



## 계산력 연습

중 2 과정

## [영역] 2.문자와 식

### 2-3-1. 곱셈공식(1)\_다항식과 다항식의 곱셈, 완전제곱식, 합과 차의 공식



◇ 「콘텐츠산업 진흥법」 제33조에 의한 표시

1) 제작연월일 : 2016-02-16

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3) 이 콘텐츠는 「콘텐츠산업 진흥법」에 따라 최초 제작일부터 5년간 보호됩니다.

◇ 「콘텐츠산업 진흥법」 외에도 「저작권법」에 의하여 보호되는 콘텐츠의 경우, 그 콘텐츠의 전부 또는 일부를 무단으로 복제하거나 전송하는 것은 콘텐츠산업 진흥법 외에도 저작권법에 의한 법적 책임을 질 수 있습니다.

## 계산시 참고사항

### 1. 다항식과 다항식의 곱셈

다항식과 다항식의 곱셈은 분배법칙을 이용하여 전개한 후 동류항끼리 모아서 간단히 한다.

$$(a+b)(c+d) = \frac{ac}{①} + \frac{ad}{②} + \frac{bc}{③} + \frac{bd}{④}$$

### 2. 완전제곱식

(1) 합의 제곱:  $(a+b)^2 = (a+b)(a+b) = a^2 + \underline{ab} + \underline{ba} + b^2 = a^2 + \underline{2ab} + b^2$

(2) 차의 제곱:  $(a-b)^2 = (a-b)(a-b) = a^2 - \underline{ab} - \underline{ba} + b^2 = a^2 - \underline{2ab} + b^2$

### 3. 합과 차의 공식

(1)  $(a-b)(a+b) = a^2 + \underline{ab} - \underline{ab} - b^2 = a^2 - b^2$

💬 (다항식) × (다항식) 계산시

● 동류항끼리 모아서 간단히 한 후 한 문자에 대하여 내림차순으로 식을 정리한다.

💬 서로 같은 제곱식

●  $(-a-b)^2 = (a+b)^2$

●  $(-a+b)^2 = (a-b)^2$

●  $(-a-b)(-a+b) = a^2 - b^2$

●  $(-a+b)(a+b) = b^2 - a^2$



## 다항식과 다항식의 곱셈

▣ 다음 식을 전개하여라.

1.  $(a+b)(c-3d)$

2.  $(a-2b)(c-5)$

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

4.  $(x+y)(3z-2)$

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

6.  $(a+2)(b+4)$

7.  $(x-1)(y+3)$

8.  $(x+1)(y+2)$

9.  $(2a-3)(b+5)$

10.  $(-3a+2)(2b+3c)$

11.  $(2a-b)(2a-3)$

12.  $(a-b)(c-d)$

13.  $(3a+b)(c-2d)$

14.  $(2x+3y)(3x-4y)$

15.  $(a-2)(b+7)$



16.  $(2a-b)(c+2d)$

17.  $(x+3y)(z-2y)$

18.  $(-3x+4y)(x-2y+1)$

19.  $(4a-3b)(a+5b+c)$

20.  $(x+4y)(3x-y+3)$

21.  $(5a-1)(3a+b-2)$

22.  $(x+2y)(x-5y-9)$

23.  $(2x-3y+8)(4x+5y)$



완전제곱식

■ 다음  $\square$  안에 알맞은 양수를 써넣어라.

24.  $(a+\square)^2 = a^2 + 2a + \square$

25.  $(x-\square)^2 = x^2 - 4x + \square$

26.  $(2x+\square)^2 = 4x^2 + 4x + \square$

27.  $(3x-\square y)^2 = 9x^2 - 12xy + \square y^2$

28.  $(x-\square)^2 = x^2 - \square x + 81$

29.  $(x-\square y)^2 = x^2 - \square xy + 16y^2$

30.  $(-2x+\square)^2 = 4x^2 - \square x + 25$

31.  $(4a-\square b)^2 = 16a^2 - \square ab + 9b^2$

■ 다음 식을 전개하여라.

