
Exponents & Powers

1. Find the value of each of the following

- a. 13^2
- b. 5^3
- c. 2^4
- d. 11^2
- e. $(-3)^3$
- f. $(-1)^6$

2. Simplify

- a. 3×10^2
- b. $2^5 \times 5^3$
- c. 0×10^4
- d. $\left(\frac{3}{4}\right)^3$
- e. $\left(\frac{-2}{3}\right)^4$

3. Express each of the following in exponential form

- a. $\left(\frac{-5}{7}\right) \times \left(\frac{-5}{7}\right) \times \left(\frac{-5}{7}\right) \times \left(\frac{-5}{7}\right)$
- b. $-5 \times -5 \times -5$
- c. $x \times x \times x \times x \times a \times a \times b \times b \times b$
- d. $(-2) \times (-2) \times (-2) \times (-2) \times a \times a \times a$

4. Express each of the following numbers as a product of powers of their prime factors.

- a. 36 b. 675 c. 392 d. 864 e. 450 f. 1800

5. Using laws of exponents , simplify

- (i) $3^6 \times 3^5$
- (ii) $(7^2)^3 \div 7^3$
- (iii) $2^{20} \div 2^5$
- (iv) $2^4 \times 5^4$
- (v) $(2^0 + 3^0)(4^0 + 6^0)$
- (vi) $\frac{7^3}{5^3}$

6. Simplify and express each of the following in exponential form :

$$(i) \frac{2^{15}}{2^7 \times 2^3} \quad (ii) (3^5 \times 3^2)^3 \quad (iii) [(2^3)^4 \times 2^8] \div 2^{12}$$

$$(iv) \frac{5^4 \times x^{10} y^5}{5^4 \times x^7 y^4} \quad (v) \left(\frac{2}{3}\right)^5 \times \left(\frac{3}{5}\right)^5 \quad (vi) \frac{9^8 \times (x^2)^5}{(27)^4 \times (x^3)^2}$$

$$(vii) \frac{3^2 \times 7^8 \times 13^6}{21^2 \times 91^3} \quad (viii) \frac{10 \times 5^{n+1} + 25 \times 5^n}{3 \times 5^{n+2} + 10 \times 5^{n+1}}$$

7. Write the numbers in expanded forms :

$$(a) 20068 \quad (b) 423719 \quad (c) 680071 \quad (d) 5004132$$

8. Find the number :

$$(a) 5 \times 10^5 + 4 \times 10^4 + 2 \times 10^3 + 3 \times 10^0$$

$$(b) 9 \times 10^6 + 8 \times 10^4 + 7 \times 10^2 + 6 \times 10^0$$

$$(c) 3 \times 10^4 + 4 \times 10^3 + 5 \times 10^0$$

9. Express in the standard form :

$$(a) 3,18,65,00,000 \quad (b) 786.3 \times 10^4 \quad (c) 5,00,00,000$$

$$(b) 42634.7 \quad (d) 4786.3460$$

10. Write the numbers in the usual form :

$$(a) 4.83 \times 10^7 \quad (b) 3.64 \times 10^5 \quad (c) 7.3 \times 10^3$$

Answers :

$$1) (a) 169 \quad (b) 125 \quad (c) 16 \quad (d) 121 \quad (e) -21 \quad (f) +1$$

$$2) (a) 3 \times 100 = 300 \quad (b) 4 \times 125 = 600 \quad (c) 0 \quad (d) \frac{9}{16} \quad (e) \frac{16}{81}$$

$$4) (a) 3^2 \times 2^2 \quad (b) 5^4 \quad (c) 2^3 \times 7^2 \quad (d) 2^5 \times 3^3$$

$$(e) 2 \times 3^2 \times 5^2 \quad (f) 2^3 \times 3^2 \times 5^2$$

$$5) (i) 3^{11} \quad (ii) 7^3 \quad (iii) 2^{15} \quad (iv) (10)^4 \quad (v) 4$$

$$(vi) \left(\frac{7}{5}\right)^3$$

$$6) (i) 2^5 \quad (ii) 3^{21} \quad (iii) 2^8 \quad (iv) x^3 y \quad (v) \left(\frac{2}{5}\right)^5 \quad (vi) (3x)^4$$

$$(vii) 7^5 \times 13^5 \quad (viii) \left(\frac{3}{5}\right)$$

Exponents (Powers)

