



# Exponents and Logarithms

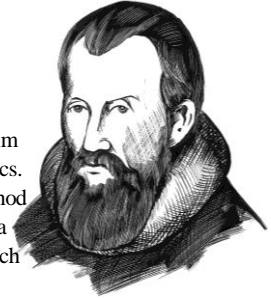
## Exercise-4.1

After reading this chapter, the students will be able to — Scottish mathematician



1. explain the rational exponent
2. explain and apply the positive integral exponents, zero and negative integral exponents
3. solve the problems by describing and applying the rules of exponents
4. explain the  $n^{\text{th}}$  root and rational fractional exponents and express the  $n^{\text{th}}$  root in terms of exponents

*John Napier* (1550-1671) had the eagerness on Astronomy which helps him to contribute in mathematics. He invented a special method to count large numbers in a better and simple way which is known as *logarithm*.



## Exercise Questions

■ 22 Exercise Questions



### Exercise Questions and Solutions



Practice the Solutions of this part properly. It will help you to solve the Creative Questions easily.

**Simplify (1 – 10) :**

1.  $\frac{3^3 \cdot 3^5}{3^6}$

**Solution:**  $\frac{3^3 \cdot 3^5}{3^6} = \frac{3^{3+5}}{3^6} = \frac{3^8}{3^6} = 3^{8-6} = 3^2 = 9$  (Ans.)

2.  $\frac{5^3 \cdot 8}{2^4 \cdot 125}$

**Solution:**  $\frac{5^3 \cdot 8}{2^4 \cdot 125} = \frac{5^3 \cdot 2^3}{2^4 \cdot 5^3} = 5^{3-3} \cdot 2^{3-4} = 5^0 \cdot 2^{-1} = 1 \cdot \frac{1}{2} = \frac{1}{2}$  (Ans.)

3.  $\frac{7^3 \times 7^{-3}}{3 \times 3^{-4}}$

**Solution:**  $\frac{7^3 \times 7^{-3}}{3 \times 3^{-4}} = \frac{7^{3-3}}{3^{1-4}} = \frac{7^0}{3^{-3}} = \frac{1}{3^{-3}} = 1 \times 3^3 = 27$  (Ans.)

4.  $\frac{\sqrt[3]{7^2} \cdot \sqrt[3]{7}}{\sqrt{7}}$

**Solution:**  $\frac{\sqrt[3]{7^2} \cdot \sqrt[3]{7}}{\sqrt{7}} = \frac{(7^2)^{\frac{1}{3}} \cdot 7^{\frac{1}{3}}}{7^{\frac{1}{2}}} = \frac{7^{\frac{2}{3}} \cdot 7^{\frac{1}{3}}}{7^{\frac{1}{2}}} = 7^{\frac{2}{3} + \frac{1}{3} - \frac{1}{2}} = 7^{\frac{4+2-3}{6}} = 7^{\frac{3}{6}} = 7^{\frac{1}{2}} = \sqrt{7}$  (Ans.)

5.  $(2^{-1} + 5^{-1})^{-1}$

**Solution:**  $(2^{-1} + 5^{-1})^{-1} = \left(\frac{1}{2} + \frac{1}{5}\right)^{-1} = \left(\frac{5+2}{10}\right)^{-1} = \left(\frac{7}{10}\right)^{-1}$

$$= \frac{1}{\frac{7}{10}} = 1 \times \frac{10}{7} = \frac{10}{7} \text{ (Ans.)}$$

6.  $(2a^{-1} + 3b^{-1})^{-1}$

**Solution:**  $(2a^{-1} + 3b^{-1})^{-1} = \left(2 \times \frac{1}{a} + 3 \times \frac{1}{b}\right)^{-1} = \left(\frac{2}{a} + \frac{3}{b}\right)^{-1} = \left(\frac{2b + 3a}{ab}\right)^{-1} = \frac{1}{\frac{2b + 3a}{ab}} = 1 \times \frac{ab}{3a + 2b} = \frac{ab}{3a + 2b}$  (Ans.)

7.  $\left(\frac{a^2 b^{-1}}{a^{-2} b}\right)^2$

**Solution:**  $\left(\frac{a^2 b^{-1}}{a^{-2} b}\right)^2 = \left(\frac{a^2 b^{-1}}{a^{-2} b}\right)^2 = (a^{2+2} b^{-1-1})^2 = (a^4 b^{-2})^2 = a^8 b^{-4} = \frac{a^8}{b^4}$  (Ans.)

8.  $\sqrt{x^{-1}y} \cdot \sqrt{y^{-1}z} \cdot \sqrt{z^{-1}x}$  ; ( $x > 0, y > 0, z > 0$ )

**Solution:**  $\sqrt{x^{-1}y} \cdot \sqrt{y^{-1}z} \cdot \sqrt{z^{-1}x} = (x^{-1}y)^{\frac{1}{2}} (y^{-1}z)^{\frac{1}{2}} (z^{-1}x)^{\frac{1}{2}} = (x^{-1}y \cdot y^{-1}z \cdot z^{-1}x)^{\frac{1}{2}} = (x^{-1+1} \cdot y^{1-1} \cdot z^{1-1})^{\frac{1}{2}} = (x^0 \cdot y^0 \cdot z^0)^{\frac{1}{2}} = (1 \times 1 \times 1)^{\frac{1}{2}} = 1$  (Ans.)

**Alternative Solution:**  $\sqrt{x^{-1}y} \cdot \sqrt{y^{-1}z} \cdot \sqrt{z^{-1}x}$

$$= \sqrt{\frac{1}{x} \cdot y} \cdot \sqrt{\frac{1}{y} \cdot z} \cdot \sqrt{\frac{1}{z} \cdot x} = \sqrt{\frac{y}{x}} \cdot \sqrt{\frac{z}{y}} \cdot \sqrt{\frac{x}{z}}$$

$$= \frac{\sqrt{y}}{\sqrt{x}} \cdot \frac{\sqrt{z}}{\sqrt{y}} \cdot \frac{\sqrt{x}}{\sqrt{z}} = 1 \text{ (Ans.)}$$

9.  $\frac{2^{n+4} - 4 \cdot 2^{n+1}}{2^{n+2} \div 2}$

**Solution:**  $\frac{2^{n+4} - 4 \cdot 2^{n+1}}{2^{n+2} \div 2} = \frac{2^n \times 2^4 - 4 \times 2^n \times 2^1}{2^{n+2} \div 2^1}$

$$= \frac{2^n \times 16 - 8 \times 2^n}{2^{n+2-1}} = \frac{2^n(16-8)}{2^{n+1}}$$

$$= \frac{2^n \times 8}{2^n \times 2^1} = \frac{8}{2} = 4 \text{ (Ans.)}$$

10.  $\frac{3^{m+1}}{(3^m)^{m-1} \div (3^{m-1})^{m+1}}$

**Solution:**  $\frac{3^{m+1}}{(3^m)^{m-1} \div (3^{m-1})^{m+1}}$

$$= \frac{3^{m+1}}{3^{m^2-m} \div 3^{(m-1)(m+1)}} = \frac{3^{m+1}}{3^{m^2-m} \div 3^{m^2-1}}$$

$$= 3^{m+1-m^2+m} \div 3^{2m+2-m^2+1}$$

$$= 3^{2m-m^2+1} \div 3^{2m-m^2+3}$$

$$= 3^{(2m-m^2+1)-(2m-m^2+3)}$$

$$= 3^{2m-m^2+1-2m+m^2-3}$$

$$= 3^{-2} = \frac{1}{3^2} = \frac{1}{9} \text{ (Ans.)}$$

Prove (11-18):

11.  $\frac{4^n - 1}{2^n - 1} = 2^n + 1$

**Solution:** L.S. =  $\frac{4^n - 1}{2^n - 1}$

$$= \frac{(2^2)^n - 1}{2^n - 1} = \frac{(2^n)^2 - 1}{2^n - 1}$$

$$= \frac{(2^n + 1)(2^n - 1)}{(2^n - 1)}$$

$$= 2^n + 1$$

$$= \text{R.S.}$$

$\therefore \frac{4^n - 1}{2^n - 1} = 2^n + 1 \text{ (Proved)}$

12.  $\frac{2^{p+1} \cdot 3^{2p-q} \cdot 5^{p+q} \cdot 6^q}{6^p \cdot 10^{q+2} \cdot 15^p} = \frac{1}{50}$

**Solution:** L.S. =  $\frac{2^{p+1} \cdot 3^{2p-q} \cdot 5^{p+q} \cdot 6^q}{6^p \cdot 10^{q+2} \cdot 15^p}$

$$= \frac{2^{p+1} \cdot 3^{2p-q} \cdot 5^{p+q} \cdot (2 \times 3)^q}{(2 \times 3)^p \cdot (5 \times 2)^{q+2} \cdot (3 \times 5)^p}$$

$$= \frac{2^{p+1} \cdot 3^{2p-q} \cdot 5^{p+q} \cdot 2^q \cdot 3^q}{2^p \cdot 3^p \cdot 5^{q+2} \cdot 2^{q+2} \cdot 3^p \cdot 5^p}$$

$$= \frac{2^{p+q+1} \cdot 3^{2p-q+q} \cdot 5^{p+q}}{2^{p+q+2} \cdot 3^{p+p} \cdot 5^{q+p+2}}$$

$$= \frac{2^{p+q+1} \cdot 3^{2p} \cdot 5^{p+q}}{2^{p+q+2} \cdot 3^{2p} \cdot 5^{p+q+2}}$$

$$= \frac{2^{(p+q+1)-(p+q+2)} \cdot 3^{2p-2p} \cdot 5^{(p+q)-(p+q+2)}}{1} = \frac{2^{-1} \cdot 1 \cdot 5^{-2}}{1} = \frac{1}{2 \cdot 5^2} = \frac{1}{2 \cdot 25} = \frac{1}{50} = \text{R.S. (Proved)}$$

$$= 2^{-1} \cdot 1 \cdot 5^{-2}$$

$$= \frac{1}{2} \cdot 1 \cdot \frac{1}{5^2} = \frac{1}{2} \cdot 1 \cdot \frac{1}{25}$$

$$= \frac{1}{50} = \text{R.S. (Proved)}$$

[N.B. There will be  $6^p$  instead of  $6^q$ ]

13.  $\left(\frac{a^l}{a^m}\right)^n \cdot \left(\frac{a^m}{a^n}\right)^l \cdot \left(\frac{a^n}{a^l}\right)^m = 1$