32.  $(a+2)^2$

33.  $(x+1)^2$

34.  $(x-2)^2$

35.  $(y-4)^2$

36.  $(a-7)^2$

37.  $(x-9)^2$

38.  $(2a-3)^2$

39.  $(y+3)^2$

40.  $(a+6)^2$

41.  $(x+5)^2$

42.  $(2a+1)^2$

43.  $(4x-1)^2$

44.  $(3x+2)^2$

45.  $(a+3b)^2$

46.  $(x+y)^2$

47.  $(x+7)^2$

48.  $(x-5)^2$

49.  $(-x+2)^2$

50.  $(-y+5)^2$

51.  $(2x+y)^2$

52.  $\left(x+\frac{1}{4}y\right)^2$

53.  $\left(-x-\frac{1}{2}\right)^2$

54.  $\left(x+\frac{1}{2}\right)^2$

55.  $(-a-9b)^2$

56.  $\left(x-\frac{1}{5}y\right)^2$

57.  $\left(\frac{1}{2}a-3\right)^2$

58.  $(x+4y)^2$

59.  $(x+5y)^2$

60.  $(-x-3)^2$

61.  $(x-3)^2$

62.  $(a-5b)^2$

63.  $\left(x-\frac{1}{6}y\right)^2$

64.  $\left(\frac{3}{2}x-\frac{1}{3}y\right)^2$

65.  $(-5a+b)^2$

66.  $\left(-\frac{1}{3}x+\frac{1}{4}y\right)^2$



## 합과 차의 공식

▣ 다음 식을 전개하여라.

67.  $(-a-2b)^2$

68.  $(3x+1)^2$

69.  $(4x-3y)^2$

70.  $(3x+4)^2$

71.  $(6a-7)^2$

72.  $(2a+3b)^2$

73.  $(-4x-5y)^2$

74.  $\left(5x+\frac{1}{2}y\right)^2$

75.  $\left(\frac{1}{3}x+y\right)^2$

76.  $\left(\frac{1}{2}x+3y\right)^2$

77.  $(-4a+3b)^2$

78.  $(-2y-5)^2$

79.  $\left(\frac{1}{4}a+1\right)^2$

80.  $(5a-1)^2$

81.  $(a+2)(a-2)$

82.  $(x+1)(x-1)$

83.  $(y+2)(y-2)$

84.  $(a+8)(a-8)$

85.  $(x+5y)(x-5y)$

86.  $(a+7)(-a+7)$

87.  $(-a+5)(a+5)$

88.  $(1+2a)(1-2a)$

89.  $(a+7)(a-7)$

90.  $(4+x)(4-x)$

91.  $(-x+6)(-x-6)$

92.  $(9-a)(-9-a)$

93.  $(x+3y)(x-3y)$

94.  $(3a+5b)(-3a+5b)$

95.  $(7x+y)(7x-y)$

96.  $(-x+6)(-x-6)$

97.  $(x+2y)(x-2y)$

98.  $(a+3b)(a-3b)$

99.  $(x+5y)(-x+5y)$

100.  $(2x+y)(2x-y)$

101.  $(2a+5b)(2a-5b)$

102.  $(-3a+1)(-3a-1)$

103.  $(-9+x)(9+x)$

104.  $(-7x+y)(-7x-y)$

105.  $(2a^2+7)(2a^2-7)$

106.  $(2a+3b)(2a-3b)$

107.  $(3a+7)(-3a+7)$

108.  $(-x+5)(-x-5)$

109.  $(x+2y)(-x+2y)$

110.  $(-3x+4y)(-3x-4y)$

111.  $\left(x+\frac{1}{2}\right)\left(x-\frac{1}{2}\right)$

112.  $\left(-x+\frac{1}{3}\right)\left(-x-\frac{1}{3}\right)$

113.  $\left(\frac{1}{3}a-\frac{1}{2}b\right)\left(\frac{1}{3}a+\frac{1}{2}b\right)$

