

EXPONENTS AND POWERS

Class: VII, Mathematics ①

SOLUTIONS

TEACHING TASK

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

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

$$\Rightarrow 32x = -21$$

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

Ans: A

02. $x + y = 5$

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

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

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

Ans: A

03. $(50.5)^2 - (49.5)^2$
 $= (50.5 + 49.5)(50.5 - 49.5)$
 $= 100 \times 1 = 100$

Ans: B

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

Ans: B

05. $2^{0.64 + 0.36} = \frac{1}{2} = 2$

Ans: B

06. $a^3 \times b^2 = a^5 \times b$
 $\Rightarrow b = a^2 \Rightarrow a = b^{\frac{1}{2}}$

Ans: —

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

Ans: B



68. $\frac{x^4(1-x^3)}{x^3} = x - x^4$ (2) Ans: —
 (OR) $\frac{x^4 \times x^7}{x^3} = \frac{x^{11}}{x^3} = x^8$ Ans: B

09. 96326000000
 $= 96326 \times 10^6$
 $= 9.6326 \times 10^4 \times 10^6 = 9.6326 \times 10^{10}$ Ans: B

10. $3^4 \times 3^2 = 81 \times 9 = 729$ Ans: —

11. $\left(\frac{x^m}{x^n}\right)^p \cdot \left(\frac{x^n}{x^p}\right)^m \cdot \left(\frac{x^p}{x^m}\right)^n$
 $= x^{(m-n)p + (n-p)m + (p-m)n} = x^0 = 1$ Ans: D

12. $x^0 = 1$ Ans: A

13. $3^{2x-1} = 3^3 \Rightarrow x = 2$ Ans: C

14. $2x^6 \times 9x^2 = 72x^8$ Ans: —

15. $\frac{a^3 \cdot b^{-2}}{a^{-1} \cdot b^4} = \frac{a^4}{b^6} = a^4 \cdot b^{-6}$ Ans: —

16. $\frac{p^{-2} \cdot q^3}{r^{-2}} \times \frac{r^6}{p^2 q^2} = p^{-4} \cdot q \cdot r^8$ Ans: —

17. $(ab)^2 = \frac{c}{d^3} \quad \left| \quad (ab)^3 = \left(\frac{c}{d^3}\right)^{\frac{3}{2}} = \frac{c^{3/2}}{d^{9/2}}$
 $ab = \left(\frac{c}{d^3}\right)^{\frac{1}{2}}$ Ans: —

ADVANCED LEVEL QUESTIONS

01. $m^{n-2n+4n} = m^p$ (2)

$\Rightarrow 3n = p$ Ans: C

02. $\left(\frac{y^2}{x^3}\right)^2 \cdot \frac{y^{15}}{x^{-3}}$
 $= \frac{y^4}{x^6} \cdot \frac{y^{15}}{x^{-3}} = y^{19} \cdot x^{-3}$ Ans:

03. $8^{\frac{2}{3}} = \left(\frac{3}{2}\right)^{\frac{2}{3}} = 2^2 = 4, 2^2, \sqrt[3]{64}$ A, B
 Ans: C

04. $2^9 \times 2^{14} = 2^{23}$ or $2^{23} = 2^{14+9}$ Ans: B, D

05. Assertion: Conceptual (True)
 Reason: Conceptual (True) Ans: A

06. Assertion: $7^3 \div 7^4 = 7^{-1}$ (True)
 Reason: Conceptual (True) Ans: A

07. $7^4 \times 5^3 = \frac{5^3}{7^4}$ (False)
 Reason: Conceptual (~~False~~) (True) Ans: D

08. Statement I: $2^6 = 64, 3^{2+3} = 3^5$ (True)
 Statement II: $(a^m)^n = a^{mn}, a^m \cdot a^n = a^{m+n}$ (True)
 Ans: A

09. Statement I: Conceptual (True)
 Statement II: $2^{3x+6} = 2^{4x-3} \Rightarrow x = 9$ (True)
 Ans: A

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

11. $x^{-2} = x^2 \Rightarrow x^4 = 1 \Rightarrow (x^2+1)(x^2-1) = 0$
 $\Rightarrow x = \pm 1$ Ans: A

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12. $x^0 = 1$ Ans: C
13. $\frac{-5+2x+1}{2} = 2^6$
 $\Rightarrow 2x-4 = 6$
 $\Rightarrow x = 5$ Ans: —
14. $2^{100-100} = 2^0 = 1$ Ans: 1
15. $\frac{3x-3}{2} = 2^{x+3} \Rightarrow 3x-3 = x+3$
 $\Rightarrow 2x = 6 \Rightarrow x = 3$ Ans: 3
16. a) $\frac{1}{5^5}$ b) $\frac{-6+6}{6} = \frac{0}{6} = 1$
c) $x=7$ d) $2^{1^{2^3}} = 2^{1^8} = 2^1 = 2$ Ans: t, q, s, r
17. a) $2^{10-(-10)} = 2^{20}$ b) $6^{18} = (2 \times 3)^{18} = 2^{18} \times 3^{18}$
c) $2^x = 2^4 \Rightarrow x = 4$ d) $1-1=0$ Ans: s, u, t, q

