

FOUNDATION⁺

①

Class: VI. MATHEMATICS

1. EXPONENTS AND POWERS

TEACHING TASK (JEE MAINS)

01. $\frac{5x-3}{19x+2} = \frac{3}{5}$

$$\Rightarrow x = \frac{-21}{32}$$

$$\Rightarrow 25x - 15 = 57x + 6$$

$$\Rightarrow 32x = -21$$

Ans: A

02. $x + y = 5$

$$\Rightarrow x^2 + y^2 + 2xy = 25$$

$$\Rightarrow 10 + 2xy = 25$$

$$\Rightarrow 2xy = 15$$

$$xy = \frac{15}{2}$$

$$= 7\frac{1}{2}$$

Ans: A

03

$$\frac{0.64 + 0.36}{2} = \frac{1}{2} = 2$$

Ans: B

04

$$a^3 \times b^2 = k \times b$$

$$\Rightarrow k = a^3 \times b$$

Ans: C

05

$$\frac{1}{2^2} + \frac{1}{3^3} = \frac{1}{4} + \frac{1}{27} = \frac{31}{108}$$

Ans: B

06

$$\frac{x^4 \times x^7}{x^3} = \frac{x^{11}}{x^3} = x^8$$

Ans: B

07

$$729 = 3^6$$

$$\therefore 3^4 \times 3^2 = 3^6$$

Ans: B



08 $(x^{m-n})^p \cdot (x^{n-p})^m \cdot (x^{p-m})^n$ (2)

$$= x^{mp - pn + mn - pm + pn - mn}$$

$$= x^0 = 1$$

Ans: D

09 $3^{2x-1} = 27 = 3^3$

$$\Rightarrow 2x-1 = 3$$

$$\Rightarrow x = 2$$

Ans: C

10 $\left(\frac{p^2 \cdot q^{-3}}{r^2} \right)^{-1} \cdot \left(\frac{r^3}{pq} \right)^2 = p^{-4} \cdot q \cdot r^8$

$$= \frac{r^2}{p^2 \cdot q^{-3}} \cdot \frac{r^6}{p^2 q^2}$$

Ans: D

11. $m^{n-2n+4m} = m^p$

$$\Rightarrow 3n = p \quad (\text{so}) \quad n = p = 0$$

Ans: C, D

12 $\left(\frac{x^3}{y^2} \right)^{-2} \cdot \left(\frac{y^5}{x^{-1}} \right)^3 = \frac{y^4}{x^6} \cdot x^3 \cdot y^{15}$

$$= \left(\frac{y^2}{x^3} \right)^2 \cdot (xy^5)^3 = \frac{y^4}{x^6} \cdot x^3 \cdot y^{15} = \frac{y^{19}}{x^3} \quad \text{or} \quad \frac{y^{19}}{x^3}$$

Ans: C, D

13 Statement I: $(2^3)^2 = 2^6 = 64$

$2^2 \cdot 3^3 = 3^5$ (True)

Statement II: Conceptual (True) Ans: A

14. Statement I: Conceptual (True) (3)

Statement II: $8^{x+2} = 2^{4x-3}$

$$\Rightarrow 2^{3x+6} = 2^{4x-3}$$

$$\Rightarrow 3x+6 = 4x-3$$

$$\Rightarrow x = 9 \text{ (True)}$$

Ans: A

15. Assertion: $\frac{3^{-2}}{3^{-5}} = \frac{3^5}{3^2} = 3^3 \text{ (True)}$

Reason: Conceptual (False) Ans: C

16. Assertion: $2^3 \times 2^4 = 2^{3+4} = 2^7 \text{ (True)}$

Reason: Conceptual (False) Ans: C

17. Earth & Moon $\rightarrow 3.84 \times 10^5$
Earth & Sun $\rightarrow 1.5 \times 10^8$

Answer = $\frac{1.5 \times 10^8}{3.84 \times 10^5} = 390 \text{ (Approx)}$
Ans: B

18. Speed = 1.92×10^3

Distance = 3.84×10^5

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\Rightarrow \text{Time} = \frac{\text{Distance}}{\text{Speed}} = \frac{3.84 \times 10^5}{1.92 \times 10^3} = 200 \text{ minutes Ans}$$

19. $\frac{2^{-3} \cdot 3^4}{(2^2)^{-2}} = \frac{2^{-3} \cdot 3^4}{2^{-4}} = \frac{2^4 \cdot 3^4}{2^3} = 2 \times 81 = 162$