114.  $\left(\frac{1}{3}x+2\right)\left(\frac{1}{3}x-2\right)$

115.  $\left(a+\frac{1}{5}\right)\left(a-\frac{1}{5}\right)$

116.  $\left(-\frac{1}{2}x+3y\right)\left(-\frac{1}{2}x-3y\right)$

117.  $\left(\frac{1}{2}x+6y\right)\left(\frac{1}{2}x-6y\right)$

118.  $\left(\frac{2}{3}x+\frac{3}{4}y\right)\left(\frac{2}{3}x-\frac{3}{4}y\right)$

119.  $\left(\frac{3}{2}a + \frac{1}{4}\right)\left(\frac{3}{2}a - \frac{1}{4}\right)$

129.  $\left(a + \frac{1}{2}\right)\left(a - \frac{1}{2}\right)\left(a^2 + \frac{1}{4}\right)$

120.  $\left(\frac{1}{2} + x\right)\left(-\frac{1}{2} + x\right)$

130.  $(2a + 3b)(2a - 3b)(4a^2 + 9b^2)$

121.  $\left(-\frac{1}{3}x + 2y\right)\left(\frac{1}{3}x + 2y\right)$

122.  $\left(-4x + \frac{1}{6}y\right)\left(-4x - \frac{1}{6}y\right)$

123.  $\left(-\frac{1}{5}a + \frac{1}{8}b\right)\left(\frac{1}{5}a + \frac{1}{8}b\right)$

124.  $\left(-\frac{2}{5}x + \frac{1}{3}y\right)\left(-\frac{2}{5}x - \frac{1}{3}y\right)$

125.  $(x+2)(x-2)(x^2+4)$

126.  $(a-2)(a+2)(a^2+4)$

127.  $(x-3)(x+3)(x^2+9)$

128.  $(x-y)(x+y)(x^2+y^2)$

## 정답 및 해설



1)  $ac - 3ad + bc - 3bd$

2)  $ac - 5a - 2bc + 10b$

3)  $ab - 2a - 5b + 10$

4)  $3xz - 2x + 3yz - 2y$

5)  $2xy + x + 6y + 3$

6)  $ab + 4a + 2b + 8$

7)  $xy + 3x - y - 3$

8)  $xy + 2x + y + 2$

9)  $2ab + 10a - 3b - 15$

10)  $-6ab - 9ac + 4b + 6c$

11)  $4a^2 - 6a - 2ab + 3b$

12)  $ac - ad - bc + bd$

13)  $3ac - 6ad + bc - 2bd$

14)  $6x^2 + xy - 12y^2$

15)  $ab + 7a - 2b - 14$

16)  $2ac + 4ad - bc - 2bd$

17)  $xz - 2xy + 3yz - 6y^2$

18)  $-3x^2 + 10xy - 8y^2 - 3x + 4y$

19)  $4a^2 + 17ab - 15b^2 + 4ac - 3bc$

20)  $3x^2 + 11xy + 3x - 4y^2 + 12y$

$$\begin{aligned} \Rightarrow (x+4y)(3x-y+3) \\ = 3x^2 - xy + 3x + 12xy - 4y^2 + 12y \\ = 3x^2 + 11xy + 3x - 4y^2 + 12y \end{aligned}$$

21)  $15a^2 + 5ab - 13a - b + 2$

$$\begin{aligned} \Rightarrow (5a-1)(3a+b-2) &= 15a^2 + 5ab - 10a - 3a - b + 2 \\ &= 15a^2 + 5ab - 13a - b + 2 \end{aligned}$$

22)  $x^2 - 3xy - 10y^2 - 9x - 18y$

$$\begin{aligned} \Rightarrow (x+2y)(x-5y-9) \\ = x^2 - 5xy - 9x + 2xy - 10y^2 - 18y \\ = x^2 - 3xy - 10y^2 - 9x - 18y \end{aligned}$$

23)  $8x^2 - 2xy - 15y^2 + 32x + 40y$

$$\begin{aligned} \Rightarrow (2x-3y+8)(4x+5y) \\ = 8x^2 + 10xy - 12xy - 15y^2 + 32x + 40y \\ = 8x^2 - 2xy - 15y^2 + 32x + 40y \end{aligned}$$