1. Simplify and write in exponential form:

a. $(-5)^3 \times (-5)^4$

b. $P^3 \times P^{-10}$

c. $3^5 \times 3^{-10} \times 3^6$

d. $(2^5 \div 2^8)^5 \times 2^{-5}$

e. $(-4)^{-3} \times (5)^3 \times (-5)^{-3}$

f. $(-3)^4 \times \left(\frac{5}{3}\right)^4$

g. $\frac{1}{8} \times 3^{-5}$

h. $(-4)^5 \div (4)^8$

2. Find the value of:

a. $\left(\frac{2}{3}\right)^{-2}$

b. $\left[\left(\frac{1}{3}\right)^{-2} - \left(\frac{1}{2}\right)^{-3}\right] \div \left(\frac{1}{4}\right)^{-2}$

c. $\left(\frac{5}{8}\right)^{-7} \times \left(\frac{8}{5}\right)^{-5}$

d. $(3^0 + 4^{-1}) \times 2^2$

e.

$(2^{-1} \times 4^{-1}) \div 2^{-2}$

f. $\left(\left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{-2}\right)$

g. $(3^{-1} + 4^{-1} + 5^{-1})^0$

h. $\left\{\left(\frac{-2}{3}\right)^{-2}\right\}^2$

i. $\frac{8^{-1} \times 5^3}{2^{-4}}$

j. $(5^{-1} \times 2^{-1}) \times 6^{-1}$

k. $\left\{\left(\frac{1}{3}\right)^{-1} - \left(\frac{1}{4}\right)^{-1}\right\}^{-1}$

l. $\left(\frac{5}{8}\right)^{-7} \times \left(\frac{8}{5}\right)^{-4}$

m. $\frac{25 \times t^{-4}}{5^{-3} \times 10 \times t^{-8}}$

n. $\frac{3^{-5} \times 10^{-5} \times 125}{6^{-5} \times 6^{-5}}$

3. Evaluate :

a. 3^{-2}

b. $(-4)^{-2}$

c. $\left(\frac{1}{2}\right)^{-5}$

d. $1/3^{-2}$

e. 2^{-3}

4. Find the multiplicative inverse of the following :

a. 2^{-4}

b. 10^{-5}

c. 7^{-2}

d. 5^{-3}

e. 10^{-100}

5. If $\frac{m}{n} = \left(\frac{5}{7}\right)^4 \div \left(\frac{5}{7}\right)^0$ Find the value of $\left(\frac{m}{n}\right)^2$ if $m = -3$ $n = 4$

6. Find the value of x^{-2} if $x = \left(\frac{-2}{5}\right)^{-3} \div \left(\frac{5}{6}\right)^0$

7. What should $\left(\frac{7}{9}\right)^{-3}$ be divided so that the quotient becomes 9?

8. What should $\left(\frac{2}{5}\right)^4$ be multiplied so that product becomes 25?

9. Express each of the following rational number in exponential form:

$$a. \frac{1}{343}$$

$$b. \frac{-25}{216}$$

$$c. \frac{64}{27}$$

$$d. \frac{243000}{729000}$$

10. Simplify and express the result as powers of 2:

$$a. \left\{ \left(\frac{1}{2} \right)^3 \right\}^4 \div \left\{ \left(\frac{1}{2} \right)^4 \right\}^3$$