LEARNER'S TASK

QUB'S

01. $a \cdot a \cdot a \cdot a = a^4$ Ans: C
02. $2 \cdot 2 \cdot 4 = 16$ Ans: B
03. 10^{-4} Ans: C
04. $\frac{1}{3} q r$ Ans: C
05. $n^4 \cdot -n^6 = -n^{10}$ Ans: A
06. $mnp = 2(-3)(-2) = 12$ Ans: A
07. $20(x-y)^4$ Ans: A
08. $(2010)^{2010}$ Ans: C



09. $(-1)^1 + (-1)^2 + \dots + (-1)^{2014} = 0$, (5)
 Since 2014 Even
 Ans: D

10. $m = n$ Ans: C

JEE MAIN LEVEL

01. $\frac{3a+3b+3b+3c+3c+3a-6a-6b-6c}{x^0} = 1$
 Ans: C

02. $\frac{2x+8x+2+3-8x}{-3} = 3^0$
 $\Rightarrow 2x+5=0 \Rightarrow x = -\frac{5}{2}$
 Ans: A

03. $\left(\frac{3}{4}\right)^{\frac{2}{3}} + \sqrt{10^2} + \left(3^4\right)^{-\frac{1}{4}} \times \left[\left(\frac{5}{4}\right)^2\right]^{-\frac{1}{2}} + 1$
 $= 16 + 2 + \frac{1}{3} \times \frac{4}{5} + 1$
 $= 19 + \frac{4}{15} = \frac{289}{15}$
 Ans: -

04. $\frac{2n+5+9-1-16}{3} = 3$
 $\Rightarrow 2n-3=3$
 $\Rightarrow n=3$
 Ans: A

04. $3^x - 3^{x-1} = 162$
 $\Rightarrow 3^x - \frac{3^x}{3} = 162$
 $\Rightarrow x=6$ (By Trial & Error method) Ans: B

06. $\left(\frac{1}{x} + \frac{1}{y}\right)^{-1} = \left(\frac{x+y}{xy}\right)^{-1} = \frac{xy}{x+y}$
 Ans: C

07. $5^3 - 3^5 = 125 - 243 = -118$
 Ans: D

$$08 \quad \left. \begin{aligned} 3^{x-1} &= 3^2 \Rightarrow x=3 \\ 4^{y+2} &= 4^3 \Rightarrow y=1 \end{aligned} \right\} \frac{x}{y} = \frac{3}{1} = 3 \quad \text{①}$$

Ans: B

$$09 \quad \frac{3^{x+3}}{3} = \frac{2^{x+6}}{3} \Rightarrow x=3 \quad \text{Ans: C}$$

$$10 \quad 0.000019 = \frac{19}{10^6} = 19 \times 10^{-6} \\ = 1.9 \times 10 \times 10^{-6} \\ = 1.9 \times 10^{-5} \quad \text{Ans: A}$$

ADVANCED LEVEL

$$11. 4.4^3 = 4^4 \text{ or } 4^2 \times 4^2 \text{ or } 256 \quad \text{Ans: A, B, C}$$

12. Statement I: $x^y = y^x$

$$\Rightarrow \frac{x}{y} = y^{\frac{x}{y}}$$

$$\Rightarrow \text{Now, } \left(\frac{x}{y}\right)^{\frac{x}{y}} = \left(\frac{y^{\frac{x}{y}}}{y}\right)^{\frac{x}{y}} = \left(y^{\frac{x}{y}-1}\right)^{\frac{x}{y}}$$

Also, $x^y = y^x$

$$\Rightarrow y = x^{\frac{y}{x}}$$

$$\text{Now, } \left(\frac{x}{y}\right)^{\frac{x}{y}} = \left(\frac{x}{x^{\frac{y}{x}}}\right)^{\frac{x}{y}} = \left(x^{1-\frac{y}{x}}\right)^{\frac{x}{y}} \\ = x^{\frac{x}{y}-1} \quad \text{Ans: (True)}$$

Statement II: $2^x = 4^y = 8^z$

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

$$\Rightarrow \text{Now, } xyz = x \cdot \frac{x}{2} \cdot \frac{x}{3} = 288 \Rightarrow x^3 = 288 \times 6 \\ \Rightarrow x = 12$$

$$\frac{1}{2x} + \frac{1}{4y} + \frac{1}{8z} = \frac{1}{2 \times 12} + \frac{1}{4 \times 6} + \frac{1}{8 \times 4} = \frac{11}{96} \quad \text{Ans: A}$$

13. 0.06398521478

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$$= 6398521478 \times 10^{-11}$$

$$= 6.398521478 \times 10^9 \times 10^{-11}$$

$$= 6.398521478 \times 10^{-2}$$

Ans: B

14. $3^{x+5} = 3^{4x-4}$

$$\Rightarrow x+5 = 4x-4 \Rightarrow x = 3$$

Ans: 3

15 a) $100^{2^{3^{100}}} = 100^{2^{3^0}} = 100^{2^1} = 100^2$

b) $(12^0 - 11^0) \times (3^1 - 1^3) = (1-1)(3-1) = 0$

c) $(128)^{\frac{5}{7}} = (2^7)^{\frac{5}{7}} = 32$

d) $5^x = 25^y = 625$

$$\Rightarrow 5^x = 5^{2y} = 5^4$$

$$\Rightarrow x = 4, y = 2$$

$$\text{Now, } x^2 - y^2 = 4^2 - 2^2 = 16 - 4 = 12$$

Ans: t, p, r, q

$\Rightarrow$ THE END $\in$