Name: Answer Key Date: Block:

Algebra – WS Product Properties of Exponents

Rules $a^m \cdot a^n = a^{m+n}$

$(a^m)^n = a^{m \cdot n}$

Simplify.

1. $2^2 \cdot 2^3$ → $2^5 = 32$
2. $5^3 \cdot 5^3$ → $5^6 = 15625$
3. $n^6 \cdot n^2$ → n^8
4. $x^2 \cdot x^{-3} \cdot x^4$ → $x^2 \cdot x^1$ → x^3

Simplify.

6. $(x^2)^5 = x^{10}$
7. $(y^4)^8 = y^{32}$
8. $(p^3)^3 = p^9$
9. $(3^{-2})^2 = 3^{-4} = \frac{1}{3^4} = \frac{1}{81}$
10. $(a^{-3})^4 \cdot (a^7)^2$ → $a^{-12} \cdot a^{14}$ → a^2
11. $xy \cdot (x^2)^3 \cdot (y^3)^4$ → $xy \cdot x^6 \cdot y^{12}$ → $x^7 \cdot y^{13}$
12. $(2t)^5 = 2^5 t^5 = 32t^5$
13. $(6k)^2 = 6^2 k^2 = 36k^2$
14. $(r^2 s)^7 = r^{14} s^7$
15. $(-2x^5)^3$ → $(-2)^3 \cdot x^{15}$ → $-8x^{15}$
16. $-(2x^5)^3 = -(2)^3 x^{15} = -8x^{15}$
17. $(a^2b^2)^5 \cdot (a^{-5})^2$ → $a^{10}b^{10} \cdot a^{-10}$ → $a^0 \cdot b^{10}$ → b^{10}

Simplify.

18. $3^3 \cdot 2^3 \cdot 3$ → $3^4 \cdot 2^3$ → $81 \cdot 8 = 648$
19. $6 \cdot 6^2 \cdot 6^3 \cdot 6^2$ → $6^8 = 1679616$
20. $a^5 \cdot a^0 \cdot a^{-5}$ → $a^0 \cdot a^0$ → $1 \cdot 1$ → 1
21. $x^7 \cdot x^{-6} \cdot y^{-3}$ → $x^1 \cdot y^{-3}$ → $\frac{x}{y^3}$

Simplify.

23. $(2^3)^3 = 2^9 = 512$
24. $(3^6)^0 = 1$
25. $(x^2)^{-1} = x^{-2} = \frac{1}{x^2}$
26. $(b^4)^6 \cdot b$ → $b^{24} \cdot b$ → b^{25}
27. $b \cdot (a^3)^4 \cdot (b^{-2})^3$ → $b \cdot a^{12} \cdot b^{-6}$ → $a^{12} \cdot b^{-5}$ → $\frac{a^{12}}{b^5}$
28. $(x^4)^2 \cdot (x^{-1})^{-4}$ → $x^8 \cdot x^4$ → x^{12}

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Find the missing exponent in each expression.

35. $a^{\blacksquare}a^4 = a^{10}$ — 6

36. $(a^{\blacksquare})^4 = a^{12}$ — 3

37. $(a^2b^{\blacksquare})^4 = a^8b^{12}$ — 3

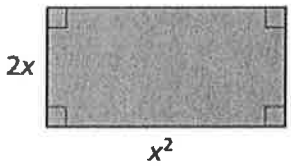
38. $(a^3b^6)^{\blacksquare} = \frac{1}{a^9b^{18}}$ — −3

39. $(b^2)^{-4} = \frac{1}{b^{\blacksquare}}$ — 8

40. $a^{\blacksquare} \cdot a^6 = a^6$ — 0

Geometry Write an expression for the area of each figure.

41.

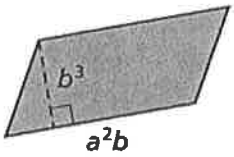


$A = b \cdot h$

$= x^2 \cdot 2x$

$A = 2x^3$

42.

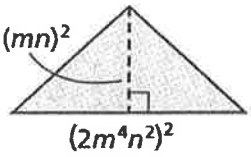


$A = \text{base} \cdot \text{height}$

$A = a^2b \cdot b^3$

$A = a^2b^4$

43.



$A = \frac{1}{2}\,\text{base} \cdot \text{height}$

$A = \frac{1}{2}(2m^4n^2)^2 \cdot (mn)^2$

$= \frac{1}{2} \cdot 4m^8n^4 \cdot m^2n^2$

$A = 2m^{10}n^6$

Simplify, if possible.

44. x^6y^5

45. $(2x^2)^2 \cdot (3x^3)^3$

$4x^4 \cdot 27x^9 = 108x^{13}$

46. $x^2 \cdot y^{-3} \cdot x^{-2} \cdot y^{-3} = y^{-6} = \frac{1}{y^6}$

47. $(5x^2)(5x^2)^2$

$5x^2 \cdot 5^2x^4$

5^3x^6

$125x^6$

48. $-(x^2)^4(-x^2)^4$

$-x^8 \cdot x^8$

$= -x^{16}$

49. $a^3 \cdot a^0 \cdot 3a^3$

$= 3a^6$

50. $(ab)^3(ab)^{-2}$

$a^3b^3a^{-2}b^{-2}$

a^1b^1

51. $10^2 \cdot 10^{-4} \cdot 10^5$

$10^2 \cdot 10^1$

10^3

1000

52. $(x^2y^2)^2(x^2y)^{-2}$

$x^4y^4x^{-4}y^{-2}$

y^2