

Chapter 11: Exponents and Powers

NCERT Exemplar · Class 7 · Maths

Questions

Question 1

$[(-3)^2]^3$ is equal to

(a) $(-3)^8$ (b) $(-3)^6$ (c) $(-3)^5$ (d) $(-3)^{23}$

Solution

Solution:-

(b) $(-3)^6$

For any non-zero integers 'a' and 'b' and whole numbers m and n,

$$(a^m)^n = a^{mn}$$

$$23(2 \times 3)$$

$$= -3^6$$

Question 2

For a non-zero rational number x, $x^8 \div x^2$ is equal to

(a) x^4 (b) x^6 (c) x^{10} (d) x^{16}

Solution

Solution:-

(b) x^6

For any non-zero integers 'a' and 'b' and whole numbers m and n,

$$a^m \div a^n = a^{m-n}, m > n$$

$$\text{so, } x^8 \div x^2$$

$$= x^8/x^2$$

$$= x^{8-2}$$

$$= x^6$$

Question 3

x is a non-zero rational number. Product of the square of x with the cube of x is equal to the

(a) second power of x (b) third power of x

(c) fifth power of x (d) sixth power of x

Solution

Solution:-

(c) fifth power of x

From the question, it is given that,

The square of x = x^2

The cube of x = x^3

As per the condition given in the question, $x^2 \times x^3$

For any non-zero integers 'a' and 'b' and whole numbers m and n,

$$a^m \times a^n = a^{m+n}$$

$$x^2 \times x^3 = x^{2+3}$$

$$= x^5$$

Therefore, fifth power of x.

Question 4

For any two non-zero rational numbers x and y, $x^5 \div y^5$ is equal to

(a) $(x \div y)^1$ (b) $(x \div y)^0$ (c) $(x \div y)^5$ (d) $(x \div y)^{10}$

Solution

Solution:-

$$(c) (x \div y)^5$$

For any non-zero integers 'a' and 'b' and whole numbers m and n,

$$a^m \div b^m = (a/b)^m$$

$$x^5 \div y^5 = (x/y)^5 = (x \div y)^5$$

Question 5

$a^m \times a^n$ is equal to

(a) $(a^2)^{mn}$ (b) a^{m-n} (c) a^{m+n} (d) a^{mn}

Solution

Solution:-

$$(c) a^{m+n}$$

$$a^m \times a^n \text{ is equal to } a^{m+n}$$

Question 6

$(1^0 + 2^0 + 3^0)$ is equal to

(a) 0 (b) 1 (c) 3 (d) 6

Solution

Solution:-

$$(c) 3$$

For any non-zero integers 'a' and 'b' and whole numbers m and n,

$$a^0 = 1$$

$$\text{So, } 1^0 = 1, 2^0 = 1, 3^0 = 1$$

$$\text{Then, } (1 + 1 + 1)$$

$$= 3$$

Question 7

Value of $(10^{22} + 10^{20})/10^{20}$ is

(a) 10 (b) 10^{42} (c) 101 (d) 10^{22}

Solution

Solution:-

(c) 101

By splitting, $(10^{22} + 10^{20})/10^{20}$ we get,

$$= (10^{22}/10^{20}) + (10^{20}/10^{20})$$

By using the rule $a^m \div a^n = a^{m-n}$, $m > n$

$$= 10^{(22-20)} + 1$$

$$= 10^2 + 1$$

$$= 100 + 1$$

$$= 101$$

Question 8

The standard form of the number 12345 is

(a) 1234.5×10^1 (b) 123.45×10^2

(c) 12.345×10^3 (d) 1.2345×10^4

Solution

Solution:-

(d) 1.2345×10^4

Any number can be expressed as a decimal number between 1.0 and 10.0 (including 1.0) multiplied by a power of 10. Such form of a number is called its standard form or scientific notation.

Question 9

If $2^{1998} - 2^{1997} - 2^{1996} + 2^{1995} = K2^{1995}$, then the value of K is

- (a) 1 (b) 2 (c) 3 (d) 4

Solution

Solution:-

- (c) 3

$$2^{1998} - 2^{1997} - 2^{1996} + 2^{1995} = K2^{1995}$$

By cross multiplication we get,

$$(2^{1998}/2^{1995}) - (2^{1997}/2^{1995}) - (2^{1996}/2^{1995}) + (2^{1995}/2^{1995}) = K$$

By the rule, $a^m \div a^n = a^{m-n}$, $m > n$

$$K = (2^{1998-1995}) - (2^{1997-1995}) - (2^{1996-1995}) + (2^{1995-1995})$$

$$K = 2^3 - 2^2 - 2^1 + 2^0$$

$$K = 8 - 4 - 2 + 1$$

$$K = 3$$

Question 10

Which of the following is equal to 1?

