

FOUNDATION (V₂)

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Class: VII, MATHEMATICS

3. EXPONENTS AND POWERS

TEACHING TASK (JEE MAINS)

01. $\frac{a^{15} \cdot b^4}{a^6 \cdot b^2} = a^{15-6} \cdot b^{4-2} = a^9 \cdot b^2$ Ans: B

02. $x+y=5$
 $\Rightarrow x^2+y^2+2xy=25$
 $\Rightarrow 10+2xy=25$ Ans: A

$xy = \frac{15}{2} = 7\frac{1}{2}$

03. $(a^{4n} \cdot a^{3n} \cdot a^{2n})^2 = (a^{4n+3n+2n})^2 = (a^{9n})^2 = a^{18n}$ Ans: C

04. $\left[5 \left(8^{\frac{1}{3}} + 27^{\frac{1}{3}}\right)^3\right]^{\frac{1}{4}} = [5 \times 125]^{\frac{1}{4}} = (5^4)^{\frac{1}{4}} = 5$
 $= [5(2+3)^3]^{\frac{1}{4}} = (625)^{\frac{1}{4}} = 5$ Ans: B

05. $\left\{ \left\{ \left(\frac{1}{3}\right)^{-3} - \left(\frac{1}{2}\right)^{-3} \right\} \div \left(\frac{1}{4}\right)^{-3} \right\}$
 $= \{ (27-8) \div 64 \}$
 $= \frac{19}{64}$ Ans: A

06. $(\sqrt[3]{4})^{2x+\frac{1}{2}} = \frac{1}{32}$
 $= 4^{\frac{4x+1}{6}} = 2^{-5}$
 $\Rightarrow 2^{\frac{4x+1}{3}} = 2^{-5}$
 $\Rightarrow 4x+1 = -15$
 $\Rightarrow x = -4$ Ans: A

(2)

$$\begin{aligned}
 07 \quad & 96326000000 \\
 & = 96326 \times 10^6 \\
 & = 9.6326 \times 10^{10}
 \end{aligned}$$

Ans: B

$$08 \quad \frac{6a^9 \cdot b^4 \cdot c^5}{2ab^2c^3} = 3a^8 \cdot b^2 \cdot c^2$$

Ans: C

$$\begin{aligned}
 09 \quad & \left[\left(\frac{1}{4} \right)^2 - \left(\frac{1}{4} \right)^3 \right] \times 2^6 = \left[\frac{4-1}{64} \right] \times 64 \\
 & = \left(\frac{1}{16} - \frac{1}{64} \right) \times 64 = 3
 \end{aligned}$$

Ans: C

$$\begin{aligned}
 10. \quad & \left(\frac{x^a}{x^b} \right)^{a^2+ab+b^2} \cdot \left(\frac{x^b}{x^c} \right)^{b^2+bc+c^2} \cdot \left(\frac{x^c}{x^a} \right)^{c^2+ca+a^2} \\
 & = \frac{(a-b)(a^2+ab+b^2)}{a^3-b^3} + \frac{(b-c)(b^2+bc+c^2)}{b^3-c^3} + \frac{(c-a)(c^2+ca+a^2)}{c^3-a^3} \\
 & = 1 \\
 & = x^0 = 1
 \end{aligned}$$

Ans: A

ADVANCED LEVEL

$$\begin{aligned}
 11 \quad & \frac{9^n \times 3^5 \times (27)^3}{3 \times (81)^4} = 27 \\
 & \Rightarrow \frac{2n+5+9}{1+16} = 3 \\
 & \Rightarrow \frac{2n+14-17}{3} = 3^3 \\
 & \Rightarrow 2n-3=3 \\
 & \Rightarrow n=3 \text{ or } \sqrt[4]{81}
 \end{aligned}$$