**Solution:** L.S. =  $\left(\frac{a^l}{a^m}\right)^n \cdot \left(\frac{a^m}{a^n}\right)^l \cdot \left(\frac{a^n}{a^l}\right)^m$

$$= \frac{a^{nl}}{a^{mn}} \cdot \frac{a^{lm}}{a^{ln}} \cdot \frac{a^{nm}}{a^{ml}}$$

$$= a^{nl-nm+lm-nl+nm-ml}$$

$$= a^0 = 1 = \text{R.S.}$$

$\therefore \left(\frac{a^l}{a^m}\right)^n \cdot \left(\frac{a^m}{a^n}\right)^l \cdot \left(\frac{a^n}{a^l}\right)^m = 1 \text{ (Proved)}$

**Alternative Solution:**

L.S. =  $\left(\frac{a^l}{a^m}\right)^n \cdot \left(\frac{a^m}{a^n}\right)^l \cdot \left(\frac{a^n}{a^l}\right)^m$

$$= (a^{l-m})^n \cdot (a^{m-n})^l \cdot (a^{n-l})^m$$

$$= (a^{nl-nm}) \cdot (a^{ml-ln}) \cdot (a^{mn-ml})$$

$$= a^{nl-nm+lm-nl+nm-ml}$$

$$= a^0 = 1 = \text{R.S.}$$

$\therefore \left(\frac{a^l}{a^m}\right)^n \cdot \left(\frac{a^m}{a^n}\right)^l \cdot \left(\frac{a^n}{a^l}\right)^m = 1 \text{ (Proved)}$

14.  $\frac{a^{p+q}}{a^{2r}} \times \frac{a^{q+r}}{a^{2p}} \times \frac{a^{r+p}}{a^{2q}} = 1$

**Solution:**

L.S. =  $\frac{a^{p+q}}{a^{2r}} \times \frac{a^{q+r}}{a^{2p}} \times \frac{a^{r+p}}{a^{2q}}$

$$= a^{p+q-2r} \cdot a^{q+r-2p} \cdot a^{r+p-2q}$$

$$= a^{p+q-2r+q+r-2p+r+p-2q}$$

$$= a^{2p-2p+2q-2q+2r-2r}$$

$$= a^0 = 1 = \text{R.S.}$$

$\therefore \frac{a^{p+q}}{a^{2r}} \times \frac{a^{q+r}}{a^{2p}} \times \frac{a^{r+p}}{a^{2q}} = 1 \text{ (Proved)}$

15.  $\left(\frac{x^a}{x^b}\right)^{\frac{1}{ab}} \left(\frac{x^b}{x^c}\right)^{\frac{1}{bc}} \left(\frac{x^c}{x^a}\right)^{\frac{1}{ca}} = 1$

**Solution:** L.S. =  $\left(\frac{x^a}{x^b}\right)^{\frac{1}{ab}} \left(\frac{x^b}{x^c}\right)^{\frac{1}{bc}} \left(\frac{x^c}{x^a}\right)^{\frac{1}{ca}}$

$$= \left(x^{a-b}\right)^{\frac{1}{ab}} \left(x^{b-c}\right)^{\frac{1}{bc}} \left(x^{c-a}\right)^{\frac{1}{ca}}$$

$$= x^{\frac{a-b}{ab}} \cdot x^{\frac{b-c}{bc}} \cdot x^{\frac{c-a}{ca}}$$

$$= x^{\frac{a-b}{ab} + \frac{b-c}{bc} + \frac{c-a}{ca}}$$

$$= x^{\frac{ca-bc+ab-ca+bc-ab}{abc}} = x^{\frac{0}{abc}} = x^0 = 1 = \text{R.S.}$$

$\therefore \left(\frac{x^a}{x^b}\right)^{\frac{1}{ab}} \left(\frac{x^b}{x^c}\right)^{\frac{1}{bc}} \left(\frac{x^c}{x^a}\right)^{\frac{1}{ca}} = 1 \text{ (Proved)}$

16.  $\left(\frac{x^a}{x^b}\right)^{a+b} \cdot \left(\frac{x^b}{x^c}\right)^{b+c} \cdot \left(\frac{x^c}{x^a}\right)^{c+a} = 1$

**Solution:** L.S. =  $\left(\frac{x^a}{x^b}\right)^{a+b} \cdot \left(\frac{x^b}{x^c}\right)^{b+c} \cdot \left(\frac{x^c}{x^a}\right)^{c+a}$   
 $= (x^{a-b})^{a+b} \cdot (x^{b-c})^{b+c} \cdot (x^{c-a})^{c+a}$   
 $= x^{(a-b)(a+b)} \cdot x^{(b-c)(b+c)} \cdot x^{(c-a)(c+a)}$   
 $= x^{a^2-b^2} \cdot x^{b^2-c^2} \cdot x^{c^2-a^2}$   
 $= x^{a^2-b^2+b^2-c^2+c^2-a^2}$   
 $= x^0 = 1 = \text{R.S.}$   
 $\therefore \left(\frac{x^a}{x^b}\right)^{a+b} \cdot \left(\frac{x^b}{x^c}\right)^{b+c} \cdot \left(\frac{x^c}{x^a}\right)^{c+a} = 1 \text{ (Proved)}$

17.  $\left(\frac{x^p}{x^q}\right)^{p+q-r} \times \left(\frac{x^q}{x^r}\right)^{q+r-p} \times \left(\frac{x^r}{x^p}\right)^{r+p-q} = 1$   
**Solution:** L.S. =  $\left(\frac{x^p}{x^q}\right)^{p+q-r} \times \left(\frac{x^q}{x^r}\right)^{q+r-p} \times \left(\frac{x^r}{x^p}\right)^{r+p-q}$   
 $= (x^{p-q})^{p+q-r} \times (x^{q-r})^{q+r-p} \times (x^{r-p})^{r+p-q}$   
 $= x^{(p-q)(p+q-r)} \times x^{(q-r)(q+r-p)} \times x^{(r-p)(r+p-q)}$   
 $= x^{(p-q)(p+q)-(p-q)r} \times x^{(q-r)(q+r)-(q-r)p} \times x^{(r-p)(r+p)-(r-p)q}$   
 $= x^{p^2-q^2-pr+qr} \times x^{q^2-r^2-pq+pr} \times x^{r^2-p^2-qr+pq}$   
 $= x^{p^2-q^2-pr+qr+q^2-r^2-pq+pr+r^2-p^2-qr+pq}$   
 $= x^0 = 1 = \text{R.S.}$   
 $\therefore \left(\frac{x^p}{x^q}\right)^{p+q-r} \times \left(\frac{x^q}{x^r}\right)^{q+r-p} \times \left(\frac{x^r}{x^p}\right)^{r+p-q} = 1 \text{ (Proved)}$

18. If  $a^x = b$ ,  $b^y = c$  and  $c^z = a$ , show that,  $xyz = 1$ .

**Solution:** Given,  $a^x = b$ ,  $b^y = c$ ,  $c^z = a$   
 Now,  $c^z = a$   
 or,  $(b^y)^z = a$  [ $\because b^y = c$ ]  
 or,  $b^{yz} = a$   
 or,  $(a^x)^{yz} = a$  [ $\because a^x = b$ ]  
 or,  $a^{xyz} = a^1$   
 $\therefore xyz = 1$ ; [If  $a^x = a^y$  then  $x = y$ , when  $a > 0$ ,  $a \neq 1$ ]  
**(Shown)**

Solve (19-22):

19.  $4^x = 8$   
**Solution:**  $4^x = 8$   
 or,  $(2^2)^x = 2^3$   
 or,  $2^{2x} = 2^3$   
 or,  $2x = 3$ ; [If  $a^x = a^y$  then  $x = y$ , when  $a > 0$ ,  $a \neq 1$ ]  
 $\therefore x = \frac{3}{2}$   
 $\therefore$  Required solution,  $x = \frac{3}{2}$  **(Ans.)**

20.  $2^{2x+1} = 128$   
**Solution:**  $2^{2x+1} = 128$   
 or,  $2^{2x+1} = 2^7$

or,  $2x + 1 = 7$ ; [If  $a^x = a^y$  then  $x = y$ , when  $a > 0$ ,  $a \neq 1$ ]  
 or,  $2x = 7 - 1$

or,  $2x = 6$ ; or,  $x = \frac{6}{2}$ ;  $\therefore x = 3$   
 $\therefore$  Required solution,  $x = 3$  **(Ans.)**

21.  $(\sqrt{3})^{x+1} = \left(\sqrt[3]{3}\right)^{2x-1}$

**Solution:**  $(\sqrt{3})^{x+1} = \left(\sqrt[3]{3}\right)^{2x-1}$   
 $\frac{1}{x+1} = \frac{1}{2x-1}$   
 or,  $(3^2)^{x+1} = (3^3)^{2x-1}$   
 $\frac{x+1}{2} = \frac{2x-1}{3}$   
 or,  $3(x+1) = 2(2x-1)$   
 or,  $3x + 3 = 4x - 2$   
 or,  $4x - 2 = 3x + 3$   
 or,  $4x - 3x = 3 + 2$   
 $\therefore x = 5$   
 $\therefore$  Required solution,  $x = 5$  **(Ans.)**

22.  $2^x + 2^{1-x} = 3$   
**Solution:**  $2^x + 2^{1-x} = 3$

or,  $2^x + \frac{2^1}{2^x} = 3$   
 or,  $a + \frac{2}{a} = 3$  [Let,  $2^x = a$ ]  
 or,  $\frac{a^2 + 2}{a} = 3$   
 or,  $a^2 + 2 = 3a$   
 or,  $a^2 - 3a + 2 = 0$   
 or,  $a^2 - 2a - a + 2 = 0$   
 or,  $a(a-2) - 1(a-2) = 0$   
 or,  $(a-2)(a-1) = 0$   
 either,  $a-2 = 0$  or,  $a-1 = 0$   
 or,  $a = 2$  or,  $a = 1$   
 or,  $2^x = 2^1$  or,  $2^x = 2^0$  [substituting the value of  $a$ ]  
 $\therefore x = 1$  or,  $x = 0$ ; [If  $a^x = a^y$  then  $x = y$  when  $a > 0$ ,  $a \neq 1$ ]  
 $\therefore$  Required solution,  $x = 0, 1$  **(Ans.)**

## Creative Multiple Choice Questions

117 Multiple Choice Questions ■ 96 simple multiple questions ■ 12 Multiple Completion ■ 9 Situation Set ■ 6 Board questions ■ 35 Cadet College questions



Board Exam MCQs with Answers



Board Exam questions are very important for the exam preparation. So practice these questions again and again properly.