- (a) $2^0 + 3^0 + 4^0$ (b) $2^0 \times 3^0 \times 4^0$
(c) $(3^0 - 2^0) \times 4^0$ (d) $(3^0 - 2^0) \times (3^0 + 2^0)$

Solution

Solution:-

- (b) $2^0 \times 3^0 \times 4^0$

For any non-zero integers 'a' and 'b' and whole numbers m and n,

$$a^0 = 1$$

$$\text{So, } 2^0 = 1, 3^0 = 1, 4^0 = 1$$

$$\text{Then, } (1 \times 1 \times 1)$$

$$= 1$$

Question 11

In standard form, the number 72105.4 is written as 7.21054×10^n where n is equal to

(a) 2 (b) 3 (c) 4 (d) 5

Solution

Solution:-

(c) 4

Any number can be expressed as a decimal number between 1.0 and 10.0 (including 1.0) multiplied by a power of 10. Such form of a number is called its standard form or scientific notation.

72105.4 is written as 7.21054×10^4

Question 12

Square of $(-2/3)$ is

(a) $-2/3$ (b) $2/3$ (c) $-4/9$ (d) $4/9$

Solution

Solution:-

(d) $4/9$

$$\text{Square of } (-2/3) \text{ is } = -2^2/3^2$$

$$= (-2 \times -2)/(3 \times 3)$$

$$= 4/9$$

Question 13

cube of $(-1/4)$ is

(a) $-1/12$ (b) $1/16$ (c) $-1/64$ (d) $1/64$

Solution

Solution:-

(c) $-1/64$

Cube of $(-1/4)$ is $= -1^3/4^3$

$$= (-1 \times -1 \times -1)/(4 \times 4 \times 4)$$

$$= -1/64$$

Question 14

Which of the following is not equal to $(-5/4)^4$?

(a) $(-5)^4/4^4$ (b) $5^4/(-4)^4$

(c) $-(5^4/4^4)$ (d) $(-5/4) \times (-5/4) \times (-5/4) \times (-5/4)$

Solution

Solution:-

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

Question 15

Which of the following is not equal to 1 ?

(a) $(2^3 \times 3^3)/(4 \times 18)$ (b) $[(-2)^3 \times (-2)^4] \div (-2)^2$

(c) $(3^0 \times 5^3)/(5 \times 25)$ (d) $2^4/(7^0 + 3^0)^3$

Solution

Solution:-

(d) $2^4/(7^0 + 3^0)^3$

$$= 2^4/(1 + 1)^3$$

$$= 2^4/2^3$$

Question 16

$(2/3)^3 \times (5/7)^3$ is equal to

(a) $((2/3) \times (5/7))^9$ (b) $((2/3) \times (5/7))^6$

(c) $((2/3) \times (5/7))^3$ (d) $((2/3) \times (5/7))^0$

Solution

Solution:-

(c) $((2/3) \times (5/7))^3$

For any non-zero integers 'a' and 'b' and whole numbers m and n.

$$a^m \times b^m = (ab)^m$$

Question 17

In standard form, the number 829030000 is written as $K \times 10^8$ where K is equal to (a) 82903 (b) 829.03
(c) 82.903 (d) 8.2903

Solution

Solution:-

(d) 8.2903

Any number can be expressed as a decimal number between 1.0 and 10.0 (including 1.0) multiplied by a power of 10. Such form of a number is called its standard form or scientific notation.

829030000 is written as 8.2903×10^8

Question 18

Which of the following has the largest value?

(a) 0.0001 (b) $1/10000$ (c) $1/10^6$ (d) $(1/10^6) \div 0.1$

Solution

Solution:-

(a) 0.0001 and (b) $1/10000 = 0.0001$

Question 19

In standard form 72 crore is written as

(a) 72×10^7 (b) 72×10^8 (c) 7.2×10^8 (d) 7.2×10^7

Solution

Solution:-

(c) 7.2×10^8

Any number can be expressed as a decimal number between 1.0 and 10.0 (including 1.0) multiplied by a power of 10. Such form of a number is called its standard form or scientific notation.