Ans: B

$$20. \quad x^3 \cdot x^{-5} = x^{3-5} = x^{-2} = x^2 \quad (4)$$

$$\Rightarrow x^4 = 1$$

$$\Rightarrow x^4 - 1 = 0$$

$$\Rightarrow (x^2 + 1)(x^2 - 1) = 0$$

$$\Rightarrow x^2 + 1 = 0 \quad \text{or} \quad x^2 - 1 = 0$$

$$\Rightarrow x^2 = -1 \quad x = \pm i$$

Not possible

Ans: A

$$21. \quad 2^{100-100} = 2^0 = 1$$

Ans: A

$$22. \quad \begin{array}{l|l} 2^x = 8^y & \Rightarrow 3y = 6 \\ \Rightarrow 2^6 = 2^{3y} & \Rightarrow y = 2 \end{array}$$

Ans: 2

$$23. \quad \begin{array}{l|l} a) (6^4)^3 = 6^{12} (p) & c) x = 7 (s) \\ b) 6^{-6} \times 6^6 = 6^0 = 1 (q) & d) 2^1 = 2 (r) \end{array}$$

Ans: p, q, s, r

$$24. \quad \begin{array}{l} a) 4^3 \times 2^2 = 2^{6+2} = 2^8 (p) \\ b) 2^6 \times 2^1 = 2^7 (q) \\ c) 2^4 \times 2^4 = 2^8 (r) \\ d) \frac{2^5}{2^2} = 2^3 (s) \end{array}$$

Ans: p, q, r, s

LEARNERS TASK (CUE'S)

$$01. \quad a \cdot a \cdot a \cdot a = a^4$$

Ans: C

$$02. \quad 2pq = 2 \cdot 2 \cdot 4 = 16$$

Ans: B

$$03. \quad 10^{-4}$$

Ans: C

04. $\frac{3pq^2r^2}{9pqr} = \frac{1}{3}qr$ (5)
Ans: C

05. $mnp = (2)(-3)(-2) = 12$ Ans: A

06. $x^m = x^n \Rightarrow m = n$ Ans: C

07. $\frac{5^2}{5^6} = \frac{1}{5^4} = 5^{-4} = \frac{1}{625}$ Ans: D

08. $(2^4 \times 3^2)^2 = 2^8 \times 3^4$ Ans: A

09. $\left(\frac{1}{2}\right)^{-3} = 2^3 = 8$ Ans: B

10. $9^{\frac{3}{2}} = (3^2)^{\frac{3}{2}} = 3^3 = 27$ Ans: B

JEE MAINS LEVEL

01.
$$\frac{(x^{a+b})^3 \cdot (x^{b+c})^3 \cdot (x^{c+a})^3}{(x^a \cdot x^b \cdot x^c)^6}$$

$$= \frac{3a+3b+3b+3c+3c+3a-6a-6b-6c}{1}$$

$$= x^0 = 1$$
 Ans: C

02. ~~$$\frac{3^{2m} \cdot 9^{4m+1} \cdot 27}{(81)^{2m}} = 1$$~~
~~$$\frac{3^{2m} \cdot 12m+3+3-8m}{3 \cdot 3 \cdot -3} = 1$$~~
~~$$\Rightarrow \frac{8m}{3} = 1$$~~
~~$$\frac{2m+12m+3+3-8m}{4m+6} = 1$$~~
~~$$x =$$~~

02

$$\frac{3^{2x} \cdot 9^{4x+1} \cdot 27}{(81)^{2x}} = 1$$

$$\Rightarrow \frac{3^{2x} \cdot 3^{12x+3} \cdot 3^3}{3^{8x}} = 1$$

$$\Rightarrow \frac{2x + 12x + 3 + 3 - 8x}{3} = 3^0$$

$$\Rightarrow 8x + 6 = 0$$

$$\Rightarrow x = -\frac{3}{4}$$

Ans: B

03

$$(64)^{\frac{2}{3}} + \sqrt{100} + (81)^{-\frac{1}{4}} \times \left(\frac{25}{16}\right)^{-\frac{1}{2}} + 1$$

$$= (4^3)^{\frac{2}{3}} + 10 + (3^4)^{-\frac{1}{4}} \times \left(\frac{16}{25}\right)^{\frac{1}{2}} + 1$$

$$= 16 + 10 + \frac{1}{3} \times \frac{4}{5} + 1$$

$$= 27 + \frac{4}{15} = \frac{409}{15}$$

Ans: B

04

$$\frac{9^n \times 3^5 \times (27)^3}{3 \times (81)^4} = 27$$

$$\Rightarrow \frac{3^{2n} \times 3^5 \times 3^9}{3 \times 3^{16}} = 27$$

$$\Rightarrow \frac{2n + 5 + 9 - 1 - 16}{3} = 3$$

$$\Rightarrow 2n - 3 = 3$$

$$\Rightarrow n = 3$$

Ans: B

05 $a^3 - b^5 = 5^3 - 3^5$ ①
 $= 125 - 243$
 $= -118$ Ans: D

06 3^8 Ans: B

07 $3^x = 3^4 \Rightarrow x = 4$ Ans: C

08 $5^{4-2-3} = 5^{-1} =$ Ans: A

09 $\left(\frac{1}{2} + \frac{1}{4} \right) - 1 \mid = \frac{3}{4} - 1 = -\frac{1}{4}$
 $= \left(\frac{1}{2} + \frac{1}{4} \right) - 1 \mid$ Ans: C