1. What is the value of the equation? [Dj.B. 15]

$\left(\frac{11\sqrt{5}}{\sqrt{5}}\right)^{5x-2} = \left(\frac{5\sqrt{5}}{\sqrt{5}}\right)^{2x+1}$   
 (a) 7 (b) 1  
 (c)  $\frac{3}{5}$  (d)  $\frac{1}{3}$

(a)

2. Under which condition  $a^0 = 1$ ? [C.B. 15]

- (a)  $a = 0$  (b)  $a \neq 0$   
 (c)  $a > 1$  (d)  $a < 1$

(b)

3. What is the value of  $(x^{-1} + y^{-1})^{-1}$ ? [Ch.B. 15]

- (a)  $\frac{x+y}{xy}$  (b)  $\frac{1}{x-y}$

- (c)  $x + y$  (d)  $\frac{xy}{x + y}$
4. What is the simplified value of  $\left(\frac{1}{\sqrt{a}} \sqrt[3]{x}\right)^{-3}$ ? [Ch.B. 15]
- (a)  $\frac{x}{\sqrt{a^3}}$  (b)  $\frac{\sqrt{a^3}}{x}$   
 (c)  $\frac{x}{a^3}$  (d)  $\frac{x^3}{\sqrt{a^3}}$

5. In the case of exponent—



Cadet Colleges MCQs with Answers



Cadet Colleges questions are also important for your excellent preparation. They will help you to give a clear idea about the question as well as chapterwise exclusive questions and answers. So, practice them with proper attention.

7. Which condition  $x^0 = 1$ ? [Mymensingh Cadet-15]  
 (a)  $x \neq 0$  (b)  $x = 0$   
 (c)  $x > 0$  (d) none of them.
8. If  $4^{x+1} = 2^{x-2}$  what is the value of  $x$ ? [Mymensingh Cadet-15]  
 (a)  $-2$  (b)  $-3$   
 (c)  $-4$  (d)  $0$
9. To solve an equation  $ax + b = 0$ , which condition 'a' is must? [Mymensingh Cadet-15]  
 (a)  $a \neq 0$  (b)  $a = 0$   
 (c)  $a > 0$  (d)  $a < 0$
10. If  $a^x = a^y$ , under what condition  $x = y$ ? [Pabna Cadet-15]  
 (a)  $a > 0, a \neq 1$  (b)  $a = 0, a = 1$   
 (c)  $a = 1, a < 0$  (d)  $a > 1, a > 0$
11. What is the value of  $\frac{4^n - 1}{2^n + 1}$ ? [Pabna Cadet-15]  
 (a)  $2^n - 1$  (b)  $2^n + 1$   
 (c)  $2^n + 2$  (d)  $4^n + 1$
12. If  $x^4 = 16$ , then what is the value of  $x$ ? [Pabna Cadet-15]  
 (a)  $2$  (b)  $4$   
 (c)  $8$  (d)  $16$
13. What is the value of  $\frac{4^n - 1}{2^n + 1} = ?$  [Comilla Cadet-15]  
 (a)  $2^n + 1$  (b)  $2^n - 1$   
 (c)  $2^n + 2$  (d)  $4^n + 1$
14. If  $4^x = 64$ , what is the value of  $x$ ? [Comilla Cadet-15]  
 (a)  $2$  (b)  $3$   
 (c)  $4$  (d)  $5$
15. If  $4^x = 256$ , then what is the value of  $x$ ? [Feni Girls' Cadet-15]  
 (a)  $2$  (b)  $4$   
 (c)  $8$  (d)  $16$
16. On what condition  $a^0 = 1$ ? [Feni Girls' Cadet-15]  
 (a)  $a \neq 0$  (b)  $a = 0$   
 (c)  $a > 0$  (d)  $a \neq 1$
17. If  $3^{-x} = 27, 2^y = 64, 4^{-x} = 256$ , then  $xyz = ?$  [Sylhet Cadet-15]  
 (a)  $-72$  (b)  $72$   
 (c)  $70$  (d)  $36$
18. What is the value of  $(x^{-2})^{-3}$  [Jhenidah Cadet-15]  
 (a)  $x^{-5}$  (b)  $x^{-6}$   
 (c)  $x^6$  (d)  $x^5$
19. If  $4^{x+1} = 64$ , which one is the value of  $x$ ? [Barisal Cadet-15]  
 (a)  $\frac{3}{2}$  (b)  $-5$

- i.  $(ab)^m = a^m \cdot b^m$   
 ii.  $a^0 = 1, (a \neq 0)$   
 iii.  $\frac{a^m}{a^n} = a^m + a^n$

Which one of the following is correct? [J.B. 15]

- (a) i & ii (b) ii & iii  
 (c) i & iii (d) i, ii & iii
6.  $a^{q-r} \times d^{r+p} = \text{what?}$  [B.B. 15]  
 (a)  $a^{qr-pq}$  (b)  $a^{q-p}$   
 (c)  $a^{p+q}$  (d)  $a^{p-q}$

- (c)  $-\frac{3}{2}$  (d)  $2$

20. Which is the value of  $\sqrt[4]{x} \times x^4$ ? [Mirzapur Cadet-14]

- (a)  $\sqrt{x}$  (b)  $x$   
 (c)  $\frac{1}{x^4}$  (d)  $\sqrt[3]{x}$

21. If  $(2\sqrt{3})^n = 12$ , then what is the value of  $n$ ? [Mirzapur Cadet-14]

- (a)  $0$  (b)  $1$   
 (c)  $2$  (d)  $4$

22. What is the value of  $x^0 - y^0 - z^0$  [Mymensingh Girls' Cadet-14]

- (a)  $1$  (b)  $-1$   
 (c)  $2$  (d)  $-2$

23. What is the value of  $\frac{4^n - 1}{2^n + 1}$ ? [Pabna Cadet-14]

- (a)  $2^n - 1$  (b)  $2^n + 1$   
 (c)  $2^n + 2$  (d)  $4^n + 1$

24. On what condition  $a^0 = 1$  [Pabna Cadet-14]

- (a)  $a = 0$  (b)  $a \neq 0$   
 (c)  $a > 0$  (d)  $a \neq 1$

25.  $(12)^2 \times \sqrt[3]{54} = ?$  [Joypurhat Girls' Cadet-14]

- (a)  $\frac{\sqrt{3}}{\sqrt{2}}$  (b)  $\frac{\sqrt{3}}{\sqrt[3]{4}}$

- (c)  $\frac{3}{\sqrt{4}}$  (d)  $\frac{\sqrt[3]{3}}{4}$

26.  $4 \cdot 2^{x+1}$  is equal to [Rangpur Cadet-14]

- (a)  $2^{x+3}$  (b)  $x + 3$   
 (c)  $2^{x-3}$  (d)  $2^{3-x}$

27. If  $4^x = 64$ , what is the value of  $x$ ? [Comilla Cadet-14]

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

28. If  $a^x = a^y$ , under what condition  $x = y$ ? [Feni Girls' Cadet-14]

- (a)  $a > 0, a \neq 1$  (b)  $a = 0, a = 1$   
 (c)  $a = 1, a < 0$  (d)  $a > 1, a > 0$

29. What is the value of  $\frac{4^n - 1}{2^n + 1}$ ? [Feni Girls' Cadet-14]

- (a)  $2^n - 1$  (b)  $2^n + 1$   
 (c)  $2^n + 2$  (d)  $4^n + 1$

30. What is the value of  $\log\sqrt{381}$ ? [Feni Girls' Cadet-14]

- (a) 2 (b) 3  
(c) 4 (d) 8

31.  $a^0 = 1$  is not possible, when [Jhenidah Cadet-14]

- (a)  $a = 0$  (b)  $a < 0$   
(c)  $a > 0$  (d)  $a = \infty$

32. If  $4^{x+1} = 32$ , which one is the value of  $x$ ? [Barisal Cadet-14]

- (a)  $\frac{3}{2}$  (b)  $-3$   
(c)  $-\frac{3}{2}$  (d) 3

33. i.  $a^0 = 1$ ;  $a \neq 0$  [Joypurhat Girls' Cadet-15]

- ii.  $a^x = a^y$  then  $x = y$ ;  $a > 0$ ,  $a \neq 1$   
iii.  $a^x = b^x$  then  $a = b$ ;  $a > 0$ ,  $b > 0$ ,  $x \neq 0$

Which one is correct?

- (a) i and ii (b) i and iii  
(c) ii and iii (d) i, ii and iii

34.  $(\sqrt{3})^{x+1} = (\sqrt[3]{3})^{2x-1}$ , then [Joypurhat Girls' Cadet-14]

i.  $\frac{x+1}{2} = \frac{2x-1}{3}$

ii.  $x+1 = \frac{2x-1}{3}$

iii.  $x = 5$

Which one is correct?

- (a) i and iii (b) i and ii  
(c) ii and iii (d) i, ii and iii

Answer the questions number 35, 36, and 37 from following expression:

$3^{-x} = 27$ ,  $2^y = 64$ ,  $4^z = 256$  [Rangpur Cadet-15]

35. What is the value of  $x$ ?

- (a)  $-3$  (b) 3  
(c)  $\frac{1}{3}$  (d)  $-\frac{1}{3}$

36. What is the value of  $y$ ?

- (a)  $-5$  (b)  $-6$   
(c) 5 (d) 6

37. What is the value of  $z$ ?

- (a)  $-3$  (b)  $-4$   
(c) 3 (d) 4

Answer the question number 38, 39, 40, 41 from following expression:

$3^{-x} = 27$ ,  $2^y = 64$ ,  $4^{-z} = 4^z = 256$

[Rangpur Cadet-14]

38. What is the value of  $x$ ?

- (a)  $-3$  (b) 3  
(c)  $\frac{1}{3}$  (d)  $-\frac{1}{3}$

39. What is the value of  $y$ ?

- (a)  $-5$  (b)  $-6$   
(c) 5 (d) 6

40. What is the value of  $z$ ?

- (a)  $-3$  (b)  $-4$   
(c) 3 (d) 4

41. What is the LCM of  $x$ ,  $y$  and  $z$ ?

- (a)  $-12$  (b)  $-1$   
(c) 8 (d) 12



Topicwise MCQs with Answers



Pay your earnest attention to the topic-related information for making your concept clear

★★ 4.1 Exponents or Indices | Text book Page-70

- If  $a$  is any real number, successive multiplication of  $a$  times  $a$  i.e.,  $a \times a \times \dots \times a$  is written as form  $a^n$ .
- In the form  $a^n$ ,  $n$  is exponent or power and  $a$  is base where  $a \in \mathbb{R}$  and  $n \in \mathbb{N}$ .

