

I. 次の式を展開しなさい。

①【岩手91】

$$(3a+2)^2 \\ = 9a^2 + 12a + 4$$

②【岡山91】

$$(2a-3)^2 \\ = 4a^2 - 12a + 9$$

③【栃木91】

$$(2x+1)(x+3) \\ = 2x^2 + 6x + x + 3 \\ = 2x^2 + 7x + 3$$

④【山口91】

$$(x+5)(x-2) \\ = x^2 + 3x - 10$$

⑤【秋田91】

$$(x-1)^2 - (x-3)(x+2) \\ = x^2 - 2x + 1 - (x^2 - x - 6) \\ = x^2 - 2x + 1 - x^2 + x + 6 \\ = -x + 7$$

⑥【山形91】

$$(x+3)(x-3) - x(x+2) \\ = x^2 - 9 - (x^2 + 2x) \\ = x^2 - 9 - x^2 - 2x \\ = -2x - 9$$

⑦【徳島91】

$$(3x+5y)(2x-3y) \\ = 6x^2 - 9xy + 10xy - 15y^2 \\ = 6x^2 + xy - 15y^2$$

⑧【愛媛91】

$$(x-3)(x+5) - (x+6)(x-6) \\ = x^2 + 2x - 15 - (x^2 - 36) \\ = x^2 + 2x - 15 - x^2 + 36 \\ = 2x + 21$$

⑨【埼玉91】

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

⑩【熊本91】

$$(m-1)^2 - (m+1)(m-3) \\ = m^2 - 2m + 1 - (m^2 - 2m - 3) \\ = m^2 - 2m + 1 - m^2 + 2m + 3 \\ = 4$$

⑪【鹿児島91】

$$(x-7)^2 - (x-5)(x+1) \\ = x^2 - 14x + 49 - (x^2 - 4x - 5) \\ = x^2 - 14x + 49 - x^2 + 4x + 5 \\ = -10x + 54$$

⑫【沖縄92】

$$(2x-1)(3x-2) \\ = 6x^2 - 4x - 3x + 2 \\ = 6x^2 - 7x + 2$$

⑬【秋田92】

$$(x+3)(x-1) - (x-2)^2 \\ = x^2 + 2x - 3 - (x^2 - 4x + 4) \\ = x^2 + 2x - 3 - x^2 + 4x - 4 \\ = 6x - 7$$

⑭【鹿児島92】

$$(x-3)^2 - (x+1)(x-5) \\ = x^2 - 6x + 9 - (x^2 - 4x - 5) \\ = x^2 - 6x + 9 - x^2 + 4x + 5 \\ = -2x + 14$$

⑮【愛媛92】

$$(a-2)^2 - (a+5)(a-5) \\ = a^2 - 4a + 4 - (a^2 - 25) \\ = a^2 - 4a + 4 - a^2 + 25 \\ = -4a + 29$$

⑯【広島92】

$$(x-2)(x+3) - (x-1)2 \\ = x^2 + x - 6 - (x^2 - 2x + 1) \\ = x^2 + x - 6 - x^2 + 2x - 1 \\ = 3x - 7$$

⑰【群馬92】

$$(x-6)^2 - (x-4)(x-9) \\ = x^2 - 12x + 36 - (x^2 - 13x + 36) \\ = x^2 - 12x + 36 - x^2 + 13x - 36 \\ = x$$

II. 次の式を展開しなさい。

①【鹿児島92】

$$(x-5)(x+9) + (x-2)^2 \\ = x^2 + 4x - 45 + x^2 - 4x + 4 \\ = 2x^2 - 41$$

②【愛媛92】

$$(a-1)(a+5) - a(a+2) \\ = a^2 + 4a - 5 - a^2 - 2a \\ = 2a - 5$$

③【栃木93】

$$(3x-1)^2 \\ = 9x^2 - 6x + 1$$

④【熊本92】

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

⑤【京都92】

$$(2x-y)^2 - (x+2y)(x-2y) \\ = 4x^2 - 4xy + y^2 - (x^2 - 4y^2) \\ = 4x^2 - 4xy + y^2 - x^2 + 4y^2 \\ = 3x^2 - 4xy + 5y^2$$

