

## Exercise 13.1

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### Question 1.

Find the value of:

(i)  $2^6$

**Solution:-**

Simplifying the given value.  
 $= 2 \times 2 \times 2 \times 2 \times 2 \times 2$   
 $= 64$

(ii)  $9^3$

**Solution:-**

Simplifying the given value.  
 $= 9 \times 9 \times 9$   
 $= 729$

(iii)  $11^2$

**Solution:-**

Simplifying the given value.  
 $= 11 \times 11$   
 $= 121$

(iv)  $5^4$

**Solution:-**

Simplifying the given value.  
 $= 5 \times 5 \times 5 \times 5$   
 $= 625$

### Question 2.

Express the following in exponential form:

(i)  $6 \times 6 \times 6 \times 6$

**Solution:-**

Converting the given value in exponential form,  $6^4$ .

(ii)  $t \times t$

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**Solution:-**

Converting the given value in exponential form,  $t^2$ .

(iii)  $b \times b \times b \times b$

**Solution:-**

Converting the given value in exponential form,  $b^4$ .

(iv)  $5 \times 5 \times 7 \times 7 \times 7$

**Solution:-**

Converting the given value in exponential form,  $5^2 \times 7^3$ .

(v)  $2 \times 2 \times a \times a$

**Solution:-**

Converting the given value in exponential form,  $2^2 \times a^2$ .

(vi)  $a \times a \times a \times c \times c \times c \times c \times d$

**Solution:-**

Converting the given value in exponential form,  $a^3 \times c^4 \times d$ .

**Question 3.**

**Express each of the following numbers using exponential notation:**

(i) 512

**Solution:-**

First find the factors of  $512 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$   
Now, converting the given value in exponential form i.e.  $2^9$ .

(ii) 343

**Solution:-**

First find the factors of  $343 = 7 \times 7 \times 7$   
Now, converting the given value in exponential form i.e.  $7^3$ .

(iii) 729

**Solution:-**

First find the factors of  $729 = 3 \times 3 \times 3 \times 3 \times 3 \times 3$   
Now, converting the given value in exponential form i.e.  $3^6$ .

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**(iv) 3125**

**Solution:-**

First find the factors of  $3125 = 5 \times 5 \times 5 \times 5 \times 5$

Now, converting the given value in exponential form i.e.  $5^5$ .

**Question 4.**

**Identify the greater number, wherever possible, in each of the following?**

**(i)  $4^3$  or  $3^4$**

**Solution:-**

Expanding the value into simpler form  $4^3 = 4 \times 4 \times 4 = 64$

Expanding the value into simpler form  $3^4 = 3 \times 3 \times 3 \times 3 = 81$

Comparing,

$$64 < 81$$

$$\text{So, } 4^3 < 3^4$$

So  $3^4$  is the greater number.

**(ii)  $5^3$  or  $3^5$**

**Solution:-**

Expanding the value into simpler form  $5^3 = 5 \times 5 \times 5 = 125$

Expanding the value into simpler form  $3^5 = 3 \times 3 \times 3 \times 3 \times 3 = 243$

Comparing,

$$125 < 243$$

$$\text{So, } 5^3 < 3^5$$

So  $3^5$  is the greater number.

**(iii)  $2^8$  or  $8^2$**

**Solution:-**

Expanding the value into simpler form  $2^8 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 256$

Expanding the value into simpler form  $8^2 = 8 \times 8 = 64$

Comparing,

$$256 > 64$$

$$\text{So, } 2^8 > 8^2$$

So  $2^8$  is the greater number.

**(iv)  $100^2$  or  $2^{100}$**

**Solution:-**

Expanding the value into simpler form  $100^2 = 100 \times 100 = 10000$

Expanding the value into simpler form  $2^{100}$

$$2^{10} = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 1024$$

Then,

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$$2^{100} =$$

$$1024 \times 1024 \times 1024 \times 1024 \times 1024 \times 1024 \times 1024 \times 1024 \times 1024 \times 1024$$

Comparing,

$$100^2 < 2^{100}$$

So  $2^{100}$  is the greater number.