42. In the symbol  $a^n$ , what is the relation between  $a$  and  $n$ ? (medium)

- (a) successive multiplication of  $n$  times  $a$   
(b) successive subtraction of  $n$  times  $a$   
(c) successive summation of  $n$  times  $a$   
(d) successive division of  $n$  times  $a$

43. If the base of the expression  $6^4 \times 6^4 \times 6^4 \times 6^4$  is 6, which of the following is the power of the expression? (easy)

- (a) 12 (b) 16 (c) 24 (d) 36

44. Which of the following is the exponential expression of exponent five (5)? (medium)

- (a)  $5^2$  (b)  $10^2$   
(c)  $5^4$  (d)  $2^5$

45. Base of which of the following said to be 7? (easy)

- (a) 7 (b)  $2^7$  (c)  $3^7$  (d)  $5^7$

46. Which of the following is the base of the expression  $(\frac{6}{9})^4$ ? (hard)

- (a)  $\frac{9}{6}$  (b)  $\frac{3}{2}$  (c)  $\frac{2}{3}$  (d) 4

TOP TIPS

47. For  $4^n$  which of the following is correct (where  $n \in \mathbb{N}$ )? (easy)

- (a)  $n^4$  (b)  $n^{-4}$   
(c)  $4 \times 4 \times 4 \times \dots$   $n$  times (d)  $4^4$

48. If the exponential expression of  $7 \times 7 \times 7 \times 7$  is  $7^4$  —

- i. its equivalent value is  $49^2$ .  
ii. its power is 4. iii. its base is 7.

Which of the following is correct? (easy)

- (a) i and ii (b) i and iii  
(c) ii and iii (d) i, ii and iii

★★★ 4.2 Formulae for Exponents | Text book Page-71

- In  $a^n$ ,  $a$  is base,  $n$  is exponent or power.
- $a^m \times a^n = a^{m+n}$
- $\frac{a^m}{a^n} = \begin{cases} a^{m-n}; & \text{when } m > n \\ \frac{1}{a^{n-m}}; & \text{when } n > m \end{cases}$  here,  $a \in \mathbb{R}$ ;  $m, n \in \mathbb{N}$
- $(ab)^n = a^n \times b^n$
- $(\frac{a}{b})^n = \frac{a^n}{b^n}$  ( $b \neq 0$ )
- $a^0 = 1$  ( $a \neq 0$ )
- $a^{-n} = \frac{1}{a^n}$  ( $a \neq 0$ )
- $(a^m)^n = a^{mn}$

49.  $x^m \times \frac{1}{x^{-n}} = \text{what?}$  (medium)

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

TOP TIPS

50.  $\frac{a^m}{a^n} = \text{what? when } n > m.$  (easy)  
 (a)  $a^{n-m}$  (b)  $a^{-mn}$  (c)  $\frac{1}{a^{n-m}}$  (d)  $\frac{1}{a^{m-n}}$  **C**
51.  $5 \times 2^0 = \text{what?}$  (easy)  
 (a) 0 (b) 2 (c) 5 (d) 10 **C**
52. Which of the following is the correct value of  $(4^{-1})^{-1}$ ? (easy)  
 (a)  $\frac{1}{4}$  (b) 4 (c)  $\frac{1}{16}$  (d) 16 **B**
53.  $2^3 \times 2^4 \times 2^{-5} = \text{what?}$  (easy)  
 (a) 2 (b)  $\frac{1}{4}$   
 (c)  $2^{3-4+5}$  (d)  $2^2$  **D**
54.  $5^7 \div 5^2 \div 5^6 = \text{what?}$  (medium)  
 (a) 5 (b)  $5^2$   
 (c)  $\frac{1}{5}$  (d)  $5^{7+2-6}$  **C**
55.  $(6x)^0 \times 6x^0 = \text{what?}$  (easy)  
 (a) 1 (b) 2 (c) 6 (d) 36 **C**
56.  $a^{-n} = \text{what? when } a \neq 0$  (easy)  
 (a)  $\frac{1}{a^n}$  (b)  $-an$  (c)  $-n+a$  (d)  $\frac{1}{a^{-n}}$  **A**
57.  $a^{-1} + b^{-1} = \text{what?}$  (easy)  
 (a)  $a^b+1$  (b)  $\frac{ab}{a+b}$  (c)  $\frac{1}{a+b}$  (d)  $\frac{a+b}{ab}$  **D**
58.  $1 - a^{-1} = \text{what?}$  (easy)  
 (a)  $-a$  (b)  $\frac{a-1}{a}$   
 (c)  $\frac{a}{a-1}$  (d)  $\left(\frac{a-1}{a}\right)^{-1}$  **B**
59.  $3x^{-2}y^4x^3y^{-5} = \text{what?}$  (medium)  
 (a)  $\frac{3x}{y}$  (b)  $\frac{3y}{x}$  (c)  $3xy$  (d)  $\frac{x}{3y}$  **A**
60. What is the simplified value of  $\pi^{\frac{3}{4}} \div \pi^{\frac{3}{4}}$ ? (easy)  
 (a)  $\frac{3}{4}$  (b) 0 (c) 1 (d)  $-1$  **C**
61.  $2^{x+2} \div 2 = \text{what?}$  (easy)  
 (a)  $2^{x+1}$  (b)  $2^{x+4}$  (c)  $2^{x-1}$  (d)  $2^{x-4}$  **A**
62. Which of the following is the exponential expression of 324? (easy)  
 (a)  $(2\sqrt{3})^4$  (b)  $(3\sqrt{2})^4$   
 (c)  $(2\sqrt{5})^4$  (d)  $(9\sqrt{2})^2$  **B**
63.  $\left(\frac{a^{-2}b}{a^3b^{-4}}\right)^{-3} = \text{what?}$  (medium)  
 (a)  $\left(\frac{a^2}{b^2}\right)^3$  (b)  $\left(\frac{a^5}{b^5}\right)^{-3}$   
 (c)  $\left(\frac{b^5}{a^5}\right)^3$  (d)  $\left(\frac{a^5}{b^5}\right)^3$  **D**
64. Which of the following is the simplified value of  $(-1)^n \times (-1)^m \times (-1)^2$  when  $m + n = -2$ ? (easy)  
 (a) 2 (b) 1 (c)  $-2$  (d)  $-1$  **B**
65.  $\frac{9^n - 1}{3^n - 1} = \text{what?}$  (medium)  
 (a)  $3^n + 1$  (b)  $3^n - 1$   
 (c)  $3^n$  (d)  $3^{n-1}$  **A**
66.  $(a^{-2} + b^2)^{-1} = \text{what?}$  (medium)

- (a)  $\frac{a^2b^2 + 1}{a^2}$  (b)  $\frac{a^2}{a^2b^2 + 1}$   
 (c)  $(a^2 + b^{-2})^{-1}$  (d)  $a^2 + b^2$  **B**
67.  $a^{m-n} = \text{what?}$  (easy)  
 (a)  $\frac{a^n}{a^m}$  (b)  $a^m \div a^n$   
 (c)  $a^m - a^n$  (d)  $a^m \div a^{-n}$  **B**
68. If  $2^{-m} \times 2^5 = 2^8$ ,  $m = \text{what?}$  (medium)  
 (a) 3 (b)  $-2$   
 (c)  $-3$  (d)  $-5$  **C**
69. If  $5^{-n} \times 2^2 = 500$ ,  $n = \text{what?}$  (medium)  
 (a) 3 (b) 2 (c) 1 (d)  $-3$  **D**
70.  $(-5)^0 = \text{what?}$  (easy)  
 (a)  $-5$  (b) 0 (c) 1 (d) 5 **C**
71. If  $\frac{4}{4^m} = 1$ ,  $m = \text{what?}$  (easy)  
 (a)  $-1$  (b) 0 (c) 1 (d) 4 **C**
72.  $\frac{2 \cdot 2^n}{2 \cdot 2^{-n}} = \text{what?}$  (medium)  
 (a)  $2^{2(n+1)}$  (b)  $2^{2n-1}$  (c) 4 (d)  $2^0$  **C**
73.  $\frac{4 \cdot 2^{n+1}}{2^{n-1}} = \text{what?}$  (hard)  
 (a)  $2^{n+1}$  (b)  $2^{n-1}$  (c) 16 (d)  $-16$  **C**
74. Under which of the following condition  $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$ ? (medium)  
 (a)  $a \neq 0$  (b)  $n \neq 0$  (c)  $b \neq 0$  (d)  $a = 0$  **C**
75. Under which of the following condition  $a^{-n} = \frac{1}{a^n}$ ? (medium)  
 (a)  $a = 0$  (b)  $a \neq 0$   
 (c)  $a > 0$  (d)  $n \in \mathbb{N}$  **B**
76.  $\frac{7^3 \times 7^{-3}}{3 \times 3^{-4}} = \text{what?}$  (easy)  
 (a)  $\frac{1}{3}$  (b)  $\frac{7}{3}$  (c)  $\frac{27}{3}$  (d) 27 **D**
77. Which of the following is equal to  $\frac{4^n - 1}{2^n - 1}$ ? (medium)  
 (a)  $2^{n-1}$  (b)  $2^n - 1$   
 (c)  $2^n + 1$  (d)  $2^{n+1}$  **C**
78.  $\left(\frac{a^l}{a^m}\right)^n \times \left(\frac{a^m}{a^n}\right)^l \times \left(\frac{a^n}{a^l}\right)^m = \text{what?}$  (hard)  
 (a) 1 (b)  $a^{m/n}$   
 (c)  $a$  (d)  $a^{l+m+mn+nl}$  **A**
79.  $\frac{5^3 \times 8}{2^4 \times 125} = \text{what?}$  (easy)  
 (a)  $\frac{1}{8}$  (b)  $\frac{1}{4}$  (c)  $\frac{1}{2}$  (d)  $\frac{5}{2}$  **C**
80.  $\frac{a^m}{a^n}$  is equal to —  
 i.  $a^{m-n}$  when  $m > n$   
 ii.  $a^{m+n}$  when  $n > m$   
 iii.  $\frac{1}{a^{n-m}}$  when  $n > m$   
 Which of the following is correct? (easy)  
 (a) i and ii (b) i and iii  
 (c) ii and iii (d) i, ii and iii **B**
81. For  $b \neq 0$  —

i.  $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$       ii.  $\left(\frac{b^{-1}}{a^{-1}}\right)^n = \frac{a^n}{b^n}$

iii.  $\left(\frac{a}{b}\right)^n = a^n \cdot b^{-n}$

Which of the following is correct? (medium)

- (a) i and ii      (b) i and iii  
(c) ii and iii      (d) i, ii and iii

82. For  $a \in \mathbb{R}, m, n \in \mathbb{N}$ —

- i.  $(a^m)^n = (a^n)^m$       ii.  $(a^m)^n = a^{mn}$   
iii.  $(a^m)^n = a^m \times a^m \times a^m \times \dots \times a^m$  [n times successive multiplication of  $a^m$ ]

Which of the following is correct? (medium)

- (a) i and ii      (b) i and iii  
(c) ii and iii      (d) i, ii and iii

83. If  $a \in \mathbb{R}$ —

- i.  $a^m \cdot a^n = a^{m+n}$       ii.  $\frac{a^m}{a^n} = a^{m-n}$   
iii.  $(a^m)^n = a^{mn}$  where  $a \neq 0$

Which of the following is correct? (easy)

