1. $(2)^3$
$(2)(2)(2)$
$(4)(2)$
8

3. $(-3)^3$
$(-3)(-3)(-3)$
$(9)(-3)$
-27

5. -3^3
$-(3)(3)(3)$
$-(9)(3)$
$-(27)$
-27

7. $(-2)^3$
$(-2)(-2)(-2)$
$(4)(-2)$
(-8)

9. $(-5)^3$
$(-5)(-5)(-5)$
$(25)(-5)$
-125

11. $(-2)^0$
Anything to the power of zero equals 1.
1

13. $(-4)^2$
$(-4)(-4)$
16

15. $(-5)^2$
$(-5)(-5)$
25

17. $(-8)^2$
$(-8)(-8)$
64

19. -4^0
Anything to the power of zero is 1. Since the power is only on the 4, the answer is -1.
$-(4^0)$
$-(1)$
-1

21. -2^2
$-(2)(2)$
$-(4)$
-4

23. $(-3)^4$
$(-3)(-3)(-3)(-3)$
$(9)(-3)(-3)$
$(9)(-3)(-3)$
$(-27)(-3)$
81

25. -2^3
$-(2)(2)(2)$
$-(4)(2)$
$-(8)$
-8

27. $(-2)^5$

$(-2)(-2)(-2)(-2)(-2)$

$(4)(-2)(-2)(-2)$

$(4)(-2)(-2)(-2)$

$(-8)(-2)(-2)$

$(-8)(-2)(-2)$

$(16)(-2)$

-32

29. $(a^8)(a^9)$

$a^8 \cdot a^9$

a^{8+9}

a^{17}

31. $(a^{12})(a^{10})$

$a^{12} \cdot a^{10}$

a^{12+10}

a^{22}

33. $(2z^8)(-2z^3)$

$(2)(z^8)(-2)(z^3)$

$(2)(-2)(z^8)(z^3)$

$-4 \cdot z^8 \cdot z^3$

$-4 \cdot z^{8+3}$

$-4z^{11}$

35. $(-6w^6)(-3w^7)$

$(-6)(-3)(w^6)(w^7)$

$18 \cdot w^6 \cdot w^7$

$18 \cdot w^{6+7}$

$18w^{13}$

37. $(-5x^3)(4x^7)$

$(-5)(4)(x^3)(x^7)$

$-20 \cdot x^3 \cdot x^7$

$-20 \cdot x^{3+7}$

$-20x^{10}$

39. $(x^3)^2$

$x^{3 \cdot 2}$

x^6

41. $(-3x^2y^4)^2$

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

$9 \cdot x^2 \cdot x^2 \cdot y^4 \cdot y^4$

$9 \cdot x^{2+2} \cdot y^{4+4}$

$9x^4y^8$

43. $(-5a^7b^6c^2)^3$

$(-5a^7b^6c^2)(-5a^7b^6c^2)(-5a^7b^6c^2)$

$(-125)(a^7a^7a^7)(b^6b^6b^6)(c^2c^2c^2)$

$-125a^{7+7+7}b^{6+6+6}c^{2+2+2}$

$-125a^{21}b^{18}c^6$

45. $(-2a^5b^2c^2)^4$

$(-2)^4a^{5 \cdot 4}b^{2 \cdot 4}c^{2 \cdot 4}$

$16a^{20}b^8c^8$

47.

$$\frac{3a^3b^{10}}{27a^5b^6}$$

$$\frac{3a^3b^6b^4}{27a^3a^2b^6}$$

$$\frac{b^4}{9a^2}$$

49.

$$\frac{12a^3b^{19}c^4d}{10a^5b^9c^2d^2}$$

$$\frac{12a^3b^9b^{10}c^2c^2d}{10a^3a^2b^9c^2dd}$$

$$\frac{6b^{10}c^2}{5a^2d}$$

51.

$$\frac{(-2c^5d^6)^4}{(-4c^2d^{10})^3}$$

$$\frac{(-2)^4c^{5\cdot 4}d^{6\cdot 4}}{(-4)^3c^{2\cdot 3}d^{10\cdot 3}}$$

$$\frac{16c^{20}d^{24}}{-64c^6d^{30}}$$

$$\frac{16c^6c^{14}d^{24}}{-64c^6d^{24}d^6}$$

$$\frac{c^{14}}{-4d^6}$$

53.

$$\frac{(x+y)^6}{(x+y)^6}$$

Anything (except zero) divided by itself is 1.

