Algebraic Expressions and Equations: Exercise Supplement*

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Abstract

This module is from Elementary Algebra by Denny Burzynski and Wade Ellis, Jr. Operations with algebraic expressions and numerical evaluations are introduced in this chapter. Coefficients are described rather than merely defined. Special binomial products have both literal and symbolic explanations and since they occur so frequently in mathematics, we have been careful to help the student remember them. In each example problem, the student is "talked" through the symbolic form. This module provides an exercise supplement for the chapter "Algebraic Expressions and Equations".

1 Exercise Supplement

1.1 Algebraic Expressions (here[1])

For the following problems, write the number of terms that appear, then write the terms.

Exercise 1 *(Solution on p. 9.)*

$4x^2 + 7x + 12$

Exercise 2

$14y^6$

Exercise 3 *(Solution on p. 9.)*

$c + 8$

Exercise 4

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List, if any should appear, the common factors for the following problems.

Exercise 5 *(Solution on p. 9.)*

$a^2 + 4a^2 + 6a^2$

Exercise 6

$9y^4 - 18y^4$

Exercise 7 *(Solution on p. 9.)*

$12x^2y^3 + 36y^3$

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[1]"Algebraic Expressions and Equations: Algebraic Expressions" <http://cnx.org/content/m18875/latest/>

Exercise 8
$6(a+4)+12(a+4)$

Exercise 9 *(Solution on p. 9.)*
$4(a+2b)+6(a+2b)$

Exercise 10
$17x^2y(z+4)+51y(z+4)$

Exercise 11 *(Solution on p. 9.)*
$6a^2b^3c+5x^2y$

For the following problems, answer the question of how many.

Exercise 12
x's in $9x$?

Exercise 13 *(Solution on p. 9.)*
$(a+b)$'s in $12(a+b)$?

Exercise 14
a^4's in $6a^4$?

Exercise 15 *(Solution on p. 9.)*
c^3's in $2a^2bc^3$?

Exercise 16
$(2x+3y)^2$'s in $5(x+2y)(2x+3y)^3$?

For the following problems, a term will be given followed by a group of its factors. List the coefficient of the given group of factors.

Exercise 17 *(Solution on p. 9.)*
$8z$, z

Exercise 18
$16a^3b^2c^4$, c^4

Exercise 19 *(Solution on p. 9.)*
$7y(y+3)$, $7y$

Exercise 20
$(-5)a^5b^5c^5$, bc

1.2 Equations (here[2])

For the following problems, observe the equations and write the relationship being expressed.

Exercise 21 *(Solution on p. 9.)*
$a=3b$

Exercise 22
$r=4t+11$

Exercise 23 *(Solution on p. 9.)*
$f=\frac{1}{2}m^2+6g$

Exercise 24
$x=5y^3+2y+6$

Exercise 25 *(Solution on p. 9.)*
$P^2=ka^3$

[2] "Algebraic Expressions and Equations: Equations" <http://cnx.org/content/m21850/latest/>

Use numerical evaluation to evaluate the equations for the following problems.

Exercise 26

$C = 2\pi r$. Find C if π is approximated by

3.14 and $r = 6$.

Exercise 27 *(Solution on p. 9.)*

$I = \frac{E}{R}$. Find I if $E = 20$ and $R = 2$.

Exercise 28

$I = prt$. Find I if $p = 1000$, $r = 0.06$, and $t = 3$.

Exercise 29 *(Solution on p. 9.)*

$E = mc^2$. Find E if $m = 120$ and $c = 186,000$.

Exercise 30

$z = \frac{x-u}{s}$. Find z if $x = 42$, $u = 30$, and

$s = 12$.

Exercise 31 *(Solution on p. 9.)*

$R = \frac{24C}{P(n+1)}$. Find R if $C = 35$, $P = 300$, and

$n = 19$.

1.3 Classification of Expressions and Equations (here[3])

For the following problems, classify each of the polynomials as a monomial, binomial, or trinomial. State the degree of each polynomial and write the numerical coefficient of each term.

Exercise 32

$2a + 9$

Exercise 33 *(Solution on p. 9.)*

$4y^3 + 3y + 1$

Exercise 34

$10a^4$

Exercise 35 *(Solution on p. 9.)*

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Exercise 36

$4xy + 2yz^2 + 6x$

Exercise 37 *(Solution on p. 9.)*

$9ab^2c^2 + 10a^3b^2c^5$

Exercise 38

$\left(2xy^3\right)^0, \quad xy^3 \neq 0$

Exercise 39 *(Solution on p. 9.)*

Why is the expression $\frac{4x}{3x-7}$ not a polynomial?

Exercise 40

Why is the expression $5a^{3/4}$ not a polynomial?