- (a) i and ii      (b) i and iii  
(c) ii and iii      (d) i, ii and iii

84. If  $a \in \mathbb{R}$ —

- i. If  $a \neq 0, a^0 = 1$     ii.  $a^{-1} = \frac{1}{a}$     iii.  $a^n = \frac{1}{a^{-(-n)}}$

Which of the following is correct? (easy)

- (a) i and ii      (b) i and iii  
(c) ii and iii      (d) i, ii and iii

★★★ 4.3 n-th root | Text book Page-74

- $(a^n)^n = a^n \cdot n = a^1 = a$
- $(a)^n = a^n = \sqrt[n]{a}$
- $n^{\text{th}}$  root of  $a$  is  $\sqrt[n]{a}$
- Under the condition  $a > 0, a \neq 1$ , if  $a^x = a^y, x = y$
- Under the condition  $a > 0, b > 0, x \neq 0$ , if  $a^x = b^y, a = b$

85.  $(2^n)^n = \text{what?}$  (easy)  
(a) 1      (b) 2

86. What is the 7th root of 5? (easy)  
(a)  $5^7$       (b)  $(\sqrt{5})^7$       (c)  $\sqrt[7]{5}$       (d)  $(\sqrt{5})^{\frac{1}{7}}$

87. What is the cube root of  $\sqrt[3]{3}$ ? (medium)  
(a) 3      (b)  $\frac{1}{3^3}$       (c)  $\frac{1}{3^6}$       (d)  $\frac{1}{3^9}$

88. Which of the following is the value of  $\sqrt[3]{5} \cdot \sqrt[3]{5}$ ? (medium)  
(a)  $\sqrt[6]{5}$       (b)  $(\sqrt[3]{5})^3$       (c)  $(\sqrt{5})^3$       (d)  $\sqrt[3]{25}$

89.  $\sqrt{\sqrt[3]{5}} = \text{what?}$  (medium)  
(a)  $\frac{3}{5^2}$       (b)  $\frac{2}{5^3}$       (c)  $\frac{1}{5^6}$       (d)  $\frac{1}{5^{3^2}}$

90.  $(16)^{\frac{3}{4}} \div (16)^{\frac{1}{2}} = \text{what?}$  (medium)  
(a)  $16^{\frac{1}{2}}$       (b)  $4^{\frac{1}{2}}$       (c)  $2^{\frac{1}{2}}$       (d)  $4^{\frac{1}{4}}$

91.  $(-3)^3 \times \left(-\frac{1}{2}\right)^2 = \text{what?}$  (easy)  
(a)  $\frac{4}{27}$       (b)  $\frac{27}{4}$       (c)  $-\frac{4}{27}$       (d)  $-\frac{27}{4}$

92.  $7^{\frac{3}{4}} \cdot 7^{\frac{1}{2}} = \text{what?}$  (easy)  
(a)  $\frac{3}{7^8}$       (b)  $\frac{3}{7^2}$       (c)  $\frac{5}{7^4}$       (d)  $\frac{1}{7^2}$

93.  $\sqrt[3]{54} = \text{what?}$  (medium)  
(a)  $3\sqrt[3]{2}$       (b)  $2\sqrt[3]{3}$       (c)  $18^{\frac{1}{8}}$       (d)  $3\sqrt[3]{18}$

94. Which of the following is the value of  $\sqrt{2^{-1}} \cdot 3 \cdot \sqrt{3^{-1}} \cdot 5 \cdot \sqrt{5^{-1}} \cdot 2$ ? (medium)  
(a) 30      (b) 15      (c) 10      (d) 1

95. Which of the following is the value of  $\left(\frac{1}{5^3} - \frac{1}{3^3}\right) \left(\frac{2}{5^3 + 5^3} \cdot \frac{1}{3^3 + 3^3}\right)$ ? (medium)  
(a)  $5^3 - 3^3$       (b)  $\left(\frac{2}{5^3 - 3^3}\right)$   
(c) 2      (d) 8

96. If  $4^{x+1} = 2^{x-2}, x = \text{what?}$  (medium)  
(a) -2      (b) -3      (c) -4      (d) -6

97. Which of the following is the simplification of  $(2x^{-1} \sqrt[3]{x^2})^{-6}$ ? (medium)  
(a)  $\frac{x^2}{16}$       (b)  $\frac{x^2}{128}$       (c)  $\frac{x^2}{64}$       (d)  $\frac{x^2}{32}$

98. Which of the following is the simplified value of  $(3 \cdot 2^n - 4 \cdot 2^{n-2})$ ? (medium)  
(a)  $4^{n-1}$       (b)  $2^{n-1}$   
(c)  $4^{n+1}$       (d)  $2^{n+1}$

99. If  $4^{n+1} = 2^5$ , what is the value of n? (medium)  
(a) 3      (b) 2      (c)  $\frac{3}{2}$       (d)  $\frac{2}{3}$

100. If  $4^x = 8, x = \text{what?}$  (easy)  
(a) 4      (b) 2      (c)  $\frac{3}{2}$       (d)  $\frac{2}{3}$

101. If  $a^{2x+1} = a^m, x = 1, m = \text{what?}$  (medium)  
(a) 7      (b) 6      (c) 3      (d) 0

102. If  $3^{2x+1} = 5^{2x+1}, x = \text{what?}$  (hard)  
(a)  $\frac{5}{3}$       (b) 1      (c)  $\frac{3}{5}$       (d)  $-\frac{1}{2}$

103. For  $a, b \in \mathbb{R}$ —
- Under the condition  $a \neq 1$ , if  $a^x = a^y, x \neq y$ .
  - Under the condition  $a > 0, b > 0, x \neq 0$ , if  $a^x = b^x, a = b$ .
  - Under the condition  $a \neq 1$ , if  $a^x = a^y, x = y$ .
- Which of the following is correct? (easy)
- (a) i and ii      (b) i and iii  
(c) ii and iii      (d) i, ii and iii

TOP TIPS

104. In  $5^n$  —
- $n^{\text{th}}$  power is 5.
  - $n^{\text{th}}$  root is  $(\sqrt[n]{5})^n$ .
  - $n^{\text{th}}$  root is  $\sqrt[n]{\left(\frac{1}{5^n}\right)}$ .
- Which of the following is correct? (easy)
- (a) i and ii      (b) i and iii  
(c) ii and iii      (d) i, ii and iii

105. In the expression  $7^{\frac{1}{3 \cdot 3}}$  —
- the power is  $\frac{2}{9}$
  - the base is 7
  - can be written as the form  $\sqrt[9]{7}$ .
- Which of the following is correct? (easy)
- (a) i and ii      (b) i and iii  
(c) ii and iii      (d) i, ii and iii

106. In the exponential expression  $(\frac{1}{23})^6$  —
- power is 2
  - 6-th power is 2
  - simplified value is 4
- Which of the following is correct? (medium)
- (a) i and ii      (b) i and iii  
(c) ii and iii      (d) i, ii and iii

107. Value of  $(2^{-1} + 5^{-1})^{-1}$  is—
- equal to the value of  $(\frac{1}{2} + \frac{1}{5})^{-1}$
  - equal to the value of  $(2 + 5)$
  - $\frac{10}{7}$ .
- Which of the following is correct? (easy)
- (a) i and ii      (b) i and iii  
(c) ii and iii      (d) i, ii and iii

108. If  $(\sqrt{3})^{x+1} = (3\sqrt{3})^{2x-1}$  —
- $\frac{x+1}{2} = \frac{2x-1}{3}$
  - $x+1 = \frac{2x-1}{3}$
  - $x = 5$
- Which of the following is correct? (hard)
- (a) i and ii      (b) i and iii  
(c) ii and iii      (d) i, ii and iii

Answer to the questions (109-111) using the following information:

$$(a^{-\frac{1}{2}} \sqrt[3]{x})^{-3} \times \sqrt[4]{x^{-4}} \cdot a^{-6}$$

109. What is the simplified value of  $(a^{-\frac{1}{2}} \sqrt[3]{x})^{-3}$ ? (easy)
- (a)  $\frac{\sqrt{a^3}}{x}$       (b)  $\frac{\sqrt[3]{a^2}}{x}$       (c)  $\frac{x}{\sqrt{a^3}}$       (d)  $\frac{x}{3\sqrt{a^2}}$       (a)

110. What is the simplified value of  $\sqrt[4]{x^{-4}} \cdot a^{-6}$ ? (medium)
- (a)  $\sqrt{a^3}x$       (b)  $x\sqrt{a^3}$       (c)  $\frac{1}{x\sqrt{a^3}}$       (d)  $\frac{1}{\sqrt{a^3}}$       (c)

111. What is the simplified value of given expression? (medium)
- (a)  $\frac{1}{x^3}$       (b)  $x^{-1}$       (c)  $\frac{1}{x}$       (d)  $\frac{1}{x^2}$       (d)

Answer to the questions (112-114) using the following information:

$$a^x = b, b^y = c \text{ and } c^z = a$$

112. Which of the following is correct? (easy)
- (a)  $b^y = a^z$       (b)  $b^y = a^z$   
(c)  $c^z = b^y$       (d)  $c^y = c^z$       (a)

113. Which of the following relation is correct? (hard)
- (a)  $a = a^{YZ}$       (b)  $a = a^{XZ}$   
(c)  $b = \frac{x}{yz}$       (d)  $a = a^{xyz}$       (d)

114. What is the value of  $xyz$ ? (easy)
- (a) 3      (b) 1  
(c)  $\frac{1}{2}$       (d)  $\frac{1}{3}$       (b)

Answer to the questions (115-117) using the following information:

$$P = 2^{n+4}, Q = 4 \cdot 2^{n+1}, R = 2^{n+2} \div 2$$

115.  $P - Q = \text{what?}$  (medium)
- (a)  $2^{n+3}$       (b)  $2^{2n+1}$       (c)  $2^{2n-3}$       (d)  $2^{n+1}$       (a)

116. Which of the following is equal to  $R$ ? (easy)
- (a)  $2^{n+4}$       (b)  $2^{n+3}$       (c)  $2^{n+1}$       (d) 2      (c)

117. Which of the following is the value of  $\frac{P-Q}{R}$ ? (medium)
- (a)  $2^n$       (b) 4      (c) 2      (d) 1      (b)



To appear at the exam, on mobile use **POLE** Apps for Multiple Choice Questions.



## Essay-Type Practice Part

19 Creative Questions ■ 1 Cadet College questions  
■ 2 Activity ■ 2 Additional questions ■ 14 Questions with hints



Board Exam MCQs with Answers



Board Exam questions are very important for the exam preparation. So practice these questions again and again properly.

**Question 1** If  $A = 6^{p+q}$ ,  $B = 6^{q+r}$ ,  $C = 6^{r+p}$  — [B.B.-15]

- Find the value of  $\log_{3\sqrt{2}} 324$ .
- $\left(\frac{A}{B}\right)^{p+r} \times \left(\frac{B}{C}\right)^{q+p} \times \left(\frac{C}{A}\right)^{r+q}$

- Show that,  $(AB)^{p-r} \times (BC)^{q-p} \times (CA)^{r-q} = 1$ .