**(v)  $2^{10}$  or  $10^2$**

**Solution:-**

Expanding the value into simpler form  $2^{10} = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 1024$

Expanding the value into simpler form  $10^2 = 10 \times 10 = 100$

Comparing,

$$1024 > 100$$

So,  $2^{10} > 10^2$

So  $2^{10}$  is the greater number.

**Question 5.**

**Express each of the following as product of powers of their prime factors:**

**(i) 648**

**Solution:-**

Finding the factors of given value  $648 = 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3$   
 $= 2^3 \times 3^4$

**(ii) 405**

**Solution:-**

Finding the factors of given value  $405 = 3 \times 3 \times 3 \times 3 \times 5$   
 $= 3^4 \times 5$

**(iii) 540**

**Solution:-**

Finding the factors of given value  $540 = 2 \times 2 \times 3 \times 3 \times 3 \times 5$   
 $= 2^2 \times 3^3 \times 5$

**(iv) 3,600**

**Solution:-**

Finding the factors of given value  
 $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5 = 3600$   
 $= 2^4 \times 3^2 \times 5^2$

**Question 6.**

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**Simplify:**

(i)  $2 \times 10^3$

**Solution:-**

Simplifying the value,  
 $= 2 \times 10 \times 10 \times 10$   
 $= 2 \times 1000$   
 $= 2000$

(ii)  $7^2 \times 2^2$

**Solution:-**

Simplifying the value,  
 $= 7 \times 7 \times 2 \times 2$   
 $= 49 \times 4$   
 $= 196$

(iii)  $2^3 \times 5$

**Solution:-**

Simplifying the value,  
 $= 2 \times 2 \times 2 \times 5$   
 $= 8 \times 5$   
 $= 40$

(iv)  $3 \times 4^4$

**Solution:-**

Simplifying the value,  
 $= 3 \times 4 \times 4 \times 4 \times 4$   
 $= 3 \times 256$   
 $= 768$

(v)  $0 \times 10^2$

**Solution:-**

Simplifying the value,  
 $= 0 \times 10 \times 10$   
 $= 0 \times 100$   
 $= 0$

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

**Solution:-**

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Simplifying the value,  
 $= 5 \times 5 \times 3 \times 3 \times 3$   
 $= 25 \times 27$   
 $= 675$

**(vii)  $2^4 \times 3^2$**

**Solution:-**

Simplifying the value,  
 $= 2 \times 2 \times 2 \times 2 \times 3 \times 3$   
 $= 16 \times 9$   
 $= 144$

**(viii)  $3^2 \times 10^4$**

**Solution:-**

Simplifying the value,  
 $= 3 \times 3 \times 10 \times 10 \times 10 \times 10$   
 $= 9 \times 10000$   
 $= 90000$

**Question 7.**

**Simplify:**

**(i)  $(-4)^3$**

**Solution:-**

Expanding the value into simpler form  $-4^3$   
 $= -4 \times -4 \times -4$   
 $= -64$

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

**Solution:-**

Expanding the value into simpler form  $(-3) \times (-2)^3$   
 $= -3 \times -2 \times -2 \times -2$   
 $= -3 \times -8$   
 $= 24$

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

**Solution:-**

Expanding the value into simpler form  $(-3)^2 \times (-5)^2$   
 $= -3 \times -3 \times -5 \times -5$   
 $= 9 \times 25$

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$$= 225$$

(iv)  $(-2)^3 \times (-10)^3$

**Solution:-**

Expanding the value into simpler form  $(-2)^3 \times (-10)^3$   
 $= -2 \times -2 \times -2 \times -10 \times -10 \times -10$   
 $= -8 \times -1000$   
 $= 8000$

**Question 8.**

**Compare the following numbers:**

(i)  $2.7 \times 10^{12}$  ;  $1.5 \times 10^8$

**Solution:-**

From the question it can be observed that  
Comparing the exponents of base 10,  
 $2.7 \times 10^{12} > 1.5 \times 10^8$

(ii)  $4 \times 10^{14}$  ;  $3 \times 10^{17}$

**Solution:-**

From the question it can be observed that  
Comparing the exponents of base 10,  
 $4 \times 10^{14} < 3 \times 10^{17}$