24) 1, 1

25) 2, 4

26) 1, 1

27) 2, 4

28) 9, 18

29) 4, 8

30) 5, 20

31) 3, 24

32)  $a^2 + 4a + 4$

33)  $x^2 + 2x + 1$

34)  $x^2 - 4x + 4$

35)  $y^2 - 8y + 16$

36)  $a^2 - 14a + 49$

37)  $x^2 - 18x + 81$

38)  $4a^2 - 12a + 9$

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

39)  $y^2 + 6y + 9$

40)  $a^2 + 12a + 36$

41)  $x^2 + 10x + 25$

42)  $4a^2 + 4a + 1$

$$\Rightarrow (2a+1)^2 = (2a)^2 + 2 \times 2a \times 1 + 1^2 = 4a^2 + 4a + 1$$

43)  $16x^2 - 8x + 1$

$$\Rightarrow (4x-1)^2 = (4x)^2 - 2 \times 4x \times 1 + 1^2 = 16x^2 - 8x + 1$$

44)  $9x^2 + 12x + 4$

$$\Rightarrow (3x+2)^2 = (3x)^2 + 2 \times 3x \times 2 + 2^2 = 9x^2 + 12x + 4$$

45)  $a^2 + 6ab + 9b^2$

46)  $x^2 + 2xy + y^2$

47)  $x^2 + 14x + 49$

48)  $x^2 - 10x + 25$

49)  $x^2 - 4x + 4$

$$\Rightarrow (-x+2)^2 = (x-2)^2 = x^2 - 2 \times x \times 2 + 2^2 \\ = x^2 - 4x + 4$$

50)  $y^2 - 10y + 25$

$$\Rightarrow (-y+5)^2 = (y-5)^2 = y^2 - 2 \times y \times 5 + 5^2 \\ = y^2 - 10y + 25$$

51)  $4x^2 + 4xy + y^2$

52)  $x^2 + \frac{1}{2}xy + \frac{1}{16}y^2$

53)  $x^2 + x + \frac{1}{4}$

54)  $x^2 + x + \frac{1}{4}$

55)  $a^2 + 18ab + 81b^2$

56)  $x^2 - \frac{2}{5}xy + \frac{1}{25}y^2$

57)  $\frac{1}{4}a^2 - 3a + 9$

$$\Rightarrow \left(\frac{1}{2}a-3\right)^2 = \left(\frac{1}{2}a\right)^2 - 2 \times \frac{1}{2}a \times 3 + 3^2 \\ = \frac{1}{4}a^2 - 3a + 9$$

58)  $x^2 + 8xy + 16y^2$

59)  $x^2 + 10xy + 25y^2$

$$\Rightarrow (x+5y)^2 = x^2 + 2 \times x \times 5y + (5y)^2 = x^2 + 10xy + 25y^2$$

60)  $x^2 + 6x + 9$

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

61)  $x^2 - 6x + 9$

62)  $a^2 - 10ab + 25b^2$

63)  $x^2 - \frac{1}{3}xy + \frac{1}{36}y^2$

$$\Rightarrow \left(x - \frac{1}{6}y\right)^2 = x^2 - 2 \times x \times \frac{1}{6}y + \left(\frac{1}{6}y\right)^2 \\ = x^2 - \frac{1}{3}xy + \frac{1}{36}y^2$$

64)  $\frac{9}{4}x^2 - xy + \frac{1}{9}y^2$

$$\Rightarrow \left(\frac{3}{2}x - \frac{1}{3}y\right)^2 = \left(\frac{3}{2}x\right)^2 - 2 \times \frac{3}{2}x \times \frac{1}{3}y + \left(\frac{1}{3}y\right)^2 \\ = \frac{9}{4}x^2 - xy + \frac{1}{9}y^2$$

65)  $25a^2 - 10ab + b^2$

66)  $\frac{1}{9}x^2 - \frac{1}{6}xy + \frac{1}{16}y^2$

$$\Rightarrow \left(-\frac{1}{3}x + \frac{1}{4}y\right)^2 \\ = \left(-\frac{1}{3}x\right)^2 + 2 \times \left(-\frac{1}{3}x\right) \times \frac{1}{4}y + \left(\frac{1}{4}y\right)^2 \\ = \frac{1}{9}x^2 - \frac{1}{6}xy + \frac{1}{16}y^2$$

