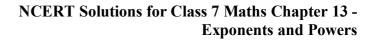
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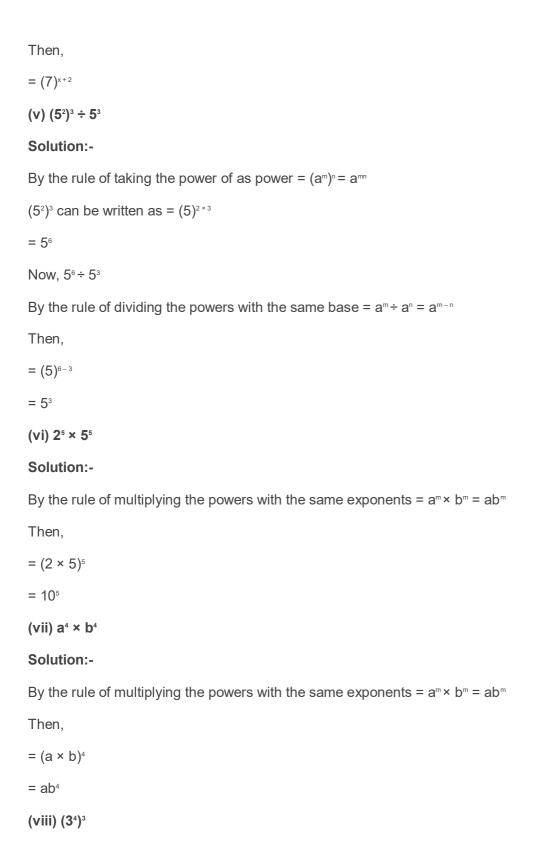
# EXERCISE 13.2

1. Using laws of exponents, simplify and write the answer in exponential form:
(i) $3^2 \times 3^4 \times 3^8$
Solution:-
By the rule of multiplying the powers with the same base = $a^m \times a^n = a^{m+n}$
Then,
$= (3)^{2+4+8}$
$=3^{14}$
(ii) 6 <sup>15</sup> ÷ 6 <sup>10</sup>
Solution:-
By the rule of dividing the powers with the same base = $a^m \div a^n = a^{m-n}$
Then,
$= (6)^{15-10}$
= 65
(iii) a³ × a²
Solution:-
By the rule of multiplying the powers with the same base = $a^m \times a^n = a^{m+n}$
Then,
$= (a)^{3+2}$
= a <sup>5</sup>
(iv) $7^x \times 7^2$
Solution:-

By the rule of multiplying the powers with the same base =  $a^m \times a^n = a^{m+n}$ 









### Solution:-

By the rule of taking the power of as power =  $(a^m)^n = a^{mn}$ 

 $(3^4)^3$  can be written as =  $(3)^{4 \times 3}$ 

= 312

(ix)  $(2^{20} \div 2^{15}) \times 2^3$ 

#### Solution:-

By the rule of dividing the powers with the same base =  $a^m \div a^n = a^{m-n}$ 

(220 ÷ 215) can be simplified as,

 $= (2)^{20-15}$ 

= 25

Then,

By the rule of multiplying the powers with the same base =  $a^m \times a^n = a^{m+n}$ 

2<sup>5</sup> × 2<sup>3</sup> can be simplified as,

 $= (2)^{5+3}$ 

= 28

(x)  $8^t \div 8^2$ 

### Solution:-

By the rule of dividing the powers with the same base =  $a^m \div a^n = a^{m-n}$ 

Then,

 $= (8)^{t-2}$ 

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

(i) 
$$(2^3 \times 3^4 \times 4)/(3 \times 32)$$

## Solution:-

Factors of  $32 = 2 \times 2 \times 2 \times 2 \times 2$ 

= 25

Factors of  $4 = 2 \times 2$ 



Then,

$$= (2^3 \times 3^4 \times 2^2)/(3 \times 2^5)$$

= 
$$(2^{3+2} \times 3^4) / (3 \times 2^5) \dots [\because a^m \times a^n = a^{m+n}]$$

$$= (2^5 \times 3^4) / (3 \times 2^5)$$

$$= 2^{5-5} \times 3^{4-1} \dots [\because a^m \div a^n = a^{m-n}]$$

$$= 2^{\circ} \times 3^{\circ}$$

$$= 1 \times 3^3$$

$$= 3^{3}$$

(ii) 
$$((5^2)^3 \times 5^4) \div 5^7$$

### Solution:-

$$(5^2)^3$$
 can be written as =  $(5)^{2 \times 3}$  ... [: $(a^m)^n = a^{mn}$ ]

$$= 5^{6}$$

Then,

$$= (5^6 \times 5^4) \div 5^7$$

= 
$$(5^{6+4}) \div 5^7 \dots [\because a^m \times a^n = a^{m+n}]$$

$$=5^{10} \div 5^7$$

$$= 5^{10-7} \dots [\because a^m \div a^n = a^{m-n}]$$

 $= 5^{3}$ 

# Solution:-

$$(25)^4$$
 can be written as =  $(5 \times 5)^4$ 

$$= (5^2)^4$$

$$(5^2)^4$$
 can be written as =  $(5)^{2 \times 4}$  ... [: $(a^m)^n = a^{mn}$ ]

