

NUMERICAL APTITUDE – IV

Any expression of the form a^m (read as 'a' to the power of 'm') is called an index in which 'a' is known as the base of the index and 'm' the power of index.

Also $a^m = a \times a \times a \times a \dots \dots \dots$ m times

For e.g. $3^4 = 3 \times 3 \times 3 \times 3 = 81$

To solve the problems based on indices one should know the laws of indices.

LAWS OF INDICES:

- (i) $a^m \times a^n = a^{(m+n)}$
- (ii) $a^m \times a^n \times a^p \times \dots \dots \dots = a^{(m+n+p+\dots)}$
- (iii) $a^m \div a^n = a^{(m-n)}$
- (iv) $(a^m)^n = a^{mn}$
- (v) $(ab)^m = a^m \times b^m$
- (vi) $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$
- (vii) $a^{-m} = \frac{1}{a^m}$

NOTE: $a^0 = 1$

Directions (Q. 1-15): What will come in place of the question mark (?) in the following questions?

1. $7^2 \times 49^2 = 7^? \times 343$
1) 4 2) 3 3) 6 4) 2 5) None of these

ANSWER: 2
 $49^2 = (7^2)^2 = 7^{2 \times 2} = 7^4$
 $343 = 7^3$
 $7^2 \times 49^2 = 7^2 \times 7^4$
 $7^? \times 343 = 7^? \times 7^3$
 $\therefore 7^2 \times 7^4 = 7^? \times 7^3$
 $\Rightarrow 7^{2+4} = 7^{?+3}$
As bases are same, powers should be equal
 $\therefore 6 = ? + 3$
 $\Rightarrow ? = 6 - 3 = 3$

2. $(5)^2 \times (25)^3 \times 125 = (5)^?$
1) 9 2) 7 3) 8 4) 11 5) None of these

ANSWER: 4
 $(25)^3 = (5^2)^3 = 5^{2 \times 3} = 5^6$
 $125 = 5^3$
 $(5)^2 \times (25)^3 \times 125 = 5^2 \times 5^6 \times 5^3 = 5^{2+6+3} = 5^{11}$
 $\therefore ? = 11$

3. $64^{12} \div 4^{15} = 64^?$
1) 9 2) 3 3) 12 4) 7 5) None of these

ANSWER: 4

$$4^{15} = 4^{3 \times 5} = (4^3)^5 = 64^5$$

$$64^{12} \div 4^{15} = 64^{12} \div 64^5 = 64^{12-5} = 64^7$$

∴ ? = 7

4. $5^5 \times (25)^3 \div 625 = (5)^?$
 1) 6 2) 9 3) 8 4) 5 5) None of these

ANSWER: 5
 $(25)^3 = (5^2)^3 = 5^{2 \times 3} = 5^6$
 $625 = 5^4$
 $5^5 \times (25)^3 \div 625 = 5^5 \times 5^6 \div 5^4 = 5^{5+6-4} = 5^7$
 ∴ ? = 7

5. $\left[\left((3^2)^6 \right)^4 \right] = 9^?$
 1) 28 2) 16 3) 12 4) 24 5) None of these

ANSWER: 4
 $\left[\left((3^2)^6 \right)^4 \right] = \left[(9^6)^4 \right] = (9)^{6 \times 4} = 9^{24}$
 $\Rightarrow 9^{24} = 9^?$
 ∴ ? = 24

6. $(80 \times 0.40)^3 \div (40 \times 1.6)^3 \times (128)^3 = (2)^{?+7}$
 1) 25 2) 11 3) 12 4) 18 5) None of these

ANSWER: 2
 $(80 \times 0.40)^3 = (32)^3 = (2^5)^3 = 2^{5 \times 3} = 2^{15}$
 $(40 \times 1.6)^3 = (64)^3 = (2^6)^3 = 2^{6 \times 3} = 2^{18}$
 $(128)^3 = (2^7)^3 = 2^{7 \times 3} = 2^{21}$
 $(80 \times 0.40)^3 \div (40 \times 1.6)^3 \times (128)^3 = 2^{15} \div 2^{18} \times 2^{21} = 2^{15-18+21} = 2^{18}$
 $2^{18} = 2^{?+7}$
 $18 = ? + 7$
 $? = 18 - 7 = 11$

7. $5^{8.9} \times 25^{7.2} \div 125^{4.6} = 5^?$
 1) 10.5 2) 9.5 3) 7.6 4) 8.7 5) None of these

ANSWER:
 $25^{7.2} = (5^2)^{7.2} = 5^{2 \times 7.2} = 5^{14.4}$
 $125^{4.6} = (5^3)^{4.6} = 5^{3 \times 4.6} = 5^{13.8}$
 $5^{8.9} \times 25^{7.2} \div 125^{4.6} = 5^{8.9} \times 5^{14.4} \div 5^{13.8}$
 $= 5^{8.9+14.4-13.8} = 5^{8.9+0.6} = 5^{9.5}$
 ∴ ? = 9.5

8. $8^{9.4} \times 4^{12.8} \times 64^{8.1} = 16^?$
 1) 41.8 2) 16.2 3) 18.4 4) 25.6 5) None of these