10 $\frac{a}{b} = \frac{2^3 \times 3^2}{2^2 \times 3^3} = \frac{2}{3}$ Ans: A

JEE ADVANCED

11. $4 \cdot 4^3 = 4^4$ or $4^2 \times 4^2$ or 256 Ans: A, B, C

12 $10^0 = 1$, $\frac{2^5}{2^5} = 1$, $3^{-4+4} = 3^0 = 1$ Ans: A, B, C

13 Statement I: $x^y = y^x \Rightarrow y = x^{\frac{y}{x}}$
 $LHS = \left(\frac{x}{y} \right)^{\frac{x}{y}} = \left(\frac{x}{x^{\frac{y}{x}} x} \right)^{\frac{x}{y}}$
 $= x^{\left(1 - \frac{y}{x} \right) \frac{x}{y}} = x^{\frac{x}{y} - 1} = RHS$
(True)

Statement II:

(8)

$$2^x = 4^y = 8^z$$
$$\Rightarrow 2^x = 2^{2y} = 2^{3z}$$

$$\Rightarrow x = 2y = 3z$$

$$\Rightarrow y = \frac{x}{2}, z = \frac{x}{3}$$

Given $xyz = 288$

$$\Rightarrow x \cdot \frac{x}{2} \cdot \frac{x}{3} = 288 \Rightarrow x = 12$$

$$\therefore y = \frac{12}{2} = 6, z = \frac{12}{3} = 4$$

$$\text{LHS} = \frac{1}{2x} + \frac{1}{4y} + \frac{1}{8z}$$

$$= \frac{1}{2 \cdot 12} + \frac{1}{4 \cdot 6} + \frac{1}{8 \cdot 4}$$

$$= \frac{1}{24} + \frac{1}{24} + \frac{1}{32} = \frac{11}{96} \text{ (True)}$$

Ans: A

14. Statement I: $a^{-3} = \frac{1}{a^3}$ (True)

Statement II: Conceptual (True) Ans: A

15. Assertion: $8^{\frac{2}{3}} = \left(2^3\right)^{\frac{2}{3}} = 2^2 = 4$ (True)

Reason: Conceptual (True) Ans: A

16. Assertion: $\left(\frac{1}{5}\right)^{-2} = 5^2 = 25$ (True)

Reason: Conceptual (False) Ans: C

17. $3^{x+2} = 3^4 \Rightarrow x+2=4 \Rightarrow x=2$

Ans: —

$$18 \quad 5^{2x} = 5^3 \Rightarrow x = \frac{3}{2} = 1.5 \quad \text{Ans: C} \quad (5)$$

$$19 \quad 4500000 = 45 \times 10^5 \\ = 4.5 \times 10^6 \quad \text{Ans: A, D}$$

$$20 \quad 3.2 \times 10^{-4} = \frac{3.2}{10000} = \frac{32}{1000000} \\ = 0.00032 \quad \text{Ans: B}$$

$$21. \quad (5 \cdot x^{-1}) \times 5^3 = 125^2 \\ \Rightarrow \frac{1}{x} \times 5^4 = 5^6 \\ \Rightarrow \frac{1}{x} = 5^2 \quad \left| \begin{array}{l} \Rightarrow x = \frac{1}{25} \\ = 0.04 \\ \text{Integral value} = 0 \\ \text{Ans: 0} \end{array} \right.$$

$$22 \quad a \times b = 2^3 \times 5^2 \times 2^2 \times 5^3 \\ = 2^5 \times 5^5 = (10)^5 \quad \text{Ans: 5}$$

$$23 \quad \begin{array}{l} a) 27 = 3^x \Rightarrow x = 3 (p) \\ b) 16 = 2^x \Rightarrow x = 4 (q) \\ c) 81 = 9^x \Rightarrow x = 2 (r) \\ d) 5 = 5^x \Rightarrow x = 1 (s) \end{array}$$

$$24 \quad \begin{array}{l} a) 2^x = 32 \Rightarrow x = 5 (p) \\ b) 3^{x-1} = 9 \Rightarrow x-1 = 2 \Rightarrow x = 3 (q) \\ c) 5^{2x} = 5^4 \Rightarrow x = 2 (r) \\ d) 10^{x+1} = 10^3 \Rightarrow x = 2 (r) \end{array} \quad \text{Ans: p, q, r, r}$$

$\Rightarrow$ THE END $\Leftarrow$