⑥【大分92】

$$(x+2y)^2 + (x+y)(x-y) \\ = x^2 + 4xy + 4y^2 + x^2 - y^2 \\ = 2x^2 + 4xy + 3y^2$$

⑦【佐賀92】

$$(5x-1)^2 + 2(5x-1) \\ = 25x^2 - 10x + 1 + 10x - 2 \\ = 25x^2 - 1$$

⑧【沖縄89】

$$(2x-3)(x+5) \\ = 2x^2 + 10x - 3x - 15 \\ = 2x^2 + 7x - 15$$

⑨【愛媛92】

$$(a-1)(a+5) - a(a+2) \\ = a^2 + 4a - 5 - a^2 - 2a \\ = 2a - 5$$

⑩【神奈川89】

$$(x+4)(x-4) - (x-1)^2 \\ = x^2 - 16 - (x^2 - 2x + 1) \\ = x^2 - 16 - x^2 + 2x - 1 \\ = 2x - 17$$

⑪【京都89】

$$(3x+y)^2 - (2x+y)(2x-y) \\ = 9x^2 + 6xy + y^2 - (4x^2 - y^2) \\ = 9x^2 + 6xy + y^2 - 4x^2 + y^2 \\ = 5x^2 + 6xy + 2y^2$$

⑫【秋田89】

$$(x+3)(x-1) - (x-2)^2 \\ = x^2 + 2x - 3 - (x^2 - 4x + 4) \\ = x^2 + 2x - 3 - x^2 + 4x - 4 \\ = 6x - 7$$

⑬【山形89】

$$(a-b)^2 + b(2a-b) \\ = a^2 - 2ab + b^2 + 2ab - b^2 \\ = a^2$$

⑭【佐賀89】

$$\begin{aligned} & (3a-1)^2 + (a+1)(a+2) \\ &= 9a^2 - 6a + 1 + a^2 + 3a + 2 \\ &= 10a^2 - 3a + 3 \end{aligned}$$

⑮【大分89】

$$\begin{aligned} & (3x+y)^2 + (x-2y)(x+4y) \\ &= 9x^2 + 6xy + y^2 \\ & \quad + x^2 + 2xy - 8y^2 \\ &= 10x^2 + 8xy - 7y^2 \end{aligned}$$

⑯【広島89】

$$\begin{aligned} & (x-2)(x+3) - (x-1)^2 \\ &= x^2 + x - 6 - (x^2 - 2x + 1) \\ &= x^2 + x - 6 - x^2 + 2x - 1 \\ &= 3x - 7 \end{aligned}$$

Ⅲ. 次の式を展開しなさい。

①【熊本89】

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

②【高専89】

$$\begin{aligned} & (x+3)(x-5) - (x-3)^2 \\ &= x^2 - 2x - 15 - (x^2 - 6x + 9) \\ &= x^2 - 2x - 15 - x^2 + 6x - 9 \\ &= 4x - 24 \end{aligned}$$

③【大分93】

$$\begin{aligned} & (2x+y)^2 + (x-y)(x+3y) \\ &= 4x^2 + 4xy + y^2 \\ & \quad + x^2 + 2xy - 3y^2 \\ &= 5x^2 + 6xy - 2y^2 \end{aligned}$$

⑨【佐賀91】

$$\begin{aligned} & (x-4y)(5x-y) + (3x+2y)(3x-2y) \\ &= 5x^2 - xy - 20xy + 4y^2 + 9x^2 - 4y^2 \\ &= 14x^2 - 21xy \end{aligned}$$

④【鹿児島93】

$$\begin{aligned} & (x+4)^2 - (3x+2)(x-2) \\ &= x^2 + 8x + 16 \\ & \quad - (3x^2 - 6x + 2x - 4) \\ &= x^2 + 8x + 16 \end{aligned}$$

$$\begin{aligned} & \quad - (3x^2 - 4x - 4) \\ &= x^2 + 8x - 16 - 3x^2 + 4x + 4 \\ &= -2x^2 + 12x + 20 \end{aligned}$$