For the following problems, classify each of the equations by degree. If the term linear, quadratic, or cubic applies, use it.

[3] "Algebraic Expressions and Equations: Classification of Expressions and Equations" <http://cnx.org/content/m21848/latest/>

Exercise 41 *(Solution on p. 9.)*
$3y + 2x = 1$

Exercise 42
$4a^2 - 5a + 8 = 0$

Exercise 43 *(Solution on p. 9.)*
$y - x - z + 4w = 21$

Exercise 44
$5x^2 + 2x^2 - 3x + 1 = 19$

Exercise 45 *(Solution on p. 9.)*
$\left(6x^3\right)^0 + 5x^2 = 7$

1.4 Combining Polynomials Using Addition and Subtraction (here[4]) - Special Binomial Products (here[5])

Simplify the algebraic expressions for the following problems.

Exercise 46
$4a^2b + 8a^2b - a^2b$

Exercise 47 *(Solution on p. 9.)*
$21x^2y^3 + 3xy + x^2y^3 + 6$

Exercise 48
$7(x + 1) + 2x - 6$

Exercise 49 *(Solution on p. 9.)*
$2\left(3y^2 + 4y + 4\right) + 5y^2 + 3(10y + 2)$

Exercise 50
$5\left[3x + 7\left(2x^2 + 3x + 2\right) + 5\right] - 10x^2 + 4\left(3x^2 + x\right)$

Exercise 51 *(Solution on p. 10.)*
$8\{3\left[4y^3 + y + 2\right] + 6\left(y^3 + 2y^2\right)\} - 24y^3 - 10y^2 - 3$

Exercise 52
$4a^2bc^3 + 5abc^3 + 9abc^3 + 7a^2bc^2$

Exercise 53 *(Solution on p. 10.)*
$x(2x + 5) + 3x^2 - 3x + 3$

Exercise 54
$4k\left(3k^2 + 2k + 6\right) + k\left(5k^2 + k\right) + 16$

Exercise 55 *(Solution on p. 10.)*
$2\{5\left[6\left(b + 2a + c^2\right)\right]\}$

Exercise 56
$9x^2y(3xy + 4x) - 7x^3y^2 - 30x^3y + 5y\left(x^3y + 2x\right)$

Exercise 57 *(Solution on p. 10.)*
$3m\left[5 + 2m\left(m + 6m^2\right)\right] + m\left(m^2 + 4m + 1\right)$

Exercise 58
$2r[4(r + 5) - 2r - 10] + 6r(r + 2)$

[4] "Algebraic Expressions and Equations: Combining Polynomials Using Addition and Subtraction" <http://cnx.org/content/m21854/latest/>

[5] "Algebraic Expressions and Equations: Special Binomial Products" <http://cnx.org/content/m21858/latest/>

Exercise 59 *(Solution on p. 10.)*

$abc\left(3abc+c+b\right)+6a\left(2bc+bc^{2}\right)$

Exercise 60

$s^{10}\left(2s^{5}+3s^{4}+4s^{3}+5s^{2}+2s+2\right)-s^{15}+2s^{14}+3s\left(s^{12}+4s^{11}\right)-s^{10}$

Exercise 61 *(Solution on p. 10.)*

$6a^{4}\left(a^{2}+5\right)$

Exercise 62

$2x^{2}y^{4}\left(3x^{2}y+4xy+3y\right)$

Exercise 63 *(Solution on p. 10.)*

$5m^{6}\left(2m^{7}+3m^{4}+m^{2}+m+1\right)$

Exercise 64

$a^{3}b^{3}c^{4}\left(4a+2b+3c+ab+ac+bc^{2}\right)$

Exercise 65 *(Solution on p. 10.)*

$\left(x+2\right)\left(x+3\right)$

Exercise 66

$\left(y+4\right)\left(y+5\right)$

Exercise 67 *(Solution on p. 10.)*

$\left(a+1\right)\left(a+3\right)$

Exercise 68

$\left(3x+4\right)\left(2x+6\right)$

Exercise 69 *(Solution on p. 10.)*

$4xy-10xy$

Exercise 70

$5ab^{2}-3\left(2ab^{2}+4\right)$

Exercise 71 *(Solution on p. 10.)*

$7x^{4}-15x^{4}$

Exercise 72

$5x^{2}+2x-3-7x^{2}-3x-4-2x^{2}-11$

Exercise 73 *(Solution on p. 10.)*

$4\left(x-8\right)$

Exercise 74

$7x\left(x^{2}-x+3\right)$

Exercise 75 *(Solution on p. 10.)*

$-3a\left(5a-6\right)$

Exercise 76

$4x^{2}y^{2}\left(2x-3y-5\right)-16x^{3}y^{2}-3x^{2}y^{3}$

Exercise 77 *(Solution on p. 10.)*

$-5y\left(y^{2}-3y-6\right)-2y\left(3y^{2}+7\right)+\left(-2\right)\left(-5\right)$

