

## Section 5-1: Adding and Subtracting Algebraic Expressions

### Monomials and Polynomials

1. 080710a, P.I. A.A.13  
The sum of  $8x^2 - x + 4$  and  $x - 5$  is  
[A]  $8x^2 - 1$  [B]  $8x^2 - 2x + 9$   
[C]  $8x^2 + 9$  [D]  $8x^2 - 2x - 1$
2. 069904a, P.I. A.A.13  
The sum of  $3x^2 + x + 8$  and  $x^2 - 9$  can be expressed as  
[A]  $4x^2 + x - 1$  [B]  $3x^4 + x - 1$   
[C]  $4x^2 + x - 17$  [D]  $4x^4 + x - 1$
3. 010108a, P.I. A.A.13  
The sum of  $3x^2 + 4x - 2$  and  $x^2 - 5x + 3$  is  
[A]  $4x^2 + x + 1$  [B]  $4x^2 - x - 1$   
[C]  $4x^2 + x - 1$  [D]  $4x^2 - x + 1$
4. 080423a, P.I. A.A.13  
The expression  $(3x^2 + 2xy + 7) - (6x^2 - 4xy + 3)$  is equivalent to  
[A]  $-3x^2 + 6xy + 4$  [B]  $3x^2 - 6xy - 4$   
[C]  $3x^2 - 2xy + 4$  [D]  $-3x^2 - 2xy + 4$
5. 010707a, P.I. A.A.13  
The expression  $(2x^2 + 6x + 5) - (6x^2 + 3x + 5)$  is equivalent to  
[A]  $-4x^2 - 3x + 10$  [B]  $-4x^2 + 3x$   
[C]  $4x^2 + 3x - 10$  [D]  $4x^2 - 3x$
6. 060511a, P.I. A.A.13  
The expression  $(x^2 - 5x - 2) - (-6x^2 - 7x - 3)$  is equivalent to  
[A]  $7x^2 + 2x - 5$  [B]  $7x^2 + 2x + 1$   
[C]  $7x^2 - 2x + 1$  [D]  $7x^2 - 12x - 5$
7. 060019a, P.I. A.A.13  
If  $2x^2 - 4x + 6$  is subtracted from  $5x^2 + 8x - 2$ , the difference is  
[A]  $-3x^2 - 12x + 8$  [B]  $3x^2 + 4x + 4$   
[C]  $3x^2 + 12x - 8$  [D]  $-3x^2 + 4x + 4$
8. 010019a, P.I. A.A.13  
When  $3a^2 - 2a + 5$  is subtracted from  $a^2 + a - 1$ , the result is  
[A]  $-2a^2 + 3a + 6$  [B]  $2a^2 - 3a + 6$   
[C]  $2a^2 - 3a - 6$  [D]  $-2a^2 + 3a - 6$
9. 080020a, P.I. A.A.13  
When  $3x^2 - 2x + 1$  is subtracted from  $2x^2 + 7x + 5$ , the result will be  
[A]  $-x^2 + 9x + 4$  [B]  $-x^2 + 5x + 6$   
[C]  $x^2 - 9x - 4$  [D]  $x^2 + 5x + 6$
10. 080209a, P.I. A.A.13  
When  $-2x^2 + 4x + 2$  is subtracted from  $x^2 + 6x - 4$ , the result is  
[A]  $2x^2 - 2x - 6$  [B]  $-x^2 + 10x - 2$   
[C]  $-3x^2 - 2x + 6$  [D]  $3x^2 + 2x - 6$
11. 010429a, P.I. A.A.13  
If  $2x^2 - x + 6$  is subtracted from  $x^2 + 3x - 2$ , the result is  
[A]  $x^2 - 4x + 8$  [B]  $x^2 + 2x - 8$   
[C]  $-x^2 + 2x - 8$  [D]  $-x^2 + 4x - 8$

12. 010523a, P.I. A.A.13  
When  $3x^2 - 8x$  is subtracted from  $2x^2 + 3x$ , the difference is  
[A]  $-x^2 + 11x$  [B]  $-x^2 - 5x$   
[C]  $x^2 - 5x$  [D]  $-x^2 - 11x$
13. 010619a, P.I. A.A.13  
When  $3a^2 - 7a + 6$  is subtracted from  $4a^2 - 3a + 4$ , the result is  
[A]  $7a^2 - 10a + 10$  [B]  $a^2 + 4a - 2$   
[C]  $a^2 - 10a - 2$  [D]  $-a^2 - 4a + 2$
14. 080123a, P.I. A.A.13  
Subtract  $5x^2 - 7x - 6$  from  $9x^2 + 3x - 4$ .

