

EXERCISE 6.1

PAGE NO: 6.12

1. Find the values of each of the following:

(i) 13^2

(ii) 7^3

(iii) 3^4

Solution:

(i) Given 13^2

$$13^2 = 13 \times 13 = 169$$

(ii) Given 7^3

$$7^3 = 7 \times 7 \times 7 = 343$$

(iii) Given 3^4

$$3^4 = 3 \times 3 \times 3 \times 3$$

$$= 81$$

2. Find the value of each of the following:

(i) $(-7)^2$

(ii) $(-3)^4$

(iii) $(-5)^5$

Solution:

(i) Given $(-7)^2$

We know that $(-a)^{\text{even number}} = \text{positive number}$

$(-a)^{\text{odd number}} = \text{negative number}$

We have, $(-7)^2 = (-7) \times (-7)$

$$= 49$$

(ii) Given $(-3)^4$

We know that $(-a)^{\text{even number}} = \text{positive number}$

$(-a)^{\text{odd number}} = \text{negative number}$

We have, $(-3)^4 = (-3) \times (-3) \times (-3) \times (-3)$

$$= 81$$

(iii) Given $(-5)^5$

We know that $(-a)^{\text{even number}} = \text{positive number}$

$(-a)^{\text{odd number}} = \text{negative number}$

$$\begin{aligned}\text{We have, } (-5)^5 &= (-5) \times (-5) \times (-5) \times (-5) \times (-5) \\ &= -3125\end{aligned}$$

3. Simplify:

(i) 3×10^2

(ii) $2^2 \times 5^3$

(iii) $3^3 \times 5^2$

Solution:

(i) Given 3×10^2

$$3 \times 10^2 = 3 \times 10 \times 10$$

$$= 3 \times 100$$

$$= 300$$

(ii) Given $2^2 \times 5^3$

$$2^2 \times 5^3 = 2 \times 2 \times 5 \times 5 \times 5$$

$$= 4 \times 125$$

$$= 500$$

(iii) Given $3^3 \times 5^2$

$$3^3 \times 5^2 = 3 \times 3 \times 3 \times 5 \times 5$$

$$= 27 \times 25$$

$$= 675$$

4. Simply:

(i) $3^2 \times 10^4$

(ii) $2^4 \times 3^2$

(iii) $5^2 \times 3^4$

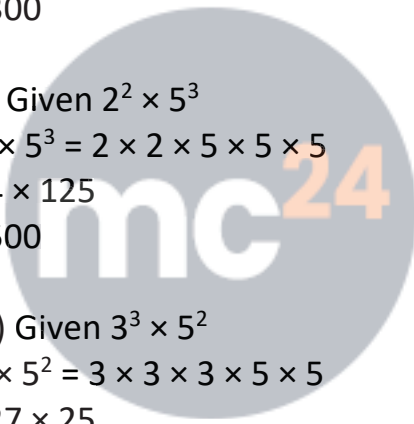
Solution:

(i) Given $3^2 \times 10^4$

$$3^2 \times 10^4 = 3 \times 3 \times 10 \times 10 \times 10 \times 10$$

$$= 9 \times 10000$$

$$= 90000$$



(ii) Given $2^4 \times 3^2$

$$\begin{aligned}2^4 \times 3^2 &= 2 \times 2 \times 2 \times 2 \times 3 \times 3 \\ &= 16 \times 9 \\ &= 144\end{aligned}$$

(iii) Given $5^2 \times 3^4$

$$\begin{aligned}5^2 \times 3^4 &= 5 \times 5 \times 3 \times 3 \times 3 \times 3 \\ &= 25 \times 81 \\ &= 2025\end{aligned}$$

5. Simplify:

(i) $(-2) \times (-3)^3$

(ii) $(-3)^2 \times (-5)^3$

(iii) $(-2)^5 \times (-10)^2$

Solution:

(i) Given $(-2) \times (-3)^3$

$$\begin{aligned}(-2) \times (-3)^3 &= (-2) \times (-3) \times (-3) \times (-3) \\ &= (-2) \times (-27) \\ &= 54\end{aligned}$$

(ii) Given $(-3)^2 \times (-5)^3$

$$\begin{aligned}(-3)^2 \times (-5)^3 &= (-3) \times (-3) \times (-5) \times (-5) \times (-5) \\ &= 9 \times (-125) \\ &= -1125\end{aligned}$$