Exercise 78

$-\left[-\left(-4\right)\right]$

Exercise 79 *(Solution on p. 10.)*

$-\left[-\left(-\left\{-\left[-\left(5\right)\right]\right\}\right)\right]$

Exercise 80

$x^{2}+3x-4-4x^{2}-5x-9+2x^{2}-6$

Exercise 81 *(Solution on p. 10.)*
$4a^2b - 3b^2 - 5b^2 - 8q^2b - 10a^2b - b^2$

Exercise 82
$2x^2 - x - \left(3x^2 - 4x - 5\right)$

Exercise 83 *(Solution on p. 10.)*
$3\left(a - 1\right) - 4\left(a + 6\right)$

Exercise 84
$-6\left(a + 2\right) - 7\left(a - 4\right) + 6\left(a - 1\right)$

Exercise 85 *(Solution on p. 10.)*
Add $-3x + 4$ to $5x - 8$.

Exercise 86
Add $4\left(x^2 - 2x - 3\right)$ to $-6\left(x^2 - 5\right)$.

Exercise 87 *(Solution on p. 10.)*
Subtract 3 times $(2x - 1)$ from 8 times $(x - 4)$.

Exercise 88
$\left(x + 4\right)\left(x - 6\right)$

Exercise 89 *(Solution on p. 10.)*
$\left(x - 3\right)\left(x - 8\right)$

Exercise 90
$\left(2a - 5\right)\left(5a - 1\right)$

Exercise 91 *(Solution on p. 10.)*
$\left(8b + 2c\right)\left(2b - c\right)$

Exercise 92
$\left(a - 3\right)^2$

Exercise 93 *(Solution on p. 10.)*
$\left(3 - a\right)^2$

Exercise 94
$\left(x - y\right)^2$

Exercise 95 *(Solution on p. 10.)*
$\left(6x - 4\right)^2$

Exercise 96
$\left(3a - 5b\right)^2$

Exercise 97 *(Solution on p. 10.)*
$\left(-x - y\right)^2$

Exercise 98
$\left(k + 6\right)\left(k - 6\right)$

Exercise 99 *(Solution on p. 10.)*
$\left(m + 1\right)\left(m - 1\right)$

Exercise 100
$\left(a - 2\right)\left(a + 2\right)$

Exercise 101 *(Solution on p. 11.)*
$\left(3c + 10\right)\left(3c - 10\right)$

Exercise 102
$\left(4a + 3b\right)\left(4a - 3b\right)$

Exercise 103 *(Solution on p. 11.)*
$(5+2b)(5-2b)$

Exercise 104
$(2y+5)(4y+5)$

Exercise 105 *(Solution on p. 11.)*
$(y+3a)(2y+a)$

Exercise 106
$(6+a)(6-3a)$

Exercise 107 *(Solution on p. 11.)*
$\left(x^2+2\right)\left(x^2-3\right)$

Exercise 108
$6(a-3)(a+8)$

Exercise 109 *(Solution on p. 11.)*
$8(2y-4)(3y+8)$

Exercise 110
$x(x-7)(x+4)$

Exercise 111 *(Solution on p. 11.)*
$m^2n(m+n)(m+2n)$

Exercise 112
$(b+2)\left(b^2-2b+3\right)$

Exercise 113 *(Solution on p. 11.)*
$3p\left(p^2+5p+4\right)\left(p^2+2p+7\right)$

Exercise 114
$(a+6)^2$

Exercise 115 *(Solution on p. 11.)*
$(x-2)^2$

Exercise 116
$(2x-3)^2$

Exercise 117 *(Solution on p. 11.)*
$\left(x^2+y\right)^2$

Exercise 118
$(2m-5n)^2$

Exercise 119 *(Solution on p. 11.)*
$\left(3x^2y^3-4x^4y\right)^2$

Exercise 120
$(a-2)^4$

1.5 Terminology Associated with Equations (here[6])

Find the domain of the equations for the following problems.