## Section 5-2: Multiplying Powers that Have the Same Base

### Finding the Product of Powers

15. 060312a, P.I. A.A.12  
The expression  $3^2 \cdot 3^3 \cdot 3^4$  is equivalent to  
[A]  $27^9$  [B]  $27^{24}$  [C]  $3^9$  [D]  $3^{24}$
16. 080001a, P.I. A.A.12  
The product of  $2x^3$  and  $6x^5$  is  
[A]  $10x^8$  [B]  $10x^{15}$   
[C]  $12x^8$  [D]  $12x^{15}$
17. 010205a, P.I. A.A.12  
The product of  $3x^2y$  and  $-4xy^3$  is  
[A]  $12x^3y^4$  [B]  $12x^2y^3$   
[C]  $-12x^3y^4$  [D]  $-12x^2y^3$
18. 010306a, P.I. A.A.12  
The product of  $3x^5$  and  $2x^4$  is  
[A]  $5x^9$  [B]  $6x^{20}$  [C]  $5x^{20}$  [D]  $6x^9$

19. 089906a, P.I. A.A.12  
The product of  $4x^2y$  and  $2xy^3$  is  
[A]  $8x^2y^3$  [B]  $8x^3y^4$   
[C]  $8x^3y^3$  [D]  $8x^2y^4$
20. 080605a, P.I. A.A.12  
What is the product of  $10x^4y^2$  and  $3xy^3$ ?  
[A]  $30x^5y^6$  [B]  $30x^4y^6$   
[C]  $30x^5y^5$  [D]  $30x^4y^5$

### Finding a Power of a Power

21. 010728a, P.I. A.A.12  
The expression  $(6x^3y^6)^2$  is equivalent to  
[A]  $12x^6y^{12}$  [B]  $36x^5y^8$   
[C]  $6x^6y^{12}$  [D]  $36x^6y^{12}$
22. 010506a, P.I. A.A.12  
The product of  $(5ab)$  and  $(-2a^2b)^3$  is  
[A]  $-40a^7b^4$  [B]  $-30a^7b^4$   
[C]  $-40a^6b^4$  [D]  $-30a^6b^4$

## Section 5-3: Multiplying by a Monomial

### Multiplying a Polynomial by a Monomial

23. 010819a, P.I. A.A.13  
What is the product of  $2r^2 - 5$  and  $3r$ ?  
[A]  $6r^3 - 15r$  [B]  $6r^2 - 15r$   
[C]  $6r^2 - 15$  [D]  $6r^3 - 5$

## Section 5-4: Multiplying Polynomials

24. 060708a, P.I. A.A.13  
What is the product of  $(c+8)$  and  $(c-5)$ ?
- [A]  $c^2 - 40$  [B]  $c^2 + 3c - 40$   
[C]  $c^2 + 13c - 40$  [D]  $c^2 - 3c - 40$
25. 060015a, P.I. A.A.13  
The expression  $(x-6)^2$  is equivalent to
- [A]  $x^2 - 12x + 36$  [B]  $x^2 + 36$   
[C]  $x^2 + 12x + 36$  [D]  $x^2 - 36$
26. 010430a, P.I. A.A.13  
The expression  $(a^2 + b^2)^2$  is equivalent to
- [A]  $a^4 + 4a^2b^2 + b^4$  [B]  $a^4 + b^4$   
[C]  $a^4 + a^2b^2 + b^4$  [D]  $a^4 + 2a^2b^2 + b^4$

## Section 5-6: Powers with Zero and Negative Exponents

### The Negative Integral Exponent

27. 060020a, P.I. A2.A.8  
What is the value of  $3^{-2}$ ?
- [A]  $-\frac{1}{9}$  [B] -9 [C] 9 [D]  $\frac{1}{9}$
28. 080522a, P.I. A2.A.8  
What is the value of  $2^{-3}$ ?
- [A] -6 [B]  $\frac{1}{6}$  [C]  $\frac{1}{8}$  [D] -8
29. 010413a, P.I. A.A.12  
The expression  $8^{-4} \cdot 8^6$  is equivalent to
- [A]  $8^{-2}$  [B]  $8^{-24}$  [C]  $8^{10}$  [D]  $8^2$

