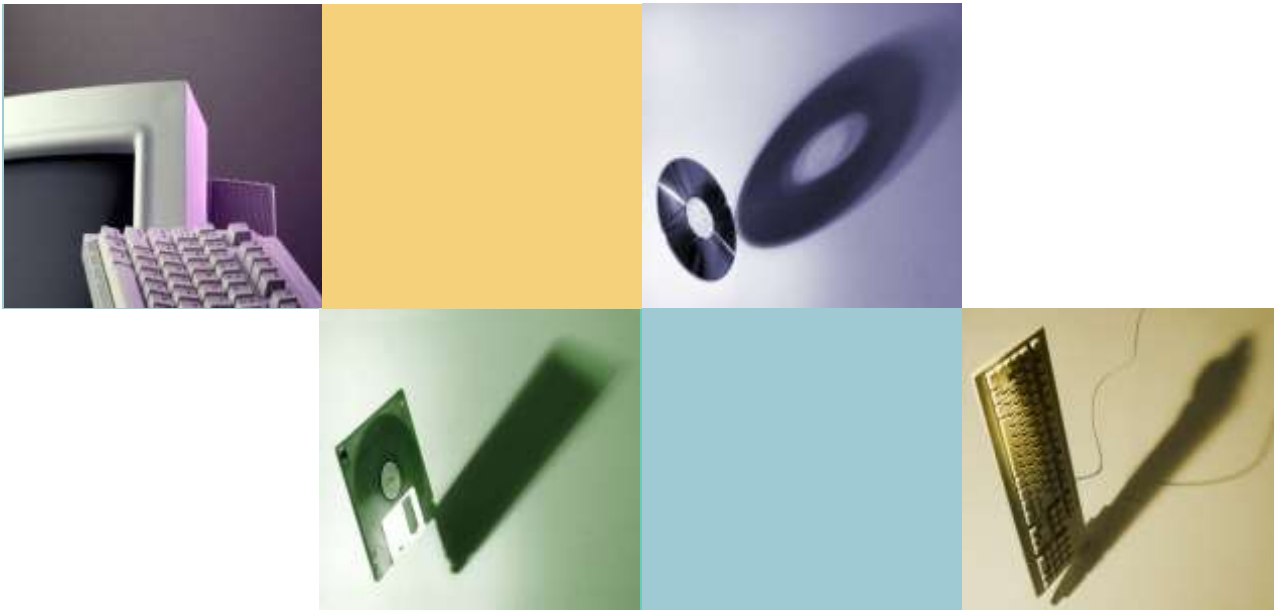
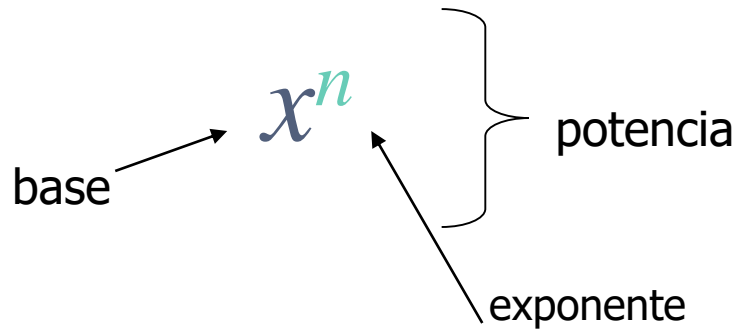


Lección 3



Exponentes Enteros



Si n entero positivo

$$x^n = \underbrace{x \cdot x \cdot x \cdots x}_{n \text{ veces}}$$

EXPONENTES POSITIVOS



Ejemplos

- $4^3 = 4 \times 4 \times 4 = 64$
- $(-3)^4 = -3 \times -3 \times -3 \times -3 = 81$
- $-3^4 = -(3 \times 3 \times 3 \times 3) = -81$
- 3^{25}

Recuerde: Si no hay un paréntesis alrededor de un número negativo, se entiende que la base de la potencia es positiva.