1

55.

$$\frac{(7a^3)^4}{(7a^3)^6}$$

$$\frac{7^4a^{12}}{7^6a^{18}}$$

$$\frac{1}{7^2a^6}$$

$$\frac{1}{49a^6}$$

57.

$$\frac{32^2}{8^5}$$

$$\frac{32\cdot 32}{8\cdot 8\cdot 8\cdot 8\cdot 8}$$

$$\frac{8\cdot 4\cdot 8\cdot 4}{8\cdot 8\cdot 8\cdot 2\cdot 4\cdot 2\cdot 4}$$

$$\frac{1}{8\cdot 2\cdot 2}$$

$$\frac{1}{32}$$

61. $(a^2)^5$

$a^{2\cdot 5}$

a^{10}

63. $(c^2)^4$

$c^{2\cdot 4}$

c^8

65. $(m^7)^3$

$m^{7\cdot 3}$

m^{21}

67. $(a^2b^3)^4$

$a^{2\cdot 4}b^{3\cdot 4}$

a^8b^{12}

69. $(b^7b^2)^3$

$(b^{7+2})^3$

$(b^9)^3$

$b^{9\cdot 3}$

b^{27}

71. $(-2c^2b^6)^2$

$(-2)^2c^{2\cdot 2}b^{6\cdot 2}$

$4c^4b^{12}$

73. $(-4x^6y)^2$

$(-4)^2x^{6\cdot 2}y^2$

$16x^{12}y^2$

75. $(-2x^2y^4)^5$

$(-2)^5x^{2\cdot 5}y^{4\cdot 5}$

$-32x^{10}y^{20}$

77. $(2x^4y^8)^5$

$(2)^5x^{4\cdot 5}y^{8\cdot 5}$

$32x^{20}y^{40}$

79. $-2(m^5n^4)^2$

$-2(m^{5\cdot 2}n^{4\cdot 2})$

$-2(m^{10}n^8)$

$-2m^{10}n^8$

81. $6(x^9y^{10})^3$

$6(x^{9\cdot 3}y^{10\cdot 3})$

$6(x^{27}y^{30})$

$6x^{27}y^{30}$

83. $3^0(a^6b^{14})^2$

$3^0(a^{6\cdot 2}b^{14\cdot 2})$

$3^0(a^{12}b^{28})$

$1(a^{12}b^{28})$

$a^{12}b^{28}$

85.

$$\frac{(-3p^3q^2)^3}{(-6p^4q^{10})^2}$$

$$\frac{(-3)^3p^{3\cdot3}q^{2\cdot3}}{(-6)^2p^{4\cdot2}q^{10\cdot2}}$$

$$\frac{-27p^9q^6}{36p^8q^{20}}$$

$$\frac{-3p}{4q^{14}}$$

87.

$$\frac{(y+z)^0}{(y+z)^2}$$

Anything to the power of zero is 1.

$$\frac{1}{(y+z)^2}$$

89.

$$\frac{-36a^{12}b^4}{9a^3b^9}$$

$$\frac{-4\cdot9a^9a^3b^4}{9a^3b^5b^4}$$

$$\frac{-4a^9}{b^5}$$

91.

$$\frac{(-3x^4y^2)^{12}}{(-3x^4y^2)^{10}}$$

$$\frac{(-3x^4y^2)^{10}(-3x^4y^2)^2}{(-3x^4y^2)^{10}}$$

$$(-3)^2x^{4\cdot2}y^{2\cdot2}$$

$9x^8y^4$

93.