$$b. (3^0 + 5^0) \div (4^0 + 2^0)$$

11. Express the following as a rational number:

$$i. \left(\frac{-7}{8} \right)^2$$

$$ii. \left(\frac{-2}{7} \right)^3$$

$$iii. \left(\frac{4}{-5} \right)^4$$

$$iv. \left(\frac{11}{8} \right)^3$$

$$v. \left(\frac{-2}{3} \right)^3$$

$$vi. \left(\frac{-5}{-7} \right)^2$$

12. Express the following as a rational numbers in power notation:

$$i. \frac{81}{256}$$

$$ii. \frac{-27}{125}$$

$$iii. \frac{-216}{-512}$$

$$iv. \frac{-16}{81}$$

$$v. \frac{256}{6561}$$

$$vi. \frac{1}{-3125}$$

$$vii. \frac{1}{64}$$

$$viii. \frac{100}{9261}$$

13. Simplify:

$$i. [-1/3 - (7/5)^2] \times (3/5)^2$$

$$ii. (-3/8)^3 \times 4^3 \times (2/3)^2$$

$$iii. [(4/5)^2 + (5/-7)^2] \times (2/5)^2 \div (-4/5)^3$$

$$iv. (-3/8)^2 \times (5/6)^3 \div \left[\left(\frac{-5}{3} \right)^4 - \left(\frac{2}{3} \right)^5 \right] \div (4/9)^2$$

14. Find the reciprocal of:

$$i) (-7/3)^2$$

$$ii) \left(\frac{2}{3} \right)^5$$

$$iii) (-6)^3 \quad iv) (2/-3)^3$$

$$\times (3/-4)^2$$

$$v) (2/3)^2 \times (3/4)^2$$

15. Find the absolute value of :

$$i) (2/3)^3$$

$$ii) (-4/7)^2$$

$$iii) ((5/-8)^3$$

$$iv) (-11/13)^2$$

16. Which of the two rational numbers $(-3/5)$ and $(3/5)$ is smaller? Insert four rational numbers between them.

17. Find the product of the cube of $(-2/3)$ and the square of $(4/-5)$.

18. Fill in the blanks:

$$i) (-2)^4 \times (-2)^5 = (-2)^{\text{-----}}$$

$$ii) (-3)^{11} \div (-3)^{15} = (1/-3) \text{-----} \quad iii) (4^2)^3 =$$

$$(4) \text{-----}$$

$$iv) \left(-\frac{2}{5} \right)^6 \div \left(-\frac{2}{5} \right)^2 = \left(-\frac{2}{5} \right) \text{-----}$$

$$v) \left(\frac{4}{-5}\right)^4 \times \left(\frac{4}{-5}\right)^7 = \left(\frac{4}{-5}\right)^{\text{---}}$$

$$vi) [(-6)^3]^4 = (-6)^{\text{---}}$$

9.