**Ans to the Ques. No. 1**

- a**  $\log_{3\sqrt{2}} 324 = \log_{3\sqrt{2}} (3\sqrt{2})^4 = 4 \log_{3\sqrt{2}} 3\sqrt{2}$

$$= 4.1 \quad [\log_a a = 1]$$

$$= 4 \quad (\text{Ans.})$$

**b** Given,

$$A = 6^{p+q}, B = 6^{q+r}, C = 6^{r+p}$$

Now,  $\left(\frac{A}{B}\right)^{p+r} \times \left(\frac{B}{C}\right)^{q+p} \times \left(\frac{C}{A}\right)^{r+q}$

$$= \left(\frac{6^{p+q}}{6^{q+r}}\right)^{p+r} \times \left(\frac{6^{q+r}}{6^{r+p}}\right)^{q+p} \times \left(\frac{6^{r+p}}{6^{p+q}}\right)^{r+q} \quad [\text{Putting values}]$$

$$= (6^{p+q-q-r})^{p+r} \times (6^{q+r-r-p})^{q+p} \times (6^{r+p-p-q})^{r+q}$$

$$= (6^p)^{p+r} \times (6^q)^{q+p} \times (6^r)^{r+q}$$

$$= 6^{p^2-r^2} \times 6^{q^2-p^2} \times 6^{r^2-q^2}$$

$$= 6^{p^2-r^2+q^2-p^2+r^2-q^2}$$

$$= 6^0$$

$$= 1 \quad (\text{Ans.})$$

**c** Given,

$$A = 6^{p+q}, B = 6^{q+r}, C = 6^{r+p}$$

$$\text{L.H.S} = (AB)^{p-r} \times (BC)^{q-p} \times (CA)^{r-q}$$

$$= (6^{p+q} \cdot 6^{q+r})^{p-r} \times (6^{q+r} \cdot 6^{r+p})^{q-p} \times (6^{r+p} \cdot 6^{p+q})^{r-q}$$

$$= (6^{p+q+q+r})^{p-r} \times (6^{q+r+r+p})^{q-p} \times (6^{r+p+p+q})^{r-q}$$

$$= (6^{p+2q+r})^{p-r} \times (6^{q+2r+p})^{q-p} \times (6^{r+2p+q})^{r-q}$$

$$= 6^{p^2+2pq+pr-pr-2qr-r^2} \times 6^{q^2+2qr+pq-pq-2pr-p^2} \times 6^{r^2+2pr+qr-qr-2pq-q^2}$$

$$= 6^{p^2+2pq-2qr-r^2+q^2+2qr-2pr-p^2+r^2+2pr-2pq-q^2}$$

$$= 6^0 = 1$$

$$= \text{R.H.S}$$

$$\therefore (AB)^{p-r} \times (BC)^{q-p} \times (CA)^{r-q} = 1 \quad (\text{showed})$$

**Question 2** L, M, N three algebraic expressions

where,  $L = \frac{x^a}{x^b}, M = \frac{x^b}{x^c}, N = \frac{x^c}{x^a}$ . [Cr. B.-15]

a. If  $L = 1$ , show that  $a = b$ .

b. Prove that,  $\sqrt[ab]{L} \times \sqrt[bc]{M} \times \sqrt[ca]{N} = 1$

c. On the basis of the questions, show that,  $\log_k L^{a+b} + \log_k M^{b+c} + \log_k N^{c+a} = 0$ .

**Ans to the Ques. No. 2**

**a**  $L = 1$

$$\text{Or, } \frac{x^a}{x^b} = 1$$

$$\text{Or, } x^{a-b} = x^0$$

$$\text{Or, } x^{a-b} = x^0$$

$$\text{Or, } a - b = 0$$

$$\therefore a = b \quad (\text{Showed})$$

**b** Given,  $L = \frac{x^a}{x^b}, M = \frac{x^b}{x^c}, N = \frac{x^c}{x^a}$

Required to prove that,  $\sqrt[ab]{L} \times \sqrt[bc]{M} \times \sqrt[ca]{N} = 1$

$$\text{L.H.S} = \sqrt[ab]{L} \times \sqrt[bc]{M} \times \sqrt[ca]{N}$$

$$= L^{\frac{1}{ab}} \times M^{\frac{1}{bc}} \times N^{\frac{1}{ca}}$$

$$= \left(\frac{x^a}{x^b}\right)^{\frac{1}{ab}} \times \left(\frac{x^b}{x^c}\right)^{\frac{1}{bc}} \times \left(\frac{x^c}{x^a}\right)^{\frac{1}{ca}}$$

$$= \frac{1}{(x^{a-b})^{ab}} \times \frac{1}{(x^{b-c})^{bc}} \times \frac{1}{(x^{c-a})^{ca}}$$

$$= \frac{a-b}{x \cdot ab} \cdot \frac{b-c}{x \cdot bc} \cdot \frac{c-a}{x \cdot ca}$$

$$= \frac{a-b}{x \cdot ab} + \frac{b-c}{bc} + \frac{c-a}{ca}$$

$$= \frac{c(a-b) + a(b-c) + b(c-a)}{abc}$$

$$= x^0$$

$$= 1$$

$$= \text{R.H.S}$$

$\therefore \sqrt[ab]{L} \times \sqrt[bc]{M} \times \sqrt[ca]{N} = 1 \quad (\text{Proved})$

**c**  $L = \frac{x^a}{x^b}, M = \frac{x^b}{x^c}, N = \frac{x^c}{x^a}$

Required to show that,  $\log_k L^{a+b} + \log_k M^{b+c} + \log_k N^{c+a} = 0$

$$\text{L.H.S} = \log_k L^{a+b} + \log_k M^{b+c} + \log_k N^{c+a}$$

$$= (a+b) \log_k L + (b+c) \log_k M + (c+a) \log_k N$$

$$= (a+b) \log_k \left(\frac{x^a}{x^b}\right) + (b+c) \log_k \left(\frac{x^b}{x^c}\right) + (c+a) \log_k \left(\frac{x^c}{x^a}\right)$$

$$= (a+b) \log_k (x^{a-b}) + (b+c) \log_k (x^{b-c}) + (c+a) \log_k (x^{c-a})$$

$$= (a+b)(a-b) \log_k x + (b+c)(b-c) \log_k x + (c+a)(c-a) \log_k x$$

$$= (a^2 - b^2) \log_k x + (b^2 - c^2) \log_k x + (c^2 - a^2) \log_k x$$

$$= (a^2 - b^2 + b^2 - c^2 + c^2 - a^2) \log_k x$$

$$= 0 \times \log_k x$$

$$= 0$$

$$= \text{R.H.S}$$

$$\therefore \text{L.H.S} = \text{R.H.S} \quad (\text{Showed})$$



**Cadet Colleges Creative Questions with Answers**



Cadet Colleges questions are also important for your excellent preparation. They will help you to give a clear idea about the question as well as chapterwise exclusive questions and answers. So, practice them with proper attention.

**Question 3** Read the stem  $\frac{5^4 \times 8 \times 16}{2^5 \times 125}, \frac{3 \cdot 2^n - 4 \cdot 2^{n-2}}{2^n - 2^{n-1}}$ .

[Jhenidah Cadet-14]

- a. Find the value of 1st expression. 2
- b. Simplify the 2<sup>nd</sup> expression. 4
- c. Show that multiplication of  $\frac{2^{n+4} - 4 \cdot 2^{n+1}}{2^{n+2} \div 2^{-1}}$  by the 2<sup>nd</sup> expression is 4. 4

**Solution to the question no. 3**

**a** Here 1st expression =  $\frac{5^4 \cdot 8 \cdot 6}{2^5 \cdot 125}$

$$= \frac{5^4 \cdot 2^3 \cdot 2^4}{2^5 \cdot 5^3}$$

$$= \frac{5 \cdot 2^7}{2^5}$$

$$= 5 \times 2^2$$

$\therefore$  The value of 1st expression = 20

**b** The second expression =  $\frac{3 \cdot 2^n - 4 \cdot 2^{n-2}}{2^n - 2^{n-1}}$

$$= \frac{3 \cdot 2^n - 2^2 \cdot 2^{n-2}}{2^n - 2^{n-1}}$$

$$\begin{aligned} &= \frac{3 \cdot 2^n - 2^n}{2^n(1 - 2^{-1})} \\ &= \frac{2 \cdot 2^n}{2^n \left(1 - \frac{1}{2}\right)} \\ &= \frac{2}{1} \\ &= 4 \end{aligned}$$

∴ The simplified value of 2nd expression is 4.

**c** Here the given expression,

$$\frac{2^{n+4} - 4 \cdot 2^{n+1}}{2^{n+2} \div 2^{-1}} = \frac{2^n \cdot 2^4 - 4 \cdot 2^n \cdot 2}{2^n \cdot 2^2 \cdot 2}$$

$$\begin{aligned} &= \frac{16 \cdot 2^n - 8 \cdot 2^n}{2^n \cdot 2^3} \\ &= \frac{8 \cdot 2^n}{8 \cdot 2^n} \\ &= 1. \end{aligned}$$

From (b), we have the 2nd expression = 4.

$$\therefore \frac{2^{n+4} - 4 \cdot 2^{n+1}}{2^{n+2} \div 2^{-1}} \times 2\text{nd expression} = 1 \times 4 = 4$$

**(Shown)**



**Creative Essay type Questions with Answers Based on Activity**



Activity promote higher thinking and to-the-point answering.

Practise the questions attentively.

**Question ▶ 4**  $2 \times 2 \times 2 \times \dots \times 2$  (2 of n times) =  $2^n$ .

◀ **Activity, page-73 and 75**

- Determine the exponential expression, base and exponent of  $2 \times 2 \times 2 \times 2$ . 2
- Determine the value of  $\frac{2^4 \cdot 2^2}{32}$  with the help of exponents. 4
- Show that,  $8^4 \div 8^2 = 2^4 \times$  value of 'b'. 4

**Solution to the question no. 4**

**a**  $2 \times 2 \times 2 \times 2 = 2^4$   
Exponential expression of the given expression is  $2^4$  (Ans.)  
Now, The base and the exponent of  $2^4$  are 2 and 4 respectively. (Ans.)