Ans: B, C

$$\begin{aligned}
 12 \quad & 3^0 + 3^1 + 3^2 + 3^3 + 3^4 \\
 & = 1 + 3 + 9 + 27 + 81 \\
 & = 121
 \end{aligned}$$

$$\therefore \sqrt{121} = 11 \text{ or } \sqrt{11^2}$$

Ans: B, C



13. Statement I: $\frac{x^{2017}}{x^{2016}} = x$ (False) (3)

Statement II: Conceptual (True) Ans: D

14 Statement I: Conceptual (True) $\Rightarrow x = 9$
Statement II: $8^{x+2} = 2^{4x-3}$ (True)

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

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

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

Ans: A

15 Assertion: $2^3 + 2^4 = 8 + 16 = 24$ (False)

Reason: Conceptual (True) Ans: D

16 Assertion: $6x^2y^3 \rightarrow \text{Degree} = 2+3 = 5$ (False)

Reason: Conceptual (True) Ans: D

17. $x^{a^2-b^2} + b^2 - c^2 + c^2 - a^2 = x^0 = 1$ Ans: C

18 $\left(\frac{5}{2}\right)^{-5} \left(\frac{2}{3}\right)^{-5} = \left(\frac{5}{2} \times \frac{2}{3}\right)^{-5} = \left(\frac{5}{3}\right)^{-5} = \left(\frac{3}{5}\right)^5$

Ans: B

19 $0.0001 = \frac{1}{10000} = \frac{1}{10^4} = 10^{-4}$

Ans: B

20 $6.23 \times 10^5 = 6.23 \times 100000$
 $= 623000$

Ans: A

$$21) \quad 3^{x+2} = 18 \Rightarrow 3^x \cdot 3^2 = 18 \Rightarrow 3^x \cdot 9 = 18 \quad (4) \\ \Rightarrow 3^x = 2 \quad \text{Ans: } 2$$

$$22) \quad 8^{x-1} = 2^{x+3} \quad \left| \quad 3x-3 = x+3 \right. \\ \Rightarrow 2^{3x-3} = 2^{x+3} \quad \left| \quad \Rightarrow 2x = 6 \right. \\ \Rightarrow x = 3 \quad \text{Ans: } 3$$

$$23) \quad \begin{aligned} a) \quad 36^6 &= (6^2)^6 = 6^{12} \quad (p) \\ b) \quad 6^{-6} \times 6^6 &= 6^{-6+6} = 6^0 = 1 \quad (q) \\ c) \quad x^3 &= 7^3 \Rightarrow x = 7 \quad (s) \\ d) \quad 2^{1^2 \cdot 3} &= 2^1 = 2 \quad (r) \end{aligned} \quad \text{Ans: } p, q, s, r$$

$$24) \quad \begin{aligned} a) \quad \frac{2^{10}}{2^{-10}} &= 2^{10+10} = 2^{20} \quad (s) \\ b) \quad 6^{18} &= (2 \times 3)^{18} = 2^{18} \times 3^{18} \quad (u) \\ c) \quad 2^x &= 16 \Rightarrow 2^x = 2^4 \Rightarrow x = 4 \quad (t) \\ d) \quad 5^0 - 6^0 &= 1 - 1 = 0 \quad (q) \end{aligned} \quad \text{Ans: } s, u, t, q$$

LEARNERS TASK (CUE'S)

$$01) \quad \left(-\frac{2}{5}\right)^{-3} = \left(-\frac{5}{2}\right)^3 = -\frac{125}{8} \quad \text{Ans: } B$$

$$02) \quad (-n^2)^2 \times (-n^2)^3 = n^4 \times -n^6 = -n^{10} \quad \text{Ans: } A$$

$$03) \quad x = y \quad \text{Ans: } A$$

64. $\left(\frac{x^m}{x^n}\right)^p \cdot \left(\frac{x^n}{x^p}\right)^m \cdot \left(\frac{x^p}{x^m}\right)^n$ (5)

$= \left(x^{m-n}\right)^p \cdot \left(x^{n-p}\right)^m \cdot \left(x^{p-m}\right)^n$