Con la calculadora $3 [^] 25 [enter]$

$$8.472886094 * 10^{11}$$

$$3^{25} \approx 847,288,609,400$$



Regla 1 de Exponentes

$$\begin{aligned}x^2 \cdot x^3 &= \underbrace{x \cdot x \cdot x \cdot x \cdot x}_{x^5} \\ &= x^5\end{aligned}$$

Si x es distinto de 0 y a, b son números enteros

$$x^a \cdot x^b = x^{a+b}$$

- Simplifique:

$$y^4 \cdot y^3 \cdot y^5 = y^{12}$$

$$\frac{x^3}{y} \cdot \frac{x^5}{y^4} = \frac{x^8}{y^5}$$

$$-3xy^4 \cdot 2y^3 \cdot 4xy^2 = -24x^2y^9$$



Regla 2 y 3 de Exponentes

Si x, y es distinto de 0 y a, b son números enteros

$$(x^a)^b = x^{ab}$$

$$(xy)^a = x^a y^a$$

- Simplifique:

$$\begin{aligned}(4^3)^2 &= 4^6 \\ &= 4096\end{aligned}$$

$$\begin{aligned}(2 \cdot 3)^5 &= 2^5 \cdot 3^5 \\ &= 7776\end{aligned}$$

$$(x^3)^5 = x^{15}$$

$$(x \cdot y)^5 = x^5 y^5$$

$$(4x^3)^2 = 4^2 (x^3)^2 = 16x^6$$

$$(-2x^3y^4)^3 = (-2)^3 (x^3)^3 (y^4)^3 = -8x^9y^{12}$$



Regla 4 de Exponentes

Si x es distinto de 0 y a un número entero $\left[\frac{x}{y}\right]^a = \frac{x^a}{y^a}$

- Simplifique:

$$\left(\frac{3}{5}\right)^3 = \frac{3^3}{5^3} = \frac{27}{125} \qquad \left(\frac{x}{y}\right)^2 = \frac{x^2}{y^2}$$

$$\left(\frac{2a}{b}\right)^3 = \frac{(2a)^3}{b^3} = \frac{2^3 a^3}{b^3} = \frac{8a^3}{b^3}$$

$$\left(\frac{3a}{2b}\right)^5 = \frac{(3a)^5}{(2b)^5} = \frac{3^5 a^5}{2^5 b^5} = \frac{243a^5}{32b^5}$$



Ejemplos 2

- Simplifica

$$2a^2b(ab)^2 - 4a(ab)^3$$

$$= 2a^2b \cdot a^2b^2 - 4a \cdot a^3b^3$$

$$= 2a^4b^3 - 4a^4b^3$$

$$= -2a^4b^3$$

$$(3ab)^3 - 2a(ab)^2$$

$$= (3)^3a^3b^3 - 2a \cdot a^2b^2$$

$$= 27a^3b^3 - 2a^3b^2$$

No son términos semejantes



Si x es distinto de 0 y n es un número natural, $x^{-n} = \frac{1}{x^n}$

Además, $x^0 = 1$

EXPONENTES NO POSITIVOS



Ejemplos 3

- $(-5)^0 = 1$
- $4^{-3} = \frac{1}{4^3} = \frac{1}{64}$
- $\left(\frac{2}{3}\right)^{-2} = \left(\frac{3}{2}\right)^2 = \frac{3^2}{2^2} = \frac{9}{4}$
- 3^{-20}

Con la calculadora $3 [^] [(-)] 20 [enter]$ $2.86797199 * 10^{-10}$

$$3^{-20} \approx 0.000000000286797199$$



Regla 5 de Exponentes

Si x es distinto de 0 y a, b son números enteros $\frac{x^a}{x^b} = x^{a-b}$

- Simplifique:

$$\frac{x^3 y^3}{x^5 y} = x^{-2} y^2 = \frac{1}{x^2} \cdot y^2 = \frac{y^2}{x^2}$$

Expresa potencias con exponentes negativos a potencias equivalentes con exponentes positivos

$$(x^{-3})^2 = x^{-6} = \frac{1}{x^6}$$

$$(y^3 z^{-5})^2 = y^6 z^{-10} = \frac{y^6}{z^{10}}$$



Ejemplos 4

Simplifique:

Expresar potencias con exponentes negativos a potencias equivalentes con exponentes positivos

$$\left(a^3 b^{-2}\right)^{-4} = \left(a^3\right)^{-4} \left(b^{-2}\right)^{-4} = a^{-12} b^8 = \frac{b^8}{a^{12}}$$

$$\left(2x^{-1} y^2\right)^{-3} = 2^{-3} \left(x^{-1}\right)^{-3} \left(y^2\right)^{-3} = \frac{1}{2^3} x^3 y^{-6} = \frac{x^3}{8y^6}$$

$$\left(\frac{3xy^2}{12x^2y}\right)^2 = \left(\frac{1}{4} x^{-1} y^1\right)^2 = \left(\frac{x^{-1} y}{4}\right)^2 = \frac{x^{-2} y^2}{4^2} = \frac{y^2}{16x^2}$$



Ejercicios del Texto – p1

Simplifica.

$$11. \frac{y^7}{y^3}$$

$$12. \frac{z^9}{z^2}$$

$$13. \frac{a^8}{a^5}$$

$$14. \frac{c^{12}}{c^5}$$

$$39. 4x^{-7}$$

$$40. -6y^{-1}$$

$$41. \frac{5}{b^{-8}}$$

$$15. \frac{p^5}{p}$$

$$16. \frac{w^9}{w}$$

$$17. \frac{4x^8}{2x^5}$$

$$18. \frac{12z^7}{4z^3}$$

$$43. \frac{1}{3x^{-2}}$$

$$44. \frac{2}{5c^{-6}}$$

$$45. (ab^5)^0$$

$$19. \frac{22k^5}{11k^4}$$

$$20. \frac{14m^{11}}{7m^{10}}$$

$$21. \frac{m^9n^7}{m^4n^5}$$

$$22. \frac{y^5z^6}{yz^3}$$

$$47. \frac{y^3}{y^8}$$

$$48. \frac{z^4}{z^6}$$

$$49. \frac{a^5}{a^{11}}$$

$$23. \frac{6r^4}{4r^2}$$

$$24. \frac{8x^9}{12x^6}$$

$$25. \frac{-16a^7}{24a^6}$$

$$26. \frac{-18b^5}{27b^4}$$

$$51. \frac{4x^2}{12x^5}$$

$$52. \frac{6y^8}{8y^9}$$

$$53. \frac{-12x}{|-18x^6|}$$

$$27. x^{-2}$$

$$28. y^{-10}$$

$$29. \frac{1}{a^{-6}}$$

$$30. \frac{1}{b^{-4}}$$

$$55. \frac{x^6y^5}{x^8y}$$

$$56. \frac{a^3b^2}{a^2b^3}$$

$$57. \frac{2m^6n^2}{5m^9n^{10}}$$

$$59. \frac{pq^3}{p^4q^4}$$

$$60. \frac{a^4b^5}{a^5b^6}$$

$$61. \frac{3x^4y^5}{6x^4y^8}$$



Ejercicios del Texto – p2

$$63. \frac{14x^4y^6z^2}{16x^3y^9z}$$

$$64. \frac{24a^2b^7c^9}{36a^7b^5c}$$

$$65. (-2xy^{-2})^3$$

$$66. (-3x^{-1}y^2)^2$$

$$67. (3x^{-1}y^{-2})^2$$

$$68. (5xy^{-3})^{-2}$$

$$69. (2x^{-1})(x^{-3})$$

$$70. (-2x^{-5})x^7$$

$$71. (-5a^2)(a^{-5})^2$$

$$72. (2a^{-3})(a^7b^{-1})^3$$

$$73. (-2ab^{-2})(4a^{-2}b)^{-2}$$

$$74. (3ab^{-2})(2a^{-1}b)^{-3}$$

$$75. \frac{a^{-3}b^{-4}}{a^2b^2}$$

$$76. \frac{3x^{-2}y^2}{6xy^2}$$

$$77. \frac{2x^{-2}y}{8xy}$$

$$78. \frac{3x^{-2}y}{xy}$$

$$79. \frac{2x^{-1}y^4}{x^2y^3}$$

$$80. \frac{2x^{-1}y^{-4}}{4xy^2}$$

$$81. \frac{12a^2b^3}{-27a^2b^2}$$

$$82. \frac{-16xy^4}{96x^4y^4}$$

$$83. \frac{-8x^2y^4}{44y^2z^5}$$