**b** Given expression,  $\frac{2^4 \cdot 2^2}{32}$

$$\begin{aligned} &= \frac{2^{4+2}}{2^5} \quad [a^m \times a^n = a^{m+n}] \\ &= \frac{2^6}{2^5} = 2^{6-5} \quad [ \frac{a^m}{a^n} = a^{m-n} ] \\ &= 2^1 = 2 \\ \therefore \frac{2^4 \cdot 2^2}{32} &= 2 \text{ (Ans.)} \end{aligned}$$

**c** Given expression,  $8^4 \div 8^2$

$$\begin{aligned} &= 8^{\frac{3}{4} - \frac{1}{2}} \quad [ \because a^m \div a^n = a^{m-n} ] \\ &= 8^{\frac{3-2}{4}} = 8^{\frac{1}{4}} = (2 \times 2 \times 2)^{\frac{1}{4}} \\ &= (2^3)^{\frac{1}{4}} = 2^{\frac{3}{4}} = 2^1 \cdot 2^{-\frac{1}{4}} \\ &= 2^1 \cdot 2^{-\frac{1}{4}} = 2 \cdot 2^{-\frac{1}{4}} \\ &= 2^{\frac{1}{4}} \times 2 = 2^{\frac{1}{4}} \times \text{value of 'b'} \\ \therefore 8^4 \div 8^2 &= 2^{\frac{1}{4}} \times \text{value of 'b'} \text{ (Shown)} \end{aligned}$$

**Question ▶ 5**  $P = \frac{2^4 \cdot 2^2}{32}$ ,  $Q = \left(\frac{2}{3}\right)^{\frac{5}{2}} \times \left(\frac{2}{3}\right)^{-\frac{5}{2}}$  and

$R = 8^{\frac{3}{4}} \div 8^{\frac{1}{2}}$  are the three mathematical expressions.

◀ **Activity, page-75**

- What is the value of P? 2
- Determine  $P \times Q$ . 4
- Show that,  $P \times Q \times R = 2^{\frac{7}{4}}$  4

**Solution to the question no. 5**

**a**  $P = m \frac{2^4 \cdot 2^2}{32} = \frac{2^{4+2}}{2^5}$

$$= \frac{2^6}{2^5} = 2^{6-5} = 2^1 = 2 \text{ (Ans.)}$$

**b**  $Q = \left(\frac{2}{3}\right)^{\frac{5}{2}} \times \left(\frac{2}{3}\right)^{-\frac{5}{2}} = \left(\frac{2}{3}\right)^{\frac{5}{2} - \frac{5}{2}} = \left(\frac{2}{3}\right)^0 = 1$

Now,  $P \times Q = 2 \times 1 = 2$  (Ans.)

**c**  $R = 8^{\frac{3}{4}} \div 8^{\frac{1}{2}}$

$$\begin{aligned} &= 8^{\frac{3}{4} - \frac{1}{2}} = 8^{\frac{3-2}{4}} = 8^{\frac{1}{4}} = (2^3)^{\frac{1}{4}} = 2^{\frac{3}{4}} \\ \text{Now, } P \times Q \times R &= 2 \times 2^{\frac{3}{4}} = 2^{1 + \frac{3}{4}} = 2^{\frac{7}{4}} \\ \therefore P \times Q \times R &= 2^{\frac{7}{4}} \text{ (Shown)} \end{aligned}$$

**Activity: Fill in the blank boxes:** ◀ **Activity, page-73**

- $3 \times 3 \times 3 \times 3 = 3^{\square}$
- $5^{\square} \times 5^3 = 5^5$
- $a^2 \times a^{\square} = a^{-3}$
- Error! = 1Error!**
- $(-5)^{\square} = \square$

**Solve fill the blanks**

- $3 \times 3 \times 3 \times 3 = 3^{\square}$   
or,  $3^4 = 3^{\square}$   
∴  $\square = 4$
- $5^{\square} \times 5^3 = 5^5$

or,  $5^{\square} = \frac{5^5}{5^3}$   
 or,  $5^{\square} = 5^2$   
 $\therefore \square = 2$   
 iii.  $a^2 \times a^{\square} = a^{-3}$   
 or,  $a^{\square} = \frac{a^{-3}}{a^2}$   
 or,  $a^{\square} = a^{-5}$   
 $\therefore \square = -5$   
 iv.  $4^1 = 4^{\square} \times 1$   
 $\therefore \square = 1$

**Activity : Simplify:**

◀ **Activity, page-75**

- (i)  $\frac{2^4 \cdot 2^2}{32}$  ;  
 (ii)  $8^{\text{Error!}} \times 8^{\text{Error!}}$   
 (iii)  $8^{\text{Error!}} \div 8^{\text{Error!}}$

**Simplify:**

◀ **Activity Solve, page-75**

- i.  $\frac{2^4 \cdot 2^2}{32}$   
 $= \frac{2^{4+2}}{4 \times 8} = \frac{2^6}{2^2 \times 2^3} = \frac{2^6}{2^5} = 2$   
 ii.  $8^{\text{Error!}} \times 8^{\text{Error!}}$   
 $= 8^{\text{Error!}} = 8^0 = 1 \text{ (Ans.)}$   
 iii.  $8^{\text{Error!}} \div 8^{\text{Error!}}$   
 $= 8^{\text{Error!}} = 8^{\text{Error!}} = 8^{\text{Error!}} = 8^{\text{Error!}} \text{ (Ans.)}$



**Additional Creative Questions with Answers**



Practice this part very well. Try to answer the questions all by yourself first. Read the answer and make sure your answer has been resembling with it.

**Question ▶ 6**  $\frac{3^{m+1}}{(3^m)^{m-1}} = 3^x$  and  $\frac{9^{m+1}}{(3^{m-1})^{m+1}} = 3^y$  are two exponential equations.

- a. Simplify the expression at the left side of the first equation. 2  
 b. Determine the value of x and y. 4  
 c. Show that,  $3^x \div 3^y = \frac{1}{9}$  4

**Solution to the question no. 6**

**a** Left side of the first equation  $= \frac{3^{m+1}}{3^{m(m-1)}} = \frac{3^{m+1}}{3^{m^2-m}}$   
 $= 3^{m+1-(m^2-m)}$   
 $= 3^{m+1-m^2+m}$   
 $= 3^{-m^2+2m+1} \text{ (Ans.)}$

**b** Given,  $3^x = \frac{3^{m+1}}{3^{m(m-1)}}$   
 or,  $3^x = 3^{-m^2+2m+1}$  [From 'a']  
 $\therefore x = -m^2 + 2m + 1$   
 Again,  $3^y = \frac{9^{m+1}}{(3^{m-1})^{m+1}}$  or,  $3^y = \frac{(3^2)^{m+1}}{3^{(m-1)(m+1)}}$   
 or,  $3^y = \frac{3^{2m+2}}{3^{m^2-1}}$  or,  $3^y = 3^{2m+2-(m^2-1)}$   
 or,  $3^y = 3^{2m+2-m^2+1}$  or,  $3^y = 3^{-m^2+2m+3}$   
 $\therefore y = -m^2 + 2m + 3$

**Ans.**  $x = -m^2 + 2m + 1$ ,  $y = -m^2 + 2m + 3$

**c** From 'b', we have,  $3^x = 3^{-m^2+2m+1}$   
 and  $3^y = 3^{-m^2+2m+3}$   
 L.S.  $= 3^x \div 3^y = \frac{3^x}{3^y} = \frac{3^{-m^2+2m+1}}{3^{-m^2+2m+3}}$   
 $= 3^{-m^2+2m+1-(-m^2+2m+3)} = 3^{-m^2+2m+1+m^2-2m-3}$   
 $= 3^{-2} = \frac{1}{3^2} = \frac{1}{9} = \text{R.S.}$

$\therefore 3^x \div 3^y = \frac{1}{9} \text{ (Shown)}$

**Question ▶ 7** Some exponential expressions are

$\left(\frac{x^a}{x^b}\right)ab, \left(\frac{x^b}{x^c}\right)bc, \left(\frac{x^c}{x^a}\right)ca$

- a. Express the 1<sup>st</sup> and 2<sup>nd</sup> expressions in the form of  $x^n$ . 2  
 b. Prove that, product of the expressions = 1 4  
 c. Show that,  $\frac{3 \cdot 2^x - 4 \cdot 2^{x-2}}{2^x - 2^{x-1}} = 4 \cdot \left(\frac{x^a}{x^b}\right)ab \cdot \left(\frac{x^b}{x^c}\right)bc \cdot \left(\frac{x^c}{x^a}\right)ca$  4

**Solution to the question no. 7**

**a** 1<sup>st</sup> expression  $= \left(\frac{x^a}{x^b}\right)ab = (x^{a-b})ab$  [ $\because \frac{a^m}{a^n} = a^{m-n}$ ]  
 $= x^{a-b} ab$  [ $\because (a^m)^n = a^{mn}$ ]

2<sup>nd</sup> expression  $= \left(\frac{x^b}{x^c}\right)bc = (x^{b-c})bc = x^{b-c} bc$

**Ans.**  $x^{a-b} ab, x^{b-c} bc$

**b** L.S.  $= \left(\frac{x^a}{x^b}\right)ab \times \left(\frac{x^b}{x^c}\right)bc \times \left(\frac{x^c}{x^a}\right)ca$   
 $= x^{a-b} ab \times x^{b-c} bc \times (x^{c-a})ca$  [From 'a']  
 $= x^{a-b} ab \times x^{b-c} bc \times x^{c-a} ca$   
 $= x^{a-b} ab + \frac{b-c}{bc} + \frac{c-a}{ca}$   
 $= \frac{c(a-b) + a(b-c) + b(c-a)}{abc}$   
 $= x \frac{ca - bc + ab - ca + bc - ab}{abc}$   
 $= x \frac{0}{abc} = x^0 = 1 = \text{R.S.}$

$$\therefore \left(\frac{x^a}{x^b}\right)ab \times \left(\frac{x^b}{x^c}\right)bc \times \left(\frac{x^c}{x^a}\right)ca = 1 \text{ (Proved)}$$

**c** L.S. =  $\frac{3 \cdot 2^x - 4 \cdot 2^{x-2}}{2^x - 2^{x-1}} = \frac{3 \cdot 2^x - 2^2 \cdot 2^{x-2}}{2^x - 2^x \cdot 2^{-1}}$

$$= \frac{3 \cdot 2^x - 2^{2+x-2}}{2^x - 2^x \cdot \frac{1}{2}} = \frac{3 \cdot 2^x - 2^x}{2^x - 2^x \cdot \frac{1}{2}}$$

$$= \frac{2^x(3-1)}{2^x(1-\frac{1}{2})} = \frac{3-1}{1-\frac{1}{2}} = \frac{2}{\frac{1}{2}} = 4$$

$$\text{R.S.} = 4 \cdot \left(\frac{x^a}{x^b}\right)ab \cdot \left(\frac{x^b}{x^c}\right)bc \cdot \left(\frac{x^c}{x^a}\right)ca$$

$$= 4 \cdot 1 \text{ [From 'b']}$$

$$= 4$$

$$\therefore \frac{3 \cdot 2^x - 4 \cdot 2^{x-2}}{2^x - 2^{x-1}} = 4 \cdot \left(\frac{x^a}{x^b}\right)ab \cdot \left(\frac{x^b}{x^c}\right)bc \cdot \left(\frac{x^c}{x^a}\right)ca$$

**(Shown)**



**Creative Questions with hints**



Answer these questions yourself. See the super tips which will help you to answer the questions easily.