$= x^{mp-np+mn-pm+pn-mn} = x^0 = 1$

Ans: B

$$05 \quad \binom{m+n}{x}^{n-n} \cdot \binom{n+p}{x}^{n-p} \cdot \binom{n+m}{x}^{n-m}$$

$$= x^{m^2 - n^2 + n^2 - p^2 + n^2 - m^2} = x^0 = 1 \quad \text{Ans: } C$$

06	$20(x-y)^4$	Ans: A
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07	(2010) 2010	Ans: B
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08 $(7^\circ - 3^\circ) \times 6^\circ = (1-1) \times 6^\circ = 0 \times 1 = 0$ Ans: 0

09.	$(-1)^{2024} = 1$	Ans. A
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10. $a^3 - b^5 = 5^3 - 3^5$
 $= 125 - 243 = -118$ Ans = D

JEE MAINS (LEVEL)

01. $\frac{a^{10}}{a^{12}} = a^{10-12} = a^{-2}$ Ans: C

02 $4^{3^2} - 4^8 = 4^9 - 4^8 = 4^8(4-1) = 3 \cdot 4^8 = 3 \cdot 2^{16}$
Ans: B

03. aplikasi persamaan: BAR ada

$8^x \times 2^2 = 2^6$ | $3x + 2 = 6$

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

Ans: B

$$04 \quad \frac{1}{2} \times (3^x - 3^{x-1}) = 81$$

$$\Rightarrow 3^x - \frac{3^x}{3} = 162$$

$$\Rightarrow \text{put } 3^x = a$$

$$\Rightarrow a - \frac{a}{3} = 162$$

$$\Rightarrow 3a - a = 3 \times 162$$

$$2a = 3 \times 162 \quad (6)$$

$$a = 3 \times 81$$

$$\Rightarrow 3^x = 3 \times 3^4$$

$$\Rightarrow x = 5$$

Ans: D

05

$$0.000019$$

$$= \frac{19}{1000000}$$

$$= 19 \times 10^{-6}$$

$$= 1.9 \times 10^{-5}$$

Ans: A

06

$$\left(\frac{1}{x} + \frac{1}{y} \right)^{-1} = \left(\frac{1}{x} + \frac{1}{y} \right)^{-1} = \left(\frac{x+y}{xy} \right)^{-1} = \frac{xy}{x+y}$$

Ans: C

07.

$$\left[\frac{2-3x \quad 4+3x}{x \quad x} \right]^3 = \left(\frac{2-3x+4+3x-3}{x} \right)^3$$

$$= x$$

Ans: D

08

$$3^{x-1} = 9 \Rightarrow 3^{x-1} = 3^2 \Rightarrow x-1=2 \Rightarrow x=3$$

$$4^{y+2} = 64 \Rightarrow 4^{y+2} = 4^3 \Rightarrow y+2=3 \Rightarrow y=1$$

$$\therefore \frac{x}{y} = \frac{3}{1} = 3$$

Ans: B

09. $\left\{ \left(\frac{3}{2}\right)^{-1} \div \left(-\frac{2}{5}\right)^{-1} \right\} = \frac{2}{3} \times \frac{-2}{5}$ ①
 $= \left\{ \frac{2}{3} \div \left(-\frac{5}{2}\right) \right\} = -\frac{4}{15}$ Ans. D

10. $\frac{1}{1+x^{a-b}} + \frac{1}{1+x^{b-a}} = \frac{x^b}{x^b+x^a} + \frac{x^a}{x^a+x^b}$
 $= \frac{1}{1+\frac{x^a}{x^b}} + \frac{1}{1+\frac{x^b}{x^a}} = \frac{x^b+x^a}{x^b+x^a} = 1$
 Ans. C