= 5<sup>8</sup>

Then,



$$= 5^8 \div 5^3$$

= 
$$5^{8-3}$$
 ... [: $a^m \div a^n = a^{m-n}$ ]

= 5<sup>5</sup>

(iv) 
$$(3 \times 7^2 \times 11^8)/(21 \times 11^3)$$

### Solution:-

Factors of  $21 = 7 \times 3$ 

Then,

= 
$$(3 \times 7^2 \times 11^8)/(7 \times 3 \times 11^3)$$

$$= 3^{1-1} \times 7^{2-1} \times 11^{8-3}$$

$$= 3^{\circ} \times 7 \times 11^{\circ}$$

$$= 1 \times 7 \times 11^{5}$$

$$= 7 \times 11^{5}$$

(v) 
$$3^7/(3^4 \times 3^3)$$

## Solution:-

$$= 3^{7}/(3^{4+3}) \dots [\because a^{m} \times a^{n} = a^{m+n}]$$

 $= 3^7/3^7$ 

$$= 3^{7-7} \dots [:a^m \div a^n = a^{m-n}]$$

 $= 3^{\circ}$ 

= 1

(vi) 
$$2^{\circ} + 3^{\circ} + 4^{\circ}$$

## Solution:-

$$= 1 + 1 + 1$$

= 3

(vii) 
$$2^{\circ} \times 3^{\circ} \times 4^{\circ}$$

## Solution:-

$$= 1 \times 1 \times 1$$



= 1

(viii) 
$$(3^{\circ} + 2^{\circ}) \times 5^{\circ}$$

### Solution:-

$$= (1 + 1) \times 1$$

$$= (2) \times 1$$

= 2

(ix) 
$$(2^8 \times a^5)/(4^3 \times a^3)$$

## Solution:-

 $(4)^3$  can be written as =  $(2 \times 2)^3$ 

$$= (2^2)^3$$

 $(2^2)^3$  can be written as =  $(2)^{2\times 3}$  ...  $[\because (a^m)^n = a^{mn}]$ 

 $= 2^{6}$ 

Then,

= 
$$(2^8 \times a^5)/(2^6 \times a^3)$$

$$= 2^{8-6} \times a^{5-3} \dots [\because a^m \div a^n = a^{m-n}]$$

$$= 2^2 \times a^2 \dots [\because (a^m)^n = a^{mn}]$$

 $= 2a^2$ 

# $(x) (a^5/a^3) \times a^8$

#### Solution:-

= 
$$(a^{5-3}) \times a^8 \dots [:a^m \div a^n = a^{m-n}]$$

$$= a^2 \times a^8$$

= 
$$a^{2+8}$$
 ... [: $a^m \times a^n = a^{m+n}$ ]

= a<sup>10</sup>

# (xi) $(4^5 \times a^8b^3)/(4^5 \times a^5b^2)$

## Solution:-

= 
$$4^{5-5} \times (a^{8-5} \times b^{3-2}) \dots [\because a^m \div a^n = a^{m-n}]$$



$$= 4^{\circ} \times (a^{3}b)$$

$$= 1 \times a^3b$$

 $= a^3b$ 

(xii) 
$$(2^3 \times 2)^2$$

## Solution:-

= 
$$(2^{3+1})^2$$
 ... [: $a^m \times a^n = a^{m+n}$ ]

$$= (2^4)^2$$

$$(2^4)^2$$
 can be written as =  $(2)^{4 \times 2}$  ... [: $(a^m)^n = a^{mn}$ ]

= 28

# 3. Say true or false and justify your answer:

(i) 
$$10 \times 10^{11} = 100^{11}$$

### Solution:-

Let us consider Left Hand Side (LHS) = 10 × 10<sup>11</sup>

= 
$$10^{1+11}$$
 ... [: $a^m \times a^n = a^{m+n}$ ]