ANSWER: 4
 $8^{9.4} = (2^3)^{9.4} = (2)^{3 \times 9.4} = 2^{28.2}$

$$4^{12.8} = (2^2)^{12.8} = (2)^{2 \times 12.8} = 2^{25.6}$$

$$64^{8.1} = (2^6)^{8.1} = 2^{48.6}$$

$$8^{9.4} \times 4^{12.8} \times 64^{8.1} = 2^{28.2} \times 2^{25.6} \times 2^{48.6}$$

$$= 2^{28.2+25.6+48.6} = 2^{102.4} = 2^{4 \times 25.6} = (2^4)^{25.6} = 16^{25.6}$$

$$16^{25.6} = 16^? \Rightarrow ? = 25.6$$

9. If $[3^{m^2} \div (3^m)^2]^{\frac{1}{m}} = 81$, the value of m is
 1) - 3 2) - 6 3) 3 4) 6 5) None of these

these

ANSWER: 4

$$(3^m)^2 = 3^{m \times 2} = 3^{2m}$$

$$[3^{m^2} \div (3^m)^2] = [3^{m^2} \div 3^{2m}] = 3^{m^2-2m}$$

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

$$3^{m-2} = 81 = 3^4$$

$$\therefore m - 2 = 4$$

$$\Rightarrow m = 4 + 2 = 6$$

10. $(2 \times 3)^2 \times (9 \times 4)^3 \div 216 = 6^?$
 1) 5 2) 4 3) 6 4) 2 5) None of these

ANSWER:

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

$$(9 \times 4)^3 = 36^3 = (6^2)^3 = 6^{2 \times 3} = 6^6$$

$$216 = 6^5$$

$$(2 \times 3)^2 \times (9 \times 4)^3 \div 216 = 6^2 \times 6^6 \div 6^5 = 6^{2+6-5} = 6^3$$

$$\therefore ? = 3$$

11. $(0.04)^5 \times (0.2)^4 \div (0.008)^2 = (0.2)^?$
 1) 5 2) 6 3) 7 4) 8 5) None of these

ANSWER: 4

$$(0.04)^5 = (0.2^2)^5 = (0.2)^{2 \times 5} = (0.2)^{10}$$

$$(0.008)^2 = (0.2^3)^2 = (0.2)^{3 \times 2} = (0.2)^6$$

$$(0.2)^{10} \times (0.2)^4 \div (0.2)^6 = (0.2)^8$$

$$\Rightarrow (0.2)^{10+4-6} = (0.2)^8$$

$$\Rightarrow (0.2)^8 = (0.2)^?$$

$$\therefore ? = 8$$

12. $(8)^3 \div (16)^2 \times 32 = (2)^{? - 4} \div (4)^2$
 1) 12 2) 18 3) 14 4) 10 5) None of these

ANSWER: 3

$$(8)^3 = (2^3)^3 = 2^{3 \times 3} = 2^9$$

$$(16)^2 = (2^4)^2 = 2^{4 \times 2} = 2^8$$

$$32 = 2^5$$

$$(4)^2 = (2^2)^2 = 2^{2 \times 2} = 2^4$$

$$(8)^3 \div (16)^2 \times 32 \times (4)^2 = (2)^{? - 4}$$

$$\Rightarrow (2)^9 \div (2)^8 \times 2^5 \times 2^4 = (2)^{? - 4}$$

$$\Rightarrow (2)^{9 - 8 + 5 + 4} = (2)^{? - 4}$$

$$\Rightarrow (2)^{10} = (2)^{? - 4}$$

$$10 = ? - 4$$

$$? = 10 + 4 = 14$$

13. $(15)^{\frac{3}{4}} \times \sqrt{225} \times \sqrt[4]{15} \div \sqrt{15} = (15)^?$

1) $\frac{1}{2}$ 2) $\frac{3}{2}$ 3) 2 4) $\frac{5}{2}$ 5) 3

ANSWER: 2

$$\sqrt{225} = 15; \quad \sqrt[4]{15} = (15)^{\frac{1}{4}};$$

$$(15)^{\frac{3}{4}} \times 15 \times (15)^{\frac{1}{4}} \div (15)^{\frac{1}{2}} = (15)^{\frac{3}{4} + 1 + \frac{1}{4} - \frac{1}{2}} = (15)^{2 - \frac{1}{2}} = (15)^{\frac{3}{2}}$$

$$\therefore ? = \frac{3}{2}$$

14. $(28)^{26} \times (21952)^{-8} \div \frac{1}{(28)^{-1}} = ?$

1) $(28)^{-2}$ 2) $(28)^{-1}$ 3) 28 4) $(28)^2$ 5) $(28)^0$

ANSWER: 3

$$(21952)^{-8} = (28^3)^{-8} = 28^{3 \times (-8)} = 28^{-24}$$

$$(28)^{26} \times (21952)^{-8} \div \frac{1}{(28)^{-1}} = (28)^{26} \times (28)^{-24} \div (28)^{-(-1)}$$

$$= (28)^{26 - 24 - 1} = 28$$

15. $(18)^7 \times (5832)^{-2} \div (324)^{-1} = (18)^?$

1) 5 2) 4 3) 3 4) 2 5) 1

ANSWER: 3

$$(5832)^{-2} = (18^3)^{-2} = (18)^{3 \times (-2)} = (18)^{-6}$$

$$(324)^{-1} = (18^2)^{-1} = (18)^{2 \times (-1)} = 18^{-2}$$

$$(18)^7 \times (18)^{-6} \div (18)^{-2} = (18)^?$$

$$(18)^{7 - 6 - (-2)} = (18)^?$$

$$(18)^3 = (18)^?$$

$$\therefore ? = 3$$

16. $(4)^5 \times (64)^{-1} \div (256)^{-1} \div 1024 = (4)^?$

1) - 2 2) - 1 3) 1 4) 2 5) - 7

ANSWER: 3

$$(64)^{-1} = (4^3)^{-1} = (4)^{3 \times (-1)} = (4)^{-3}$$

$$(256)^{-1} = (4^4)^{-1} = (4)^{-4}$$

$$(1024) = 4^5$$

$$(4)^5 \times (4)^{-3} \div (4)^{-4} \div 4^5 = (4)^?$$

$$(4)^{5-3+4-5} = (4)^1 = (4)^?$$

$$\therefore ? = 1$$

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