Exercise 121 *(Solution on p. 11.)*

$y = 8x + 7$

Exercise 122

$y = 5x^2 - 2x + 6$

Exercise 123 *(Solution on p. 11.)*

$y = \frac{4}{x-2}$

Exercise 124

$m = \frac{-2x}{h}$

Exercise 125 *(Solution on p. 11.)*

$z = \frac{4x+5}{y+10}$

[6] "Algebraic Expressions and Equations: Terminology Associated with Equations" <http://cnx.org/content/m21849/latest/>

Solutions to Exercises in this Module

Solution to Exercise (p. 1)
three: $4x^2, 7x, 12$
Solution to Exercise (p. 1)
two: $c, 8$
Solution to Exercise (p. 1)
a^2
Solution to Exercise (p. 1)
$12y^3$
Solution to Exercise (p. 2)
$2(a+2b)$
Solution to Exercise (p. 2)
no common factors
Solution to Exercise (p. 2)
12
Solution to Exercise (p. 2)
$2a^2b$
Solution to Exercise (p. 2)
8
Solution to Exercise (p. 2)
$(y+3)$
Solution to Exercise (p. 2)
The value of a is equal to three time the value of b.
Solution to Exercise (p. 2)
The value of f is equal to six times g more then one half time the value of m squared.
Solution to Exercise (p. 2)
The value of P squared is equal to the value of a cubed times k.
Solution to Exercise (p. 3)
10
Solution to Exercise (p. 3)
4.1515×10^{12}
Solution to Exercise (p. 3)
$\frac{7}{50}$ or 0.14
Solution to Exercise (p. 3)
trinomial; cubic; 4, 3, 1
Solution to Exercise (p. 3)
monomial; zero; 147
Solution to Exercise (p. 3)
binomial; tenth; 9, 10
Solution to Exercise (p. 3)
. . . because there is a variable in the denominator
Solution to Exercise (p. 3)
linear
Solution to Exercise (p. 4)
linear
Solution to Exercise (p. 4)
quadratic
Solution to Exercise (p. 4)
$22x^2y^3 + 3xy + 6$

Solution to Exercise (p. 4)
$11y^2 + 38y + 14$
Solution to Exercise (p. 4)
$120y^3 + 86y^2 + 24y + 45$
Solution to Exercise (p. 4)
$5x^2 + 2x + 3$
Solution to Exercise (p. 4)
$60c^2 + 120a + 60b$
Solution to Exercise (p. 4)
$36m^4 + 7m^3 + 4m^2 + 16m$
Solution to Exercise (p. 4)
$3a^2b^2c^2 + 7abc^2 + ab^2c + 12abc$
Solution to Exercise (p. 5)
$6a^6 + 30a^4$
Solution to Exercise (p. 5)
$10m^{13} + 15m^{10} + 5m^8 + 5m^7 + 5m^6$
Solution to Exercise (p. 5)
$x^2 + 5x + 6$
Solution to Exercise (p. 5)
$a^2 + 4a + 3$
Solution to Exercise (p. 5)
$-6xy$
Solution to Exercise (p. 5)
$-8x^4$
Solution to Exercise (p. 5)
$4x - 32$
Solution to Exercise (p. 5)
$-15a^2 + 18a$
Solution to Exercise (p. 5)
$-11y^3 + 15y^2 + 16y + 10$
Solution to Exercise (p. 5)
-5
Solution to Exercise (p. 5)
$-6a^2b - 8q^2b - 9b^2$
Solution to Exercise (p. 6)
$-a - 27$
Solution to Exercise (p. 6)
$2x - 4$
Solution to Exercise (p. 6)
$2x - 29$
Solution to Exercise (p. 6)
$x^2 - 11x + 24$
Solution to Exercise (p. 6)
$16b^2 - 4bc - 2c^2$
Solution to Exercise (p. 6)
$a^2 - 6a + 9$
Solution to Exercise (p. 6)
$36x^2 - 48x + 16$
Solution to Exercise (p. 6)
$x^2 + 2xy + y^2$

Solution to Exercise (p. 6)
$m^2 - 1$
Solution to Exercise (p. 6)
$9c^2 - 100$
Solution to Exercise (p. 6)
$25 - 4b^2$
Solution to Exercise (p. 7)
$2y^2 + 7ay + 3a^2$
Solution to Exercise (p. 7)
$x^4 - x^2 - 6$
Solution to Exercise (p. 7)
$48y^2 + 32y - 256$
Solution to Exercise (p. 7)
$m^4n + 3m^3n^2 + 2m^2n^3$
Solution to Exercise (p. 7)
$3p^5 + 21p^4 + 63p^3 + 129p^2 + 84p$
Solution to Exercise (p. 7)
$x^2 - 4x + 4$
Solution to Exercise (p. 7)
$x^4 + 2x^2y + y^2$
Solution to Exercise (p. 7)
$9x^4y^6 - 24x^6y^4 + 16x^8y^2$
Solution to Exercise (p. 8)
all real numbers
Solution to Exercise (p. 8)
all real numbers except 2
Solution to Exercise (p. 8)
x can equal any real number; y can equal any number except -10