2 \\ = 4(4x^2 + 12xy + 9y^2) \\ = 4\{(2x)^2 + 2 \times 3y \times 2x + (3y)^2\} \\ = 4(2x+3y)^2$$

10 次の式を因数分解しなさい。

$$(1) \quad (x+2)^2 + (x+2) - 56 \\ x+2=M \text{ とおくと,} \\ (x+2)^2 + (x+2) - 56 = M^2 + M - 56 \\ = (M+8)(M-7) \\ M \text{ を } x+2 \text{ に戻すと,} \\ (M+8)(M-7) = (x+2+8)(x+2-7) \\ = (x+10)(x-5)$$

$$(3) \quad 4(x-y)^2 - 12(x-y) + 9 \\ x-y=M \text{ とおくと,} \\ 4(x-y)^2 - 12(x-y) + 9 = 4M^2 - 12M + 9 \\ = (2M-3)^2 \\ M \text{ を } x-y \text{ に戻すと,} \\ (2M-3)^2 = \{2(x-y) - 3\}^2 \\ = (2x-2y-3)^2$$

$$(2) \quad (a+b)^2 - 16 \\ a+b=M \text{ とおくと,} \\ (a+b)^2 - 16 = M^2 - 16 \\ = (M+4)(M-4) \\ M \text{ を } a+b \text{ に戻すと,} \\ (M+4)(M-4) = (a+b+4)(a+b-4)$$

**11** 次の式を因数分解しなさい。

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

$$\begin{aligned}(2) \quad & ab-3a+2b-6 \\ & = a(b-3)+2(b-3) \\ & = (a+2)(b-3)\end{aligned}$$

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

**12** 次の式を，工夫して計算しなさい。

$$\begin{aligned}(1) \quad & 201^2 \\ & = (200+1)^2 \\ & = 200^2+2\times 1\times 200+1^2 \\ & = 40401\end{aligned}$$

$$\begin{aligned}(2) \quad & 55^2-45^2 \\ & = (55+45)\times (55-45) \\ & = 100\times 10 \\ & = 1000\end{aligned}$$

$$\begin{aligned}(3) \quad & 102\times 98 \\ & = (100+2)\times (100-2) \\ & = 100^2-2^2 \\ & = 9996\end{aligned}$$