$$-\frac{(-2x^4y^3)^2}{(-3x^5y^7)^3}$$

$$-\frac{(-2)^2x^{4\cdot2}y^{3\cdot2}}{(-3)^3x^{5\cdot3}y^{7\cdot3}}$$

$$\frac{4x^8y^6}{27x^{15}y^{21}}$$

$$\frac{4x^8y^6}{27x^8x^7y^6y^{15}}$$

$$-\frac{4}{27x^7y^{15}}$$

95.

$$\left(\frac{2x^3y^8}{-3x^6y^4}\right)^5$$

$$\frac{\left(2x^3y^8\right)^5}{\left(-3x^6y^4\right)^5}$$

$$\frac{(2)^5\,x^{3\cdot5}y^{8\cdot5}}{(-3)^5\,x^{6\cdot5}y^{4\cdot5}}$$

$$\frac{32x^{15}y^{40}}{-243x^{30}y^{20}}$$

$$\frac{-32y^{20}}{243x^{15}}$$

97.

$$\left(\frac{4a^3b^3}{-3a^6b}\right)^6$$

$$\frac{\left(4a^3b^3\right)^6}{\left(-3a^6b\right)^6}$$

$$\frac{(4)^6\,a^{3\cdot6}b^{3\cdot6}}{(-3)^6\,a^{6\cdot6}b^6}$$

$$\frac{4096a^{18}b^{18}}{729a^{36}b^6}$$

$$\frac{4096b^{12}}{729a^{18}}$$

99. $2^2 + 3^2 - 4^2$

(2)(2) + (3)(3) - (4)(4)

4 + 9 - 16

13 - 16

-3

101. $-3^2 - 2^2$

-(3)(3) - (2)(2)

-9 - 4

-13

103 . $(-3)^2 - 3^2$

$(-3)(-3) - (3)(3)$

$9 - 9$

0

105. $(-2)^2 - 3^2$

$(-2)(-2) - (3)(3)$

$4 - 9$

-5

107. $(-3)^3 - 2^3$

$(-3)(-3)(-3) - (2)(2)(2)$

$-27 - 8$

-35

109. $(10^3)^2$

$(10^3)(10^3)$

$[(10)(10)(10)][(10)(10)(10)]$

$[1000][1000]$

$1{,}000{,}000$

111. $(10^3)^3$

10^{3*3}

10^9

$1{,}000{,}000{,}000$

113. $a^3 \cdot a^{10}$

a^{3+10}

a^{13}

115. $y^{12} \cdot y^4$

y^{12+4}

y^{16}

117. $3^2 \cdot 3^4$

3^{2+4}

3^6

729

119. $(5y^4)(-2y^2)$

$-10y^{4+2}$

$-10y^6$

121. $(-4m^2)(-2m^2)$

$8m^{2+2}$

$8m^4$

123. $(a)(a)$

$(a^1)(a^1)$

a^{1+1}

a^2

125.
1st week, 3 letters.
2nd week, 9 letters
(3 people each send 3 letters)
3rd week, 27 letters
(9 people each send 3 letters)
4th week, 81 letters
(27 people each send 3 letters)
5th week, 243 letters
(81 people each send 3 letters)

On the 5th week, there are 3^5 or 243 letters sent.

127.
1st week, 2 letters
2nd week, 4 letters
(2 people each send 2 letters)
3rd week, 8 letters
(4 people each send 2 letters)
4th week, 16 letters
(8 people each send 2 letters)
5th week, 32 letters
(16 people each send 2 letters)
6th week, 64 letters
(32 people each send 2 letters)
7th week, 128 letters
(64 people each send 2 letters)
On the 7th week, there are 2^7 or 128 letters sent.

129.
1st second, 3 dominos fall
2nd second, 9 dominos fall
(3 dominos each knocks down 3)
3rd second, 27 dominos fall
(9 dominos each knocks down 3)
4th second, 81 dominos fall
(27 dominos each knocks down 3)

On the 4th second, 3^4 or 81 dominos fall.