⑤【佐賀93】

$$\begin{aligned} & (5x+1)^2 - (5x+2)(5x-2) \\ &= 25x^2 + 10x + 1 \\ & \quad - (25x^2 - 4) \\ &= 25x^2 + 10x + 1 \end{aligned}$$

$$- 25x^2 + 4$$

⑥【熊本93】

$$\begin{aligned} & (n-2)(n+2) - (n+1)(n+4) \\ &= n^2 - 4 - (n^2 + 5n + 4) \\ &= n^2 - 4 - n^2 - 5n - 4 \\ &= -5n - 8 \end{aligned}$$

⑦【高知92】

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

$$= x^2 - 10x + 25 - y^2$$

⑧【香川92】

$$\begin{aligned} & (a-b-1)(a-b+2) \\ &= (a-b)^2 - (a-b) + 2 \\ &= (a-b)^2 + (a-b) - 2 \\ &= a^2 - 2ab + b^2 + a - b - 2 \end{aligned}$$

⑩【愛媛89】

$$\begin{aligned} & (3x+2)(3x-2) - (x+4)(x-1) \\ &= (3x)^2 - 4 - (x^2 + 3x - 4) \\ &= 9x^2 - 4 - x^2 - 3x + 4 \\ &= 8x^2 - 3x \end{aligned}$$

⑪【岩倉高校93】

$$\begin{aligned} & 3(2a+3b)^2 - (4a-5b)^2 \\ &= 3((2a)^2 + 2 \times 3b \times 2a + (3b)^2) - ((4a)^2 - 2 \times 5b \times 4a + (5b)^2) \\ &= 3(4a^2 + 12ab + 9b^2) - (16a^2 - 40ab + 25b^2) \\ &= 12a^2 + 36ab + 27b^2 - 16a^2 + 40ab - 25b^2 \\ &= -4a^2 + 76ab + 2b^2 \end{aligned}$$

Ⅳ. 次の式を展開しなさい。(問題にはありませんが、やってみてください)

①【九州国際大学附属高校93】

$$\begin{aligned} & 3a(2a-7) - 2(3a^2-5a+1) \\ &= 6a^2 - 21a - 6a^2 + 10a - 2 \\ &= -11a - 2 \end{aligned}$$

②【和洋国府台女子高校93】

$$\begin{aligned} & (2x-y)^2 - (4a-5b)^2 \\ &= (2x)^2 - 2 \times y \times 2x + y^2 - ((4a)^2 - 2 \times 5b \times 4a + (5b)^2) \\ &= 4x^2 - 4xy + y^2 - (16a^2 - 40ab + 25b^2) \\ &= 4x^2 - 4xy + y^2 - 16a^2 + 40ab - 25b^2 \end{aligned}$$

③【明星高校89】

$$\begin{aligned} & (2x-3y)^2 - (2x-3y)(2x+3y) + (2x+3y)^2 \\ & \quad 2x = X, \quad 3y = Y \text{ とおく} \\ & (\text{与式}) = (X-Y)^2 - (X-Y)(X+Y) + (X+Y)^2 \\ & \quad = X^2 - 2XY + Y^2 - (X^2 - Y^2) + X^2 + 2XY + Y^2 \\ & \quad = X^2 - 2XY + Y^2 - X^2 + Y^2 + X^2 + 2XY + Y^2 \\ & \quad = X^2 + 3Y^2 \\ & \quad = (2x)^2 + 3(3y)^2 \\ & \quad = 4x^2 + 27y^2 \end{aligned}$$

④【高知93】

$$\begin{aligned} & 2x(3x-y) - 3y(x+y) \\ &= 6x^2 - 2xy - 3xy - 3y^2 \\ &= 6x^2 - 5xy - 3y^2 \end{aligned}$$