72 crore is written as $= 72,00,00,000 = 7.2 \times 10^8$

Question 20

For non-zero numbers a and b, $(a/b)^m \div (a/b)^n$, where $m > n$, is equal to

(a) $(a/b)^{mn}$ (b) $(a/b)^{m+n}$ (c) $(a/b)^{m-n}$ (d) $((a/b)^m)^n$

Solution

Solution:-

(c) $(a/b)^{m-n}$

For any non-zero integers 'a' and 'b' and whole numbers m and n,

$$a^m \div a^n = a^{m-n}, m > n$$

Question 21

Which of the following is not true?

(a) $3^2 > 2^3$ (b) $4^3 = 2^6$ (c) $3^3 = 9$ (d) $25 > 5$

Solution**Solution:-**

$$(c) 3^3 = 9$$

$$3 \times 3 \times 3 = 27$$

Therefore, $27 > 9$

Question 22

Which power of 8 is equal to 2^6 ?

(a) 3 (b) 2 (c) 1 (d) 4

Solution**Solution:-**

(b) 2

$$2^6 = 2 \times 2 \times 2 \times 2 \times 2 \times 2$$

$$= 64$$

$$8^2 = 8 \times 8 = 64$$

In questions 23 to 39, fill in the blanks to make the statements true.

Question 23

$$(-2)^{31} \times (-2)^{13} = (-2)$$

Solution**Solution:-**

$$(-2)^{31} \times (-2)^{13} = (-2)^{44}$$

For any non-zero integers 'a' and 'b' and whole numbers m and n,

$$a^m \times a^n = a^{m+n}$$

$$(-2)^{31} \times (-2)^{13} = (-2)^{31+13}$$

$$= -2^{44}$$

Question 24

$$(-3)^8 \div (-3)^5 = (-3)$$

Solution

Solution:-

$$(-3)^8 \div (-3)^5 = (-3)^3$$

For any non-zero integers 'a' and 'b' and whole numbers m and n,

$$a^m \div a^n = a^{m-n}, m > n$$

$$(-3)^8 \div (-3)^5 = (-3)^{8-5}$$

$$= -3^3$$

Question 25

$$(11/15)^4 \times ()^5 = (11/15)^9$$

Solution

Solution:-

$$(11/15)^4 \times (11/15)^5 = (11/15)^9$$

We know that,

For any non-zero integers 'a' and 'b' and whole numbers m and n,

$$a^m \times a^n = a^{m+n}$$

$$\text{Therefore, } (11/15)^4 \times (11/15)^5 = (11/15)^9$$

Question 26

$$(-1/4)^3 \times (-1/4) = (-1/4)^{11}$$

Solution

Solution:-

$$(-1/4)^3 \times (-1/4)^8 = (-1/4)^{11}$$

We know that,

For any non-zero integers 'a' and 'b' and whole numbers m and n,

$$a^m \times a^n = a^{m+n}$$

Let us assume missing power be y,

$$\text{Then, } (-1/4)^3 \times (-1/4)^y = (-1/4)^{11}$$

$$(-1/4)^y = (-1/4)^{11}/(-1/4)^3$$

$$(-1/4)^y = (-1/4)^{11-3}$$

$$(-1/4)^y = (-1/4)^8$$

Question 27

$$[(7/11)^3]^4 = (7/11)$$

Solution

Solution:-

$$3412$$

For any non-zero integers 'a' and 'b' and whole numbers m and n,

$$(a^m)^n = a^{mn}$$

$$34(3 \times 4)$$

$$= (7/11)^{12}$$

Question 28

$$(6/13)^{10} \div [(6/13)^5]^2 = (6/13)$$

Solution**Solution:-**

$$(6/13)^{10} \div [(6/13)^5]^2 = (6/13)^0$$

In the given question first consider $[(6/13)^5]^2$

For any non-zero integers 'a' and 'b' and whole numbers m and n,

$$(a^m)^n = a^{mn}$$

$$52(5 \times 2)$$

$$= (6/13)^{10}$$

$$\text{Then, } (6/13)^{10} \div (6/13)^{10}$$

For any non-zero integers 'a' and 'b' and whole numbers m and n,

$$a^m \div a^n = a^{m-n}, m > n$$

$$(6/13)^{10} \div (6/13)^{10} = (6/13)^{10-10}$$

$$= (6/13)^0$$

Question 29

$$[(-1/4)^{16}]^2 = (-1/4)$$

Solution**Solution:-**

$$16232$$

For any non-zero integers 'a' and 'b' and whole numbers m and n,

$$(a^m)^n = a^{mn}$$

$$162(16 \times 2)$$

$$= (-1/4)^{32}$$

Question 30