67)  $a^2 + 4ab + 4b^2$

$$\Rightarrow (-a-2b)^2 \\ = (-a)^2 + 2 \times (-a) \times (-2b) + (-2b)^2 \\ = a^2 + 4ab + 4b^2$$

68)  $9x^2 + 6x + 1$

69)  $16x^2 - 24xy + 9y^2$

70)  $9x^2 + 24x + 16$

$$\Rightarrow (3x+4)^2 = (3x)^2 + 2 \times 3x \times 4 + 4^2 = 9x^2 + 24x + 16$$

71)  $36a^2 - 84a + 49$

$$\Rightarrow (6a-7)^2 = (6a)^2 - 2 \times 6a \times 7 + 7^2 = 36a^2 - 84a + 49$$

72)  $4a^2 + 12ab + 9b^2$

73)  $16x^2 + 40xy + 25y^2$

74)  $25x^2 + 5xy + \frac{1}{4}y^2$

$$\Rightarrow \left(5x + \frac{1}{2}y\right)^2 = (5x)^2 + 2 \times 5x \times \frac{1}{2}y + \left(\frac{1}{2}y\right)^2 \\ = 25x^2 + 5xy + \frac{1}{4}y^2$$

75)  $\frac{1}{9}x^2 + \frac{2}{3}xy + y^2$

$$\Rightarrow \left(\frac{1}{3}x + y\right)^2 = \left(\frac{1}{3}x\right)^2 + 2 \times \frac{1}{3}x \times y + y^2 \\ = \frac{1}{9}x^2 + \frac{2}{3}xy + y^2$$

76)  $\frac{1}{4}x^2 + 3xy + 9y^2$

77)  $16a^2 - 24ab + 9b^2$

$$\Rightarrow$$



$$\begin{aligned} (-4a+3b)^2 &= (-4a)^2 + 2 \times (-4a) \times 3b + (3b)^2 \\ &= 16a^2 - 24ab + 9b^2 \end{aligned}$$

$$78) 4y^2 + 20y + 25$$

$$\begin{aligned} \Rightarrow (-2y-5)^2 &= (2y+5)^2 \\ &= (2y)^2 + 2 \times 2y \times 5 + 5^2 \\ &= 4y^2 + 20y + 25 \end{aligned}$$

$$79) \frac{1}{16}a^2 + \frac{1}{2}a + 1$$

$$80) 25a^2 - 10a + 1$$

$$81) a^2 - 4$$

$$82) x^2 - 1$$

$$83) y^2 - 4$$

$$84) a^2 - 64$$

$$85) x^2 - 25y^2$$

$$86) 49 - a^2$$

$$87) 25 - a^2$$

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

$$88) 1 - 4a^2$$

$$89) a^2 - 49$$

$$90) 16 - x^2$$

$$91) x^2 - 36$$

$$92) a^2 - 81$$

$$\begin{aligned} \Rightarrow (9-a)(-9-a) &= (-a+9)(-a-9) \\ &= (-a)^2 - 9^2 = a^2 - 81 \end{aligned}$$

$$93) x^2 - 9y^2$$

$$94) -9a^2 + 25b^2$$

$$95) 49x^2 - y^2$$

$$\Rightarrow (7x+y)(7x-y) = (7x)^2 - y^2 = 49x^2 - y^2$$

$$96) x^2 - 36$$

$$97) x^2 - 4y^2$$

$$98) a^2 - 9b^2$$

$$99) 25y^2 - x^2$$

$$100) 4x^2 - y^2$$

$$101) 4a^2 - 25b^2$$

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

$$102) 9a^2 - 1$$

$$103) x^2 - 81$$

$$104) 49x^2 - y^2$$

$$105) 4a^4 - 49$$

$$106) 4a^2 - 9b^2$$

$$107) 49 - 9a^2$$

$$\begin{aligned} \Rightarrow (3a+7)(-3a+7) &= (7+3a)(7-3a) \\ &= 7^2 - (3a)^2 = 49 - 9a^2 \end{aligned}$$