30. 080730a, P.I. A2.A.8  
The expression  $(\frac{3}{4})^2 \cdot (\frac{1}{4})^{-2}$  is equivalent to
- [A]  $\frac{9}{16}$  [B] 9 [C] 3 [D]  $\frac{9}{256}$
31. 010723a, P.I. A2.A.8  
What is the value of  $3^0 + 3^{-2}$ ?
- [A] 0 [B] 6 [C]  $1\frac{1}{9}$  [D]  $\frac{1}{9}$
32. 010511a, P.I. A2.A.9  
Which expression is equivalent to  $x^{-4}$ ?
- [A] 0 [B]  $\frac{1}{x^4}$  [C]  $-4x$  [D]  $x^4$
33. 080119a, P.I. A2.A.9  
Which expression is equivalent to  $x^{-1} \cdot y^2$ ?
- [A]  $xy^2$  [B]  $\frac{y^2}{x}$  [C]  $\frac{x}{y^2}$  [D]  $xy^{-2}$

## Section 5-7: Scientific Notation

### Writing Numbers in Scientific Notation

34. 060720a, P.I. 7.N.5  
According to the 2000 census, the population of New York State was approximately 18,900,000. How is this number expressed in scientific notation?
- [A]  $18.9 \times 10^6$  [B]  $189 \times 10^5$   
[C]  $1890 \times 10^4$  [D]  $1.89 \times 10^7$

35. 080715a, P.I. 7.N.5  
The video of the movie *Star Wars* earned \$193,500,000 in rental fees during its first year. Expressed in scientific notation, the number of dollars earned is
- [A]  $1.935 \times 10^8$  [B]  $193.5 \times 10^6$   
[C]  $1935 \times 10^8$  [D]  $1.935 \times 10^6$
36. 010111a, P.I. 7.N.5  
The distance from Earth to the Sun is approximately 93 million miles. A scientist would write that number as
- [A]  $93 \times 10^7$  [B]  $9.3 \times 10^6$   
[C]  $93 \times 10^{10}$  [D]  $9.3 \times 10^7$
37. 010206a, P.I. 7.N.5  
The approximate number of seconds in a year is 32,000,000. When this number is written in scientific notation, the numerical value of the exponent is
- [A] 7 [B] -7 [C] 8 [D] 6
38. 080607a, P.I. 7.N.5  
A micron is a unit used to measure specimens viewed with a microscope. One micron is equivalent to 0.00003937 inch. How is this number expressed in scientific notation?
- [A]  $3.937 \times 10^5$  [B]  $3937 \times 10^8$   
[C]  $3937 \times 10^{-8}$  [D]  $3.937 \times 10^{-5}$
39. 080210a, P.I. 7.N.5  
If 0.0347 is written by a scientist in the form  $3.47 \times 10^n$ , the value of  $n$  is
- [A] -2 [B] -3 [C] 2 [D] 3
40. 060504a, P.I. 7.N.5  
The mass of an orchid seed is approximately 0.0000035 gram. Written in scientific notation, that mass is equivalent to  $3.5 \times 10^n$ . What is the value of  $n$ ?
- [A] -7 [B] -6 [C] -5 [D] -8
41. 010609a, P.I. 7.N.5  
The size of a certain type of molecule is 0.00009078 inch. If this number is expressed as  $9.078 \times 10^n$ , what is the value of  $n$ ?
- [A] -5 [B] 8 [C] 5 [D] -8
42. 089904a, P.I. 7.N.7  
Which expression is equivalent to  $6.02 \times 10^{23}$ ?
- [A]  $602 \times 10^{21}$  [B]  $60.2 \times 10^{21}$   
[C]  $0.602 \times 10^{21}$  [D]  $6020 \times 10^{21}$
43. 080511a, P.I. 7.N.5  
The expression  $0.62 \times 10^3$  is equivalent to
- [A]  $6.2 \times 10^4$  [B] 0.062  
[C]  $6.2 \times 10^2$  [D] 62,000
- Changing to Ordinary Decimal Notation
44. 080004a, P.I. 7.N.6  
Expressed in decimal notation,  $4.726 \times 10^{-3}$  is
- [A] 0.04726 [B] 4,726  
[C] 472.6 [D] 0.004726
45. 060301a, P.I. 7.N.6  
The number  $8.375 \times 10^{-3}$  is equivalent to
- [A] 0.08375 [B] 0.0008375  
[C] 8,375 [D] 0.008375

46. 080424a, P.I. 7.N.6

The number  $1.56 \times 10^{-2}$  is equivalent to

- [A] 156 [B] 0.156  
[C] 0.00156 [D] 0.0156

47. 060628a

What is the sum of  $6 \times 10^3$  and  $3 \times 10^2$ ?