$$(13/14)^5 \div ()^2 = (13/14)^3$$

Solution

Solution:-

$$(13/14)^5 \div (13/14)^2 = (13/14)^3$$

We know that,

For any non-zero integers 'a' and 'b' and whole numbers m and n,

$$a^m \div a^n = a^{m-n}, m > n$$

$$\text{Therefore, } (13/14)^5 \div (13/14)^2 = (13/14)^{5-2}$$

$$= (13/14)^3$$

Question 31

$$a^6 \times a^5 \times a^0 = a$$

Solution

Solution:-

$$a^6 \times a^5 \times a^0 = a^{11}$$

We know that,

For any non-zero integers 'a' and 'b' and whole numbers m and n,

$$a^m \times a^n \times a^0 = a^{m+n+0}$$

$$a^6 \times a^5 \times a^0 = a^{5+6+0}$$

$$= a^{11}$$

Question 32

$$1 \text{ lakh} = 10$$

Solution

Solution: –

$$1 \text{ lakh} = 10^5$$

Any number can be expressed as a decimal number between 1.0 and 10.0 (including 1.0) multiplied by a power of 10. Such form of a number is called its standard form or scientific notation.

$$1 \text{ lakh} = 1,00,000$$

$$= 10^5$$

Question 33

1 million = 10

Solution

Solution:-

$$1 \text{ million} = 10^6$$

Any number can be expressed as a decimal number between 1.0 and 10.0 (including 1.0) multiplied by a power of 10. Such form of a number is called its standard form or scientific notation.

$$1 \text{ million} = 10,00,000$$

$$= 10^6$$

Question 34

729 = 3

Solution

Solution: –

$$729 = 3^6$$

Now, we have to find out the factors of 729.

$$\begin{array}{r|l}
 3 & 729 \\
 \hline
 3 & 243 \\
 \hline
 3 & 81 \\
 \hline
 3 & 27 \\
 \hline
 3 & 9 \\
 \hline
 3 & 3 \\
 \hline
 & 1
 \end{array}$$

Therefore, factors of 729 are = $3 \times 3 \times 3 \times 3 \times 3 \times 3$

$$729 = 3^6$$

Question 35

$$432 = 2^4 \times 3$$

Solution

Solution:-

$$432 = 2^4 \times 3^3$$

Now, we have to find out the factors of 432.

$$\begin{array}{r|l}
 2 & 432 \\
 \hline
 2 & 216 \\
 \hline
 2 & 108 \\
 \hline
 2 & 54 \\
 \hline
 2 & 27 \\
 \hline
 3 & 27 \\
 \hline
 3 & 9 \\
 \hline
 3 & 3 \\
 \hline
 & 1
 \end{array}$$

Therefore, factors of 432 are = $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3$

$$432 = 2^4 \times 3^3$$

Question 36

$$53700000 = \text{---} \times 10^7$$

Solution

Solution:-

$$53700000 = 5.37 \times 10^7$$

$$= (53700000/10000000) \times 10000000$$

$$= 5.37 \times 10^7$$

Any number can be expressed as a decimal number between 1.0 and 10.0 (including 1.0) multiplied by a power of 10. Such form of a number is called its standard form or scientific notation

Question 37

$$88880000000 = \text{---} \times 10^{10}$$

Solution

Solution:-

$$88880000000 = 8.888 \times 10^{10}$$

$$= (88880000000/10000000000) \times 10000000000$$

$$= 8.888 \times 10^{10}$$

Question 38

$$27500000 = 2.75 \times 10\text{---}$$

Solution

Solution:-

$$27500000 = 2.75 \times 10^7$$

$$= (27500000/10000000) \times 10000000$$

$$= 2.75 \times 10^7$$

Question 39

$$340900000 = 3.409 \times 10\text{---}$$

Solution

Solution:-

$$\begin{aligned} 340900000 &= 3.409 \times 10^8 \\ &= (340900000/1000000000) \times 1000000000 \\ &= 3.409 \times 10^8 \end{aligned}$$

Question 40

Fill in the blanks with $<$, $>$ or $=$ sign.