**Question ▶ 8**  $\frac{a^n + a^{n+2}}{a^n + a^{n-2}}$  is an exponential expression

- where **a** is a non-zero real number.
- Show that,  $a^0 = 1$  2
  - Find the simplified value of the given expression. 4
  - If  $a = \frac{\sqrt[3]{3^2} \cdot \sqrt[3]{3}}{\sqrt{3}}$  then what is the value of the given expression? 4
- Ans. b.**  $a^2$ ; **c.**  $\sqrt{3}$ .

**Question ▶ 9**  $6^{p+2q}$ ,  $12^{-p+q}$ ,  $20^{2p+q}$  and  $9^{p-q}$ ,  $8^{p-2q}$ ,  $15^{-2p-q}$  are two exponential expressions.

- Express the 1<sup>st</sup> exponential expression in the form of the product of the exponential of 2, 3 and 5. 2
  - Find the product of the two expressions. 4
  - Show that, the product of the two expressions is equal to the sum of  $p(p+q^{-1})^{-1}$  and  $p^{-1}(q+p^{-1})^{-1}$ . 4
- Ans. a.**  $2^{3p+6q} 3^{3q} 5^{2p+q}$ ; **b.** 1.

**Question ▶ 10**  $a = \sqrt{x}$ ,  $b = \sqrt[3]{c}$  and  $c = \sqrt[4]{a}$

- Express a as the exponential expression of c. 2
  - Find the value of x, y, z. 4
  - If  $3x = 4y = 18z$  then find the value of x, y, z? 4
- Ans. a.**  $c^{xy}$ ; **b.** 1; **c.**  $x = 2, y = \frac{3}{2}, z = \frac{1}{3}$

**Question ▶ 11**  $p = 2^{n+1}$ ,  $q = 4 \cdot 2^{n-1}$  and  $r = 4 \cdot 2^{2n-1}$

- Express q and r as the exponential expression of 2. 2
  - Find the simplified value of  $\frac{p^2 - q}{r}$ . 4
  - Show that, the values of  $\frac{p^2 - q}{r}$  and  $2\left(1 - \frac{1}{p}\right)$  are equal; where  $n = 1$ . 4
- Ans. a.**  $2^{n+1}, 2^{2n+1}$ ; **b.**  $2 - \frac{1}{2^n}$

**Question ▶ 12**  $4^x + 4^{1-x} = 4$  is an exponential equation.

- Express the equation as the exponential equation of 2. 2
  - Putting  $2^x = a$  solve the equation. 4
  - If  $y^{4x} + 1 = 2y^{2x}$  then what is the value of y? 4
- Ans. a.**  $2^{2x} + 2^{2-2x} = 2^2$ ; **b.**  $x = \frac{1}{2}$ ; **c.**  $y = 1$

**Question ▶ 13**  $A = (\sqrt{3})^{x+1}$  and  $B = \left(\frac{3}{\sqrt{3}}\right)^{2x-1}$  are two exponential expressions.

- Express A and B as the exponential expression of 3. 2
  - Find the simplified value of  $A \times B$ . 4
  - If  $A \times B = \sqrt[3]{81}$  then what is the value of x? 4
- Ans. a.**  $3^{\frac{x+1}{2}}, 3^{\frac{2x-1}{3}}$ ; **b.**  $3^{\frac{6}{5}}$ ; **c.** 1

**Question ▶ 14**  $p = \frac{x^b}{x^a}$ ,  $q = \frac{x^c}{x^b}$  and  $r = \frac{x^a}{x^c}$

- What is the simplified value of  $p \times q \times r$ ? 2
  - Find the value of  $p^{a+b} \cdot q^{b+c} \cdot r^{c+a}$ . 4
  - Show that, the value of  $p^{a^2+ab+b^2} \cdot q^{b^2+bc+c^2} \cdot r^{c^2+ca+a^2}$  is equal to the value of  $p^{a+b} \cdot q^{b+c} \cdot r^{c+a}$ . 4
- Ans. a.** 1; **b.** 1

**Question ▶ 15**  $3a^m + \frac{1}{4} \times \sqrt{a^{2-2m}}$  and  $\sqrt[4]{a^3}$  are two exponential expressions.

- Find the simplified value of the 1<sup>st</sup> expression. 2
  - Find the simplified value of the quotient of the division of the 1<sup>st</sup> expression by the 2<sup>nd</sup> expression. Where  $a = 9$ . 4
  - If the product of the 1<sup>st</sup> expression and  $\sqrt[4]{a^3} = 27$  then what is the value of a? 4
- Ans. a.**  $3a^4$ ; **b.** 9; **c.**  $a = 3$

**Question ▶ 16** Mr. Jaman deposited Tk. 1000 in a bank. That money becomes equal to the product of the principal and the x exponent of  $\sqrt[6]{2}$ .

- How much Tk. will be the profit principal after x years? 2
  - How many years are needed to double the profit principal of that money? 4
  - If the profit principal after x years becomes equal to the product of the principal and the x exponent of  $\sqrt[7]{3}$  then how much money would be in total profit principal in the years obtained in 'b'? 4
- Ans. a.**  $1000 \times 2^{\frac{x}{6}}$ ; **b.** 6; **c.**  $1000 \times 3^{\frac{6}{7}}$

**Question ▶ 17** If  $p = a^{-1}$ ,  $q = b^{-1}$  then,

- Find the simplified value of  $(q - p^{-1})^{-1}$ . 2

- b. Find the value of  $[p^{-1} - \{p + (q - p^{-1})^{-1}\}^{-1}]$ . 4  
 c. What value is to be multiplied with the value obtained in 'a' to equal to the value obtained in 'b'? 4

Ans. a.  $\frac{b}{1-ab}$ ; b.  $a^2b$ ; c.  $a^2(1-ab)$

**Question ▶ 18**  $\frac{3^{x+1}}{(3^x)^{x-1}}$  and  $\frac{9^{x+1}}{(3^{x+1})^{(x-1)}}$  are two exponential expressions.

- a. Find the simplified value of the 1<sup>st</sup> expression. 2  
 b. Divide the 1<sup>st</sup> expression by the 2<sup>nd</sup> expression. 4  
 c. If the quotient of division of the value obtained from 'b' by  $\sqrt{3^x}$  is 1 then find the value of x. 4

Ans. a.  $3^{-x^2-2x+1}$ ; b.  $\frac{1}{9}$ ; c. -4

**Question ▶ 19**  $3^x - 4.32^{\frac{x}{2}} + 1 = 0$  is an exponential equation.

- a. Putting  $3^{\frac{x}{2}} = a$  express the equation in terms of a. 2  
 b. Find the value of x. 4

- c. Verify the correctness of the equation for the value of x obtained in 'b'. 4

Ans. a.  $a^2 - 12a + 27 = 0$ ; b. 2, 4.

**Question ▶ 20** If  $a = x^q$ ,  $b = x^r$  and  $c = x^p$  then —

- a. Find the value of  $\left(\frac{a}{b}\right)^{q+r} \times \left(\frac{b}{c}\right)^{r+p} \times \left(\frac{c}{a}\right)^{p+q}$ . 2  
 b. Show that,  $\left(\frac{a}{b}\right)^{q+r-p} \times \left(\frac{b}{c}\right)^{r+p-q} \times \left(\frac{c}{a}\right)^{p+p-r} = 1$  4  
 c. Simplify:  $\left(\frac{a}{b}\right)^{q^2+qr+r^2} \times \left(\frac{b}{c}\right)^{r^2+rp+p^2} \times \left(\frac{c}{a}\right)^{p^2+pq+q^2}$ . 4

Ans. a. 1; c. 1.

**Question ▶ 21** If  $l = xy^{p-1}$ ,  $m = xy^{q-1}$ ,  $n = xy^{r-1}$ ,  $p + q + r = 3$  and  $p^2 + q^2 + r^2 = 3$  then —

- a. Find the value of  $lmn$ . 2  
 b. Prove that,  $l^{q-r} \times m^{r-p} \times n^{p-q} = 1$  4  
 c. Show that,  $l^{p+1} \times m^{q+1} \times n^{r+1} = x^6$  4

Ans. a.  $x^3$ .



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internet-linked

In this part important information of the chapter, at which it is needed to cast a look before exam or you must remember, such subject matters have been mentioned here at a glance. So that you can keep the important information in mind easily; specially you can make you self-confident revising these in a quick view.



- $a^n$ ,  $a \rightarrow$  base,  $n \rightarrow$  index or power
- $a^m \times a^n = a^{m+n}$
- $\frac{a^m}{a^n} = \begin{cases} a^{m-n}, & \text{when } m > n \\ \frac{1}{a^{n-m}}, & \text{when } n > m \end{cases}$   $a \neq 0$  Here,  $a \in \mathbb{R}$ ;  $m, n \in \mathbb{N}$
- $(ab)^n = a^n \times b^n$
- $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$  ( $b \neq 0$ )
- $a^0 = 1$  ( $a \neq 0$ )
- $a^{-n} = \frac{1}{a^n}$  ( $a \neq 0$ )

- $(a^m)^n = a^{mn}$
- $\frac{1}{a^n} = a^{-n}$
- $(a^n)^m = a^n \cdot \frac{1}{n} = a^1 = a$
- $\frac{1}{a^n} = \frac{1}{a^n} = \frac{1}{a^n}$
- $(a^n)^m = a^n = \sqrt[n]{a}$
- $n^{\text{th}}$  root of  $a = \sqrt[n]{a}$
- If  $a^x = a^y$  then  $x = y$ , when  $a > 0$ ,  $a \neq 1$
- If  $a^x = b^x$  then  $a = b$ , when  $a > 0$ ,  $b > 0$ ,  $x \neq 0$

## Suggestion: Highway Ensuring a Brilliant Result

It is not that you will find all the questions common but the practice of these questions will guide you in solving different and difficult question patterns.



### Suggestions | Multiple Choice Questions

| Question Nos. |   |
|---------------|---|
| ★★★           | 1, 3, 9, 10, 11, 12, 13, 15, 16, 19, 24, 25, 29, 34, 35, 36, 37, 42, 43, 50, 51, 54, 58, 59, 61, 62, 65 |
| ★★            | 4, 6, 14, 18, 22, 26, 28, 30, 32, 39, 41, 45, 46, 56, 63, 67, 68-70, 74-76                              |



### Suggestions | Creative Questions

| Question Nos. |              |
|---------------|--------------|
| ★★★           | 2, 3, 10, 13 |
| ★★            | 1, 7, 9      |