- [A]  $9 \times 10^6$  [B]  $6.3 \times 10^3$   
[C]  $18 \times 10^5$  [D]  $9 \times 10^5$

48. 060207a, P.I. A.N.4

If  $3.85 \times 10^6$  is divided by  $385 \times 10^4$ , the result is

- [A]  $3.85 \times 10^{10}$  [B] 0.01  
[C]  $3.85 \times 10^4$  [D] 1

49. 010319a, P.I. A.N.4

What is the value of  $\frac{6.3 \times 10^8}{3 \times 10^4}$  in scientific notation?

- [A]  $2.1 \times 10^4$  [B]  $2.1 \times 10^{-2}$   
[C]  $2.1 \times 10^{-4}$  [D]  $2.1 \times 10^2$

50. fall0725ia, P.I. A.N.4

What is the quotient of  $8.05 \times 10^6$  and  $3.5 \times 10^2$ ?

- [A]  $2.3 \times 10^{12}$  [B]  $2.3 \times 10^3$   
[C]  $2.3 \times 10^4$  [D]  $2.3 \times 10^8$

51. 010018a, P.I. A.N.4

If the number of molecules in 1 mole of a substance is  $6.02 \times 10^{23}$ , then the number of molecules in 100 moles is

- [A]  $6.02 \times 10^{25}$  [B]  $6.02 \times 10^{22}$   
[C]  $6.02 \times 10^{24}$  [D]  $6.02 \times 10^{21}$

52. 060429a, P.I. A.N.4

If the mass of a proton is  $1.67 \times 10^{-24}$  gram, what is the mass of 1,000 protons?

- [A]  $1.67 \times 10^{-27}$  [B]  $1.67 \times 10^{-23}$   
[C]  $1.67 \times 10^{-21}$  [D]  $1.67 \times 10^{-22}$

53. 060029a, P.I. A.N.4

The distance from Earth to the imaginary planet Med is  $1.7 \times 10^7$  miles. If a spaceship is capable of traveling 1,420 miles per hour, how many days will it take the spaceship to reach the planet Med? Round your answer to the nearest day.

54. 060308b, P.I. A.N.4

Two objects are  $2.4 \times 10^{20}$  centimeters apart. A message from one object travels to the other at a rate of  $1.2 \times 10^5$  centimeters per second. How many seconds does it take the message to travel from one object to the other?

- [A]  $1.2 \times 10^{15}$  [B]  $2.0 \times 10^{15}$   
[C]  $2.88 \times 10^{25}$  [D]  $2.0 \times 10^4$

## Section 5-8: Dividing by a Monomial

### Dividing a Monomial by a Monomial

55. 080405a, P.I. A.A.12

When  $-9x^5$  is divided by  $-3x^3$ ,  $x \neq 0$ , the quotient is

- [A]  $-3x^2$  [B]  $-27x^{15}$   
[C]  $3x^2$  [D]  $27x^8$

56. 060005a, P.I. A.A.12

The quotient of  $-\frac{15x^8}{5x^2}$ ,  $x \neq 0$ , is

- [A]  $-10x^6$  [B]  $-10x^4$   
[C]  $-3x^4$  [D]  $-3x^6$

57. 060707a, P.I. A.A.12

The expression  $\frac{-32x^8}{4x^2}$ ,  $x \neq 0$ , is equivalent to

- [A]  $8x^4$  [B]  $8x^6$   
[C]  $-8x^4$  [D]  $-8x^6$

58. 010817a, P.I. A.A.12

The expression  $\frac{4x^2y^3}{2xy^4}$  is equivalent to

- [A]  $\frac{2x}{y}$  [B]  $-2xy$  [C]  $2xy$  [D]  $\frac{2y}{x}$

59. 080526a, P.I. A.A.12

The expression  $\frac{5x^6y^2}{x^8y}$  is equivalent to

- [A]  $\frac{5y^3}{x^{14}}$  [B]  $5x^2y$   
[C]  $\frac{5y}{x^2}$  [D]  $5x^{14}y^3$

60. fall0703ia, P.I. A.A.12

Which expression represents  $\frac{(2x^3)(8x^5)}{4x^6}$  in simplest form?