(a) 3^2 _____ 15

Solution

Solution:-

$$3^2 < 15$$

Where, $3^2 = 3 \times 3 = 9$

Therefore, $9 < 15$

(b) 2^3 _____ 3^2

Solution:-

$$2^3 < 3^2$$

Where, $2^3 = 2 \times 2 \times 2 = 8$

$$3^2 = 3 \times 3 = 9$$

Therefore, $8 < 9$

(c) 7^4 _____ 5^4

Solution:-

$$7^4 > 5^4$$

Where, $7^4 = 7 \times 7 \times 7 \times 7 = 2401$

$$5 \times 5 \times 5 \times 5 = 625$$

Therefore, $2401 > 625$

(d) $10,000$ _____ 10^5

Solution:-

$$10,000 < 100000$$

$$\text{Where, } 10 \times 10 \times 10 \times 10 \times 10 = 100000$$

$$\text{Therefore, } 10,000 < 100000$$

(e) 6^3 _____ 4^4

Solution:-

$$6^3 < 4^4$$

$$\text{Where, } 6^3 = 6 \times 6 \times 6 = 216$$

$$4^4 = 4 \times 4 \times 4 \times 4 = 256$$

$$\text{Therefore, } 216 < 256$$

In questions 41 to 50, state whether the given statements are True or False.

Question 41

One million = 10^7

Solution

Solution:-

False.

$$\text{We know that, } 1 \text{ million} = 10,00,000$$

$$= 10^6$$

Question 42

One hour = 60^2 seconds

Solution

Solution:-

True.

We know that, 1 hour = 60 minutes

1 minutes = 60 seconds

Therefore, 1 hour = $60 \times 60 = 3600$ seconds

Question 43

$$1^0 \times 0^1 = 1$$

Solution

Solution:-

False

$$1^0 = 1$$

$$0^1 = 0$$

$$\text{So, } 1 \times 0 = 0$$

Question 44

$$(-3)^4 = -12$$

Solution

Solution:-

False.

$$(-3)^4 = -3 \times -3 \times -3 \times -3 = 81$$

$$\text{So, } 81 \neq -12$$

Question 45

$$3^4 > 4^3$$

Solution

Solution:-

True.

$$3^4 = 3 \times 3 \times 3 \times 3 = 81$$

$$4^3 = 4 \times 4 \times 4 = 64$$

Therefore, $81 > 64$

Question 46

$$(-3/5)^{100} = (-3^{100}/5^{100})$$

Solution

Solution:-

True.

$$\text{Consider the LHS} = (-3/5)^{100}$$

$$-3 \text{ can be written as } = (-1 \times 3)$$

$$\text{So, } ((-1 \times 3)/5)^{100}$$

$$= (-1^{100} \times 3^{100})/5^{100}$$

$$= (1 \times 3^{100})/5^{100}$$

$$= 3^{100}/5^{100}$$

$$\text{Then, consider the RHS} = -3^{100}/-5^{100}$$

$$= 3^{100}/5^{100}$$

By comparing LHS and RHS,

$$\text{LHS} = \text{RHS}$$

$$3^{100}/5^{100} = 3^{100}/5^{100}$$

Therefore, $(-3/5)^{100} = (-3^{100}/5^{100})$

Question 47

$$(10 + 10)^{10} = 10^{10} + 10^{10}$$

Solution

Solution:-

False.

For any non-zero integers 'a' and 'b' and whole numbers m and n,

$$a^m \times a^n = a^{m+n}$$

Question 48

$x^0 \times x^0 = x^0 \div x^0$ is true for all non-zero values of x.

Solution

Solution:-

True.

we know that, $x^0 = 1$

$$\text{so, } x^0 \times x^0 = 1 \times 1 = 1$$

$$x^0 \div x^0 = 1 \div 1 = 1$$

Therefore, $x^0 \times x^0 = x^0 \div x^0$

$$1 = 1$$

Question 49

In the standard form, a large number can be expressed as a decimal number between 0 and 1, multiplied by a power of 10.

Solution

Solution:-

False

Any number can be expressed as a decimal number between 1.0 and 10.0 (including 1.0) multiplied by a power of 10. Such form of a number is called its standard form or scientific notation.

Question 50

4^2 is greater than 2^4 .

Solution

Solution:-

False.

$$4^2 = 4 \times 4 = 16$$

$$2^4 = 2 \times 2 \times 2 \times 2 = 16$$

Therefore, $4^2 = 2^4$