$$108) x^2 - 25$$

$$109) 4y^2 - x^2$$

$$110) 9x^2 - 16y^2$$

$$\Rightarrow (-3x+4y)(-3x-4y) = (-3x)^2 - (4y)^2 = 9x^2 - 16y^2$$

$$111) x^2 - \frac{1}{4}$$

$$112) x^2 - \frac{1}{9}$$

$$113) \frac{1}{9}a^2 - \frac{1}{4}b^2$$

$$114) \frac{1}{9}x^2 - 4$$

$$115) a^2 - \frac{1}{25}$$

$$116) \frac{1}{4}x^2 - 9y^2$$

$$117) \frac{1}{4}x^2 - 36y^2$$

$$\Rightarrow \left(\frac{1}{2}x+6y\right)\left(\frac{1}{2}x-6y\right) = \left(\frac{1}{2}x\right)^2 - (6y)^2 = \frac{1}{4}x^2 - 36y^2$$

$$118) \frac{4}{9}x^2 - \frac{9}{16}y^2$$

$$\begin{aligned} \Rightarrow \left(\frac{2}{3}x+\frac{3}{4}y\right)\left(\frac{2}{3}x-\frac{3}{4}y\right) &= \left(\frac{2}{3}x\right)^2 - \left(\frac{3}{4}y\right)^2 \\ &= \frac{4}{9}x^2 - \frac{9}{16}y^2 \end{aligned}$$

$$119) \frac{9}{4}a^2 - \frac{1}{16}$$

$$120) x^2 - \frac{1}{4}$$

$$121) 4y^2 - \frac{1}{9}x^2$$

$$122) 16x^2 - \frac{1}{36}y^2$$

$$\begin{aligned} \Rightarrow \left(-4x + \frac{1}{6}y\right)\left(-4x - \frac{1}{6}y\right) &= (-4x)^2 - \left(\frac{1}{6}y\right)^2 \\ &= 16x^2 - \frac{1}{36}y^2 \end{aligned}$$

$$123) \frac{1}{64}b^2 - \frac{1}{25}a^2$$

$$\begin{aligned} \Rightarrow \left(-\frac{1}{5}a + \frac{1}{8}b\right)\left(\frac{1}{5}a + \frac{1}{8}b\right) \\ &= \left(\frac{1}{8}b - \frac{1}{5}a\right)\left(\frac{1}{8}b + \frac{1}{5}a\right) = \left(\frac{1}{8}b\right)^2 - \left(\frac{1}{5}a\right)^2 \\ &= \frac{1}{64}b^2 - \frac{1}{25}a^2 \end{aligned}$$

$$124) \frac{4}{25}x^2 - \frac{1}{9}y^2$$

$$\begin{aligned} \Rightarrow \left(-\frac{2}{5}x + \frac{1}{3}y\right)\left(-\frac{2}{5}x - \frac{1}{3}y\right) \\ &= \left(-\frac{2}{5}x\right)^2 - \left(\frac{1}{3}y\right)^2 = \frac{4}{25}x^2 - \frac{1}{9}y^2 \end{aligned}$$

$$125) x^4 - 16$$

$$\Rightarrow (\text{주어진 식}) = (x^2 - 4)(x^2 + 4) = x^4 - 16$$

$$126) a^4 - 16$$

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

$$127) x^4 - 81$$

$$\Rightarrow (x-3)(x+3)(x^2+9) = (x^2-9)(x^2+9) = x^4 - 81$$

$$128) x^4 - y^4$$

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

$$129) a^4 - \frac{1}{16}$$

$$\begin{aligned} \Rightarrow \left(a + \frac{1}{2}\right)\left(a - \frac{1}{2}\right)\left(a^2 + \frac{1}{4}\right) \\ &= \left(a^2 - \frac{1}{4}\right)\left(a^2 + \frac{1}{4}\right) = a^4 - \frac{1}{16} \end{aligned}$$

$$130) 16a^4 - 81b^4$$

$$\begin{aligned} \Rightarrow (2a+3b)(2a-3b)(4a^2+9b^2) \\ &= (4a^2-9b^2)(4a^2+9b^2) = 16a^4 - 81b^4 \end{aligned}$$