- [A]  $x^2$  [B]  $x^9$  [C]  $4x^9$  [D]  $4x^2$

61. 060518a, P.I. A.A.12

If  $x \neq 0$ , then  $\frac{(x^2)^3}{x^5} \cdot 1000$  is equivalent to

- [A]  $1000x$  [B]  $1000 + x$   
[C]  $0$  [D]  $1000$

62. 080415b, P.I. A.A.12

The expression  $\frac{(b^{2n+1})^3}{b^n \cdot b^{4n+3}}$  is equivalent to

- [A]  $b^n$  [B]  $b^{-3n}$  [C]  $\frac{b^n}{2}$  [D]  $b^{-3n+1}$

### Dividing a Polynomial by a Monomial

63. 060506a, P.I. A.A.14

When  $3x^2 - 6x$  is divided by  $3x$ , the result is

- [A]  $x - 2$  [B]  $x + 2$   
[C]  $2x$  [D]  $-2x$

64. 010724a, P.I. A.A.14

The expression  $(50x^3 - 60x^2 + 10x) \div 10x$  is equivalent to

- [A]  $5x^3 - 6x^2 + x$  [B]  $5x^2 - 60x^2 + 10x$   
[C]  $5x^2 - 6x$  [D]  $5x^2 - 6x + 1$

- |  |               |
|--|---------------|
| [1] <u>A</u>   | [23] <u>A</u> |
| [2] <u>A</u>   | [24] <u>B</u> |
| [3] <u>D</u>   | [25] <u>A</u> |
| [4] <u>A</u>   | [26] <u>D</u> |
| [5] <u>B</u>   | [27] <u>D</u> |
| [6] <u>B</u>   | [28] <u>C</u> |
| [7] <u>C</u>   | [29] <u>D</u> |
| [8] <u>D</u>   | [30] <u>B</u> |
| [9] <u>A</u>   | [31] <u>C</u> |
| [10] <u>D</u>  | [32] <u>B</u> |
| [11] <u>D</u>  | [33] <u>B</u> |
| [12] <u>A</u>  | [34] <u>D</u> |
| [13] <u>B</u>  | [35] <u>A</u> |
| [2] $4x^2 + 10x + 2$ , and appropriate work is shown, such as $(9x^2 + 3x - 4) - (5x^2 - 7x - 6)$ .  | [36] <u>D</u> |
| [1] The setup is correct, but the distribution of the negative sign is incorrect.  | [37] <u>A</u> |
| or [1] $14x^2 - 4x - 10$ , but appropriate work is shown.  | [38] <u>D</u> |
| or [1] $4x^2 + 10x + 2$ , but no work is shown.  | [39] <u>A</u> |
| [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure. | [40] <u>B</u> |
| [14] _____   | [41] <u>A</u> |
| [15] <u>C</u>  | [42] <u>A</u> |
| [16] <u>C</u>  | [43] <u>C</u> |
| [17] <u>C</u>  | [44] <u>D</u> |
| [18] <u>D</u>  | [45] <u>D</u> |
| [19] <u>B</u>  | [46] <u>D</u> |
| [20] <u>C</u>  | [47] <u>B</u> |
| [21] <u>D</u>  | [48] <u>D</u> |
| [22] <u>A</u>  | [49] <u>A</u> |
|  | [50] <u>C</u> |

[51] A

[52] C

[3] 499 days and appropriate work is shown,

such as  $\frac{17,000,000 \text{ miles}}{1420 \frac{\text{miles}}{\text{hour}} \times 24 \frac{\text{hours}}{\text{day}}}$ .

[2] Appropriate work is shown, but one computational error is made or the student incorrectly calculates  $1.7 \times 10^7$  by one decimal place.

or [2] Appropriate work is shown, but the answer is rounded incorrectly or is not rounded.

[1]  $1.7 \times 10^7 = 17,000,000$  is shown.

or [1]  $\frac{1.7 \times 10^7}{1420} = 11,971.831$  hours is shown.

or [1] 34,080 miles in 1 day is shown.

or [1] 499 but no work is shown.

[0] The student does not understand scientific notation.

or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an

[53] obviously incorrect procedure.

[54] B

[55] C

[56] D

[57] D

[58] A

[59] C

[60] D

[61] A

[62] A

[63] A

[64] D