19. Simplify:

$$i) (3/4)^2 \times (3/4)^3$$

$$ii) (-2/7)^2 \times (-2/7)^3$$

$$iii) (-7/8)^4 \div (-7/8)^2$$

$$iv) (1/3^2)^3$$

20. Simplify and express the result in power notation:

$$i) (7/-4)^4 \times (7/-4)^6$$

$$ii) (3/8)^{10} \div (3/8)^6$$

$$iii) (-5/2)^3 \div (-5/2)^7$$

$$iv) [(-3/4)^2]^3$$

$$v) (-5/7)^6 \div (-5/7)^3$$

$$vi) [(-3/4)^2]^3$$

$$vii) [(-5/7)^4]^5$$

21. Find the value of:

$$i) 3^{-4}$$

$$ii) (-4)^{-3}$$

$$iii) \left(\frac{2}{3}\right)^{-3}$$

$$iv) \left(\frac{-3}{7}\right)^{-2}$$

$$v) \left(\frac{5}{-6}\right)^{-3}$$

$$vi) (-3)^{-1}$$

22. Express the following as a rational number with positive exponent by using laws of exponents:

$$i) (3/4)^{-2}$$

$$ii) (-7/8)^{-3}$$

$$iii) [(3^{-3})^4]$$

$$iv) 3^{-4}$$

$$\times 3^{-2}$$

$$v) (3)^{-4} \times (5)^{-4}$$

$$vi) 3^7 \times 3^{-4} \div 3^5$$

23. Express the following as a rational number with negative exponent by using laws of exponents:

$$i) (1/3)^4$$

$$ii) [(3^2)^3]$$

$$iii) -4^2 \times -4^3 \times -4^7$$

$$iv) (5/-6)^2 \times (-\frac{6}{5})^3 \times 1/-6$$

$$v) [(-3/8^2)^3]$$

24. Find the value of :

$$i) 5^0$$

$$ii) 2^0 + 4^0 + 5^0$$

$$iii) \left(\frac{3}{4}\right)^{5+3+8}$$

iv) $(-7)^{6 \times 3 - 8 - 10}$

v) $(2^\circ \times 4^\circ \div 5^\circ + 3^\circ) \div 7^\circ$

25. By what number should we multiply 5^{-4} so that the product may be equal to 25 ?

26. By what number should 7^{-3} be divided so that the quotient may be equal to 7^{-2} ?

27. Find the value of x, such that $(3/5)^{-3} \times (3/5)^{-12} = (3/5)^{-5x}$.

28. Find the value of y, such that $(2/-3)^{-9} \times (-2/3)^{-3} = (-2/3)^{7y+2}$

29. Find the reciprocal of the rational number :

$$[(2/3)^{-3} \times (6/7)^2] \div [(3/7)^2 \times (3/4)^{-5}$$

30. If $x = (2/3)^{-4} \div (4/6)^{-3} \times (3/4)^2$, find x^{-2}

31. If $y = (5/2)^2 \times (5/3)^4$, then find the value of y^3 .

32) Find the value of b if

a) $4^3 \times 4^{b-2} = 4^{-2}$

b) $8^{-6} / 8^b = 8^4$

c) $(6/7)^b \times (6/7)^4 = (6/7)^{-4}$

d) $(1/2)^{2b} / (1/2)^2 = (1/2)^4$

33) Simplify

i) $[(1/3)^{-1} + (1/6)^{-1}]^2 \times 4^2$

ii) $(5/-6)^4 / (5/-6)^n = [(5/6)^2]^3$

iii) $(-7)^{2n} \times (-7)^3 = (-7)^9$

iv) $[(1/2)^{-3} - (1/3)^{-2}] \times (1/4)^{-3}$

v) $(6/7)^4 \times (6/7)^{-3} \times (1/2)^{-4} \times (3/5)^{-2}$

vi) $(5/2)^3 \times (5/2)^{-1} \times [(2/3)^2]^{-2} \times 1/16$

34) Express in positive exponents

a) $(1/2)^{-3}$ b) $(-3/7)^{-5}$ c) $(-3)^{-6}$ d) $(2)^{-3}$

35) Simplify and express with positive exponents.

a) $(4/5)^{-4} \times (6)^{-4}$

b) $(\frac{3}{5})^{-8} \times (\frac{10}{9})^{-8}$

c) $(-3)^{-8} \times (-\frac{1}{9})^{-8}$

d) $[(\frac{5}{4})^{-2} \times (\frac{2}{5})^{-3}]^{-1}$

36) a) By what no. should $(\frac{1}{5})^2$ be multiplied so that the product becomes 15.

b) By what no. should $(\frac{7}{11})^0$ be multiplied so that the product becomes $(\frac{13}{15})^0$.

37) a) By what no. should $(\frac{3}{7})^{-2}$ be divided so that the quotient becomes 7.

b) By what no. should $(-18)^{-1}$ be divided so that the quotient may be equal to $(-3)^{-1}$.

Exponents

I. Find x, if

1. $1^0 + 2^1 + 3^x = 4$

2. $x^2 = 2^2 + 4^2 + 5^2 + 6^2$

3. $x = a^{p-q} \times a^{q-r} \times a^{r-p}$

4. $3^4 \times 9^{x+2} = \left(\frac{1}{9}\right)^{-3}$

5. $\left(\frac{3}{2}\right)^2 \times \left(\frac{2}{3}\right)^{5-2x} = \frac{2}{3}$

6. $\frac{1}{x} = \left[\left(-\frac{1}{2}\right)^2 \right]^3 \div 2^{-4}$

II By what number should $\left(-\frac{2}{7}\right)^{-3}$ be divided so that the quotient be 49 ?

III Simplify : $\frac{x^a}{x^b} \left[\frac{x^b}{x^c} \right]^{b+c} \frac{x^c}{x^a} \left[\frac{x^c}{x^a} \right]^{c+a}$

ANSWERS :

I. 1. $x = 0$ 2. $x = 9$ 3. $x = 1$ 4. $x = -1$
 5. $x =$ 6. $x = 4$

II $-\frac{7}{8}$

III 1