JEE ADVANCED

11. $\frac{9^n \times 3^2 \times \left(3^{\frac{-n}{2}}\right)^{-2} - 3^{3n}}{3^{3m} \times 8} = 3^{-3}$
 $\Rightarrow \frac{3^{2n+2+n} - 3^{3n}}{3^{3m} \times 8} = \frac{3^{3m-3} \times 8}{3^{3(m-1)} \times 8}$
 $\Rightarrow \frac{3^{3n+2} - 3^{3n}}{3^{3m} \times 8} = \frac{3^{3(m-1)} \times 8}{3^{3(m-1)} \times 8}$
 $\Rightarrow \frac{3^{3n} (9 - 1)}{3^{3m} \times 8} = \frac{3^{3(m-1)} \times 8}{3^{3(m-1)} \times 8}$
 $\Rightarrow \frac{3^{3n}}{3^{3m}} = \frac{3^{3(m-1)}}{3^{3(m-1)}} = 1$
 $\Rightarrow 3^{3n} = 3^{3m-3}$
 $\Rightarrow n = m-1 \Rightarrow m-n = 1 = 3^0$
 Ans: A, B

12. Conceptual Ans. A, B, C, D

13

Statement I: $(a^0 - b^0)^0 = (1-1)^0 = 0^0$, not defined (True) (8)

Statement II:

$$2^x = 4^y = 8^z$$

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

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

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

$$\Rightarrow xyz = 288$$

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

$$\Rightarrow x^3 = 288 \times 6$$

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

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

$$\Rightarrow x^3 = (2^2 \times 3)^3$$

$$\Rightarrow \boxed{x=12}$$

$$y = \frac{x}{2} = \frac{12}{2} = 6, \boxed{y=6}$$

$$z = \frac{x}{3} = \frac{12}{3} = 4, \boxed{z=4}$$

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

$$= \frac{1}{2^4} + \frac{1}{2^4} + \frac{1}{2^2}$$

$$= \frac{11}{96} \text{ (True)}$$

Ans. A

14 Statement I: $a^{-n} = \frac{1}{a^n}$ ($a \neq 0$) (True)

Statement II: $2^{-3} = \frac{1}{8}$ (True) Ans. A

15. Assertion: Conceptual (True)

Reason: Conceptual (True)

Ans. A

16. Assertion: $3^{-2} = \frac{1}{9}$ (True)

Reason: $a^{-m} = \frac{1}{a^m}$ (True)

Ans. A

$$17. \quad 0.000939478 \quad \left| \quad = 939478 \times 10^{-9} \quad (9) \right.$$

$$= \frac{939478}{10000000000} \quad \left| \quad = 9.39478 \times 10^{-4} \right.$$

Ans: A

$$18. \quad 1.32 \times 10^{-2} \quad \left| \quad = \frac{132}{10000} = 0.0132 \right.$$

$$= \frac{1.32}{100} \quad \left| \quad \right.$$

Ans: A

$$19. \quad Q(x) = -3x^4 + 7x^2y - 11$$

Coefficient of $x^2y = 7$

Ans: B

$$20. \quad -3x^4 \rightarrow \text{degree} = 4$$

Ans: B

$$21. \quad 3^{x+5} = 3^{4x-4} \Rightarrow 4x-4 = x+5 \Rightarrow x=3$$

Ans: ~~A~~ 3

$$22. \quad (3^4)^{\frac{1}{2}} + (3^3)^{\frac{1}{3}} = 3^2 + 3 = 9 + 3 = 12 \quad \text{Ans: 12}$$

$$23. \quad a) 100^2(t)$$

$$b) (1-1)(3-1)=0 (p)$$

$$c) (2^7)^{5/7} = 32(x)$$

$$d) x=4, y=2$$

$$x^2 - y^2 = 4^2 - 2^2 = 12(y)$$

Ans: t, p, x, y

$$24. \quad a) -6(p)$$

$$b) 5(q)$$

$$c) 4(x)$$

$$d) -11(s)$$

Ans: p, q, x, s

$\Rightarrow$ THE END $\Leftarrow$