(iii) Given $(-2)^5 \times (-10)^2$

$$\begin{aligned}(-2)^5 \times (-10)^2 &= (-2) \times (-2) \times (-2) \times (-2) \times (-2) \times (-10) \times (-10) \\ &= (-32) \times 100 \\ &= -3200\end{aligned}$$

6. Simplify:

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

(ii) $(-2/3)^4$

(iii) $(-4/5)^5$

Solution:

(i) Given $(3/4)^2$

$$(3/4)^2 = (3/4) \times (3/4) \\ = (9/16)$$

(ii) Given $(-2/3)^4$

$$(-2/3)^4 = (-2/3) \times (-2/3) \times (-2/3) \times (-2/3) \\ = (16/81)$$

(iii) Given $(-4/5)^5$

$$(-4/5)^5 = (-4/5) \times (-4/5) \times (-4/5) \times (-4/5) \times (-4/5) \\ = (-1024/3125)$$

7. Identify the greater number in each of the following:

(i) 2^5 or 5^2

(ii) 3^4 or 4^3

(iii) 3^5 or 5^3

Solution:

(i) Given 2^5 or 5^2

$$2^5 = 2 \times 2 \times 2 \times 2 \times 2 \\ = 32$$

$$5^2 = 5 \times 5$$

$$= 25$$

Therefore, $2^5 > 5^2$

(ii) Given 3^4 or 4^3

$$3^4 = 3 \times 3 \times 3 \times 3$$

$$= 81$$

$$4^3 = 4 \times 4 \times 4$$

$$= 64$$

Therefore, $3^4 > 4^3$

(iii) Given 3^5 or 5^3

$$3^5 = 3 \times 3 \times 3 \times 3 \times 3$$

$$= 243$$

$$5^3 = 5 \times 5 \times 5$$

$$= 125$$

Therefore, $3^5 > 5^3$

8. Express each of the following in exponential form:

(i) $(-5) \times (-5) \times (-5)$

(ii) $(-5/7) \times (-5/7) \times (-5/7) \times (-5/7)$

(iii) $(4/3) \times (4/3) \times (4/3) \times (4/3) \times (4/3)$

Solution:

(i) Given $(-5) \times (-5) \times (-5)$

Exponential form of $(-5) \times (-5) \times (-5) = (-5)^3$

(ii) Given $(-5/7) \times (-5/7) \times (-5/7) \times (-5/7)$

Exponential form of $(-5/7) \times (-5/7) \times (-5/7) \times (-5/7) = (-5/7)^4$

(iii) Given $(4/3) \times (4/3) \times (4/3) \times (4/3) \times (4/3)$

Exponential form of $(4/3) \times (4/3) \times (4/3) \times (4/3) \times (4/3) = (4/3)^5$

9. Express each of the following in exponential form:

(i) $x \times x \times x \times x \times a \times a \times b \times b \times b$

(ii) $(-2) \times (-2) \times (-2) \times (-2) \times a \times a \times a$

(iii) $(-2/3) \times (-2/3) \times x \times x \times x$

Solution:

(i) Given $x \times x \times x \times x \times a \times a \times b \times b \times b$

Exponential form of $x \times x \times x \times x \times a \times a \times b \times b \times b = x^4 a^2 b^3$

(ii) Given $(-2) \times (-2) \times (-2) \times (-2) \times a \times a \times a$

Exponential form of $(-2) \times (-2) \times (-2) \times (-2) \times a \times a \times a = (-2)^4 a^3$

(iii) Given $(-2/3) \times (-2/3) \times x \times x \times x$

Exponential form of $(-2/3) \times (-2/3) \times x \times x \times x = (-2/3)^2 x^3$

10. Express each of the following numbers in exponential form:

(i) 512

(ii) 625

(iii) 729

Solution:

(i) Given 512

$$\begin{aligned}\text{Prime factorization of } 512 &= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \\ &= 2^9\end{aligned}$$

(ii) Given 625

$$\begin{aligned}\text{Prime factorization of } 625 &= 5 \times 5 \times 5 \times 5 \\ &= 5^4\end{aligned}$$

(iii) Given 729

$$\begin{aligned}\text{Prime factorization of } 729 &= 3 \times 3 \times 3 \times 3 \times 3 \times 3 \\ &= 3^6\end{aligned}$$

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

(i) 36

(ii) 675

(iii) 392

Solution:

(i) Given 36

$$\begin{aligned}\text{Prime factorization of } 36 &= 2 \times 2 \times 3 \times 3 \\ &= 2^2 \times 3^2\end{aligned}$$

(ii) Given 675

$$\begin{aligned}\text{Prime factorization of } 675 &= 3 \times 3 \times 3 \times 5 \times 5 \\ &= 3^3 \times 5^2\end{aligned}$$

(iii) Given 392

$$\begin{aligned}\text{Prime factorization of } 392 &= 2 \times 2 \times 2 \times 7 \times 7 \\ &= 2^3 \times 7^2\end{aligned}$$

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

(i) 450

(ii) 2800

(iii) 24000

Solution:

(i) Given 450

$$\begin{aligned}\text{Prime factorization of } 450 &= 2 \times 3 \times 3 \times 5 \times 5 \\ &= 2 \times 3^2 \times 5^2\end{aligned}$$

(ii) Given 2800

$$\begin{aligned}\text{Prime factorization of } 2800 &= 2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 7 \\ &= 2^4 \times 5^2 \times 7\end{aligned}$$

(iii) Given 24000

$$\begin{aligned}\text{Prime factorization of } 24000 &= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 5 \times 5 \times 5 \\ &= 2^6 \times 3 \times 5^3\end{aligned}$$

13. Express each of the following as a rational number of the form (p/q):

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

(ii) $(7/9)^3$

(iii) $(-2/3)^4$

Solution:

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

$$\begin{aligned}(3/7)^2 &= (3/7) \times (3/7) \\ &= (9/49)\end{aligned}$$

(ii) Given $(7/9)^3$

$$\begin{aligned}(7/9)^3 &= (7/9) \times (7/9) \times (7/9) \\ &= (343/729)\end{aligned}$$

(iii) Given $(-2/3)^4$

$$\begin{aligned}(-2/3)^4 &= (-2/3) \times (-2/3) \times (-2/3) \times (-2/3) \\ &= ((16/81))\end{aligned}$$

14. Express each of the following rational numbers in power notation:

(i) $(49/64)$

(ii) $(-64/125)$

(iii) $(-12/16)$

Solution:

(i) Given $(49/64)$

We know that $7^2 = 49$ and $8^2 = 64$

Therefore $(49/64) = (7/8)^2$

(ii) Given $(-64/125)$

We know that $4^3 = 64$ and $5^3 = 125$

Therefore $(-64/125) = (-4/5)^3$

(iii) Given $(-1/216)$

We know that $1^3 = 1$ and $6^3 = 216$

Therefore $(-1/216) = -(1/6)^3$

15. Find the value of the following:

(i) $(-1/2)^2 \times 2^3 \times (3/4)^2$

(ii) $(-3/5)^4 \times (4/9)^4 \times (-15/18)^2$

Solution:

(i) Given $(-1/2)^2 \times 2^3 \times (3/4)^2$

$$\begin{aligned} (-1/2)^2 \times 2^3 \times (3/4)^2 &= 1/4 \times 8 \times 9/16 \\ &= 9/8 \end{aligned}$$

(ii) Given $(-3/5)^4 \times (4/9)^4 \times (-15/18)^2$

$$\begin{aligned} (-3/5)^4 \times (4/9)^4 \times (-15/18)^2 &= (81/625) \times (256/6561) \times (225/324) \\ &= (64/18225) \end{aligned}$$

16. If $a = 2$ and $b = 3$, find the values of each of the following:

(i) $(a + b)^a$

(ii) $(a b)^b$

(iii) $(b/a)^b$

(iv) $((a/b) + (b/a))^a$

Solution:

(i) Consider $(a + b)^a$

Given $a = 2$ and $b = 3$

$$(a + b)^a = (2 + 3)^2$$

$$= (5)^2$$

$$= 25$$

(ii) Given $a = 2$ and $b = 3$

Consider, $(a \times b)^b = (2 \times 3)^3$

$$= (6)^3$$

$$= 216$$

(iii) Given $a = 2$ and $b = 3$

Consider, $(b/a)^b = (3/2)^3$

$$= 27/8$$

(iv) Given $a = 2$ and $b = 3$

Consider, $((a/b) + (b/a))^a = ((2/3) + (3/2))^2$

$$= (4/9) + (9/4)$$

LCM of 9 and 6 is 36

$$= 169/36$$



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