 $= 10^{12}$ 

Now, consider Right Hand Side (RHS) = 10011

$$= (10 \times 10)^{11}$$

$$= (10^{1+1})^{11}$$

$$= (10^2)^{11}$$

= 
$$(10)^{2 \times 11} \dots [\because (a^m)^n = a^{mn}]$$

 $= 10^{22}$ 

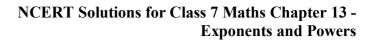
By comparing LHS and RHS,

LHS ≠ RHS

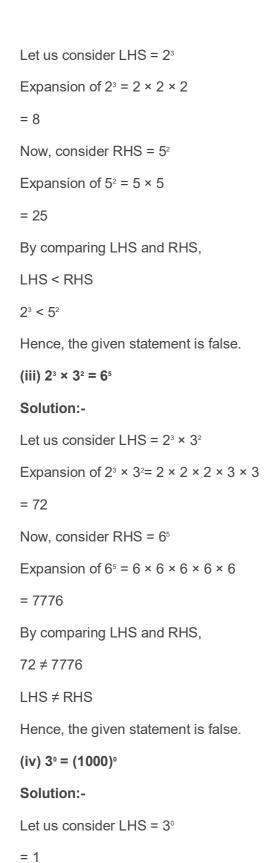
Hence, the given statement is false.

(ii)  $2^3 > 5^2$ 

### Solution:-









Now, consider RHS = 1000° = 1

By comparing LHS and RHS,

LHS = RHS

 $3^{\circ} = 1000^{\circ}$ 

Hence, the given statement is true.

- 4. Express each of the following as a product of prime factors only in exponential form:
- (i) 108 × 192

### Solution:-

The factors of  $108 = 2 \times 2 \times 3 \times 3 \times 3$ 

 $= 2^2 \times 3^3$ 

The factors of  $192 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3$ 

 $= 2^6 \times 3$ 

Then,

$$= (2^2 \times 3^3) \times (2^6 \times 3)$$

$$= 2^{_{^{2+6}}} \times 3^{_{^{3+1}}} \ldots [\because a^m \times a^n = a^{_{^{m+n}}}]$$

 $= 2^8 \times 3^4$ 

## (ii) 270

### Solution:-

The factors of 270 =  $2 \times 3 \times 3 \times 3 \times 5$ 

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

## (iii) 729 × 64

The factors of 729 =  $3 \times 3 \times 3 \times 3 \times 3 \times 3$ 

= 36

The factors of  $64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2$ 

 $= 2^{6}$ 



Then,

$$= (3^6 \times 2^6)$$

$$= 3^6 \times 2^6$$

(iv) 768

### Solution:-

The factors of 768 =  $2 \times 2 \times 3$ 

$$= 2^8 \times 3$$

# 5. Simplify:

(i) 
$$((2^5)^2 \times 7^3)/(8^3 \times 7)$$

## Solution:-

 $8^{3}$  can be written as =  $(2 \times 2 \times 2)^{3}$ 

$$= (2^3)^3$$

We have,

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

= 
$$(2^{5 \times 2} \times 7^3)/((2^{3 \times 3} \times 7) \dots [\because (a^m)^n = a^{mn}]$$

$$= (2^{10} \times 7^3)/(2^9 \times 7)$$

= 
$$(2^{10-9} \times 7^{3-1}) \dots [\because a^m \div a^n = a^{m-n}]$$

$$= 2 \times 7^2$$

$$= 2 \times 7 \times 7$$

(ii) 
$$(25 \times 5^2 \times t^8)/(10^3 \times t^4)$$

#### Solution:-

25 can be written as =  $5 \times 5$ 

$$= 5^{2}$$

 $10^{3}$  can be written as =  $10^{3}$ 

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



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

We have,

= 
$$(5^2 \times 5^2 \times t^8)/(5^3 \times 2^3 \times t^4)$$

= 
$$(5^{2+2} \times t^8)/(5^3 \times 2^3 \times t^4) \dots [\because a^m \times a^n = a^{m+n}]$$

= 
$$(5^4 \times t^8)/(5^3 \times 2^3 \times t^4)$$

= 
$$(5^{4-3} \times t^{8-4})/2^3 \dots [\because a^m \div a^n = a^{m-n}]$$

$$= (5 \times t^4)/(2 \times 2 \times 2)$$

$$= (5t^4)/8$$

(iii) 
$$(3^5 \times 10^5 \times 25)/(5^7 \times 6^5)$$

## Solution:-

10<sup>5</sup> can be written as = (5 × 2)<sup>5</sup>

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

25 can be written as =  $5 \times 5$ 

$$= 5^{2}$$

6<sup>5</sup> can be written as =  $(2 \times 3)^5$ 

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

Then we have,

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

= 
$$(3^5 \times 5^{5+2} \times 2^5)/(5^7 \times 2^5 \times 3^5) \dots [\because a^m \times a^n = a^{m+n}]$$

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

$$= (3^{5-5} \times 5^{7-7} \times 2^{5-5})$$

= 
$$(3^{\circ} \times 5^{\circ} \times 2^{\circ}) \dots [\because a^{m} \div a^{n} = a^{m-n}]$$

$$= 1 \times 1 \times 1$$

= 1