EXPONENTS AND POWERS.

Class: VIII, Mathematics (F)

SOLUTIONS

TEACHING TASK

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

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

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

Scanned with OKEN Scanner

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. $\left(\sqrt[3]{4}\right)^{2x+\frac{1}{2}} = \frac{1}{32}$

$= 4^{\frac{4x+1}{6}} = 2^{-5}$

$\Rightarrow 2^{\frac{4x+1}{3}} = 2^{-5}$

$\Rightarrow 4x + 1 = -15$

$\Rightarrow x = -4$

Ans: A

07. $3 \cdot a^8 \cdot b^2 \cdot c^2$

Ans: D

09. $\left[\left(\frac{1}{4}\right)^2 - \left(\frac{1}{4}\right)^3\right] \times 2^6$

$= \left[\frac{1}{16} - \frac{1}{64}\right] \times 64$

$= \left[\frac{4 - 1}{64}\right] \times 64 = 3$

Ans: C

10. $\left(\frac{x^a}{x^b}\right)^{a^2+ab+b^2} \cdot \left(\frac{x^b}{x^c}\right)^{b^2+bc+c^2} \cdot \left(\frac{x^c}{x^a}\right)^{c^2+ca+a^2}$

$= x^{(a-b)(a^2+ab+b^2)} \cdot x^{(b-c)(b^2+bc+c^2)} \cdot x^{(c-a)(c^2+ca+a^2)}$

$= x^{a^3-b^3+b^3-c^3+c^3-a^3}$

$= x^0$

$= 1$

Ans: A

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11. 2^{8m-2} Ans: A

12 $a^2 = 16 \Rightarrow a = 4.$

$\therefore a^{-1} = \frac{1}{a} = \frac{1}{4}$ Ans: A

13. $x^{-2} = 5^{-2} \Rightarrow x = 5$ Ans: A

14. 

$\Rightarrow x^3 \cdot y^3 = z^5$

$\Rightarrow (xy)^3 = z^5$

$\Rightarrow xy = z^{\frac{5}{3}}$ Ans: D

15 $a^{8-2} = a^p \Rightarrow p = 6$ Ans. B

16. $m^{n-2n} = m^{-3}$

$\Rightarrow n = 3$ Ans:

17. $\left(\frac{m^3}{n^2}\right)^{-2} \times \left(\frac{n^5}{m}\right)^{-1}$

$= \frac{m^{-6}}{n^{-4}} \times \frac{n^{-5}}{m^{-1}}$

$= m^{-6+1} \times n^{-5+4}$

$= m^{-5} \times n^{-1}$ Ans:

$= \frac{1}{mn^5}$

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18

19. $(a^3 . b^2)^2 \div a^{-4} . b^3$

$= a^6 . b^{-4} \div a^{-4} . b^3$

$= a^{6+4} . b^{-4-3}$

$= \frac{a^{10}}{b^7}$

Ans: —

20 $a^9 . b^3 . a^2 . b^{-4} = a^m . b^n$

$\Rightarrow a^{11} . b^{-1} = a^m . b^n$

$\Rightarrow m+n = 11-1 = 10$

Ans.

ADVANCED LEVEL

01. Conceptual

Ans: A, B, C, D

02. $\frac{3^{2n} . 3^5 . 3^9}{3 . 3^{16}} = 3^3$

$3^{2n+5+9-1-16} = 3^3$

$\therefore 3$

$\Rightarrow 2n-3 = 3$

$\Rightarrow n = 3$ or $\sqrt{81}$

Ans: B, D

03 $\sqrt{1+3+9+27+81} = \sqrt{121} = 11$ or $\sqrt{11^2}$

Ans: B, C

04. $a^{3/2} = \sqrt{a^3} = a\sqrt{a} = a . a^{\frac{1}{2}}$

Ans: A, C, D

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05 $m^3 \cdot m^{-5} \cdot n^2 = p$

$\Rightarrow m^{3-5} \cdot n^2 = p$

$\Rightarrow m^{-2} \cdot n^2 = p$

Ans: C

06. Assertion: Conceptual (True)
Reason: Conceptual (True)

Ans: A

07. Assertion: Conceptual (False)
Reason: Conceptual (False)

08 Assertion: Conceptual (True)
Reason: Conceptual (True)

Ans: A

09 Assertion: Conceptual (True)
Reason: Conceptual (True)

Ans: A

10. Assertion: Conceptual (True)
Reason : Conceptual (True)

Ans: A

11. Assertion: Conceptual (True)
Reason: Conceptual (True)

Ans: A

12. Assertion: Conceptual (True)
Reason: Conceptual (True)

Ans: A

13 Assertion: Conceptual (True)
Reason: Conceptual (True)

Ans: A

14. Assertion: Conceptual (True)
Reason: Conceptual (True)

Ans: A

15. Assertion: Conceptual (True)
Reason: Conceptual (True)

Ans A

Scanned with OKEN Scanner

16. Statement I: $x^{2017} \times \frac{1}{x^{2016}}$ (7)

$= x^{2017-2016}$

$= x$

$= x^1$ (True)

Statement II: Conceptual (True)

17. Statement I: $a^m = a^n \Rightarrow m = n$ (True)

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

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

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

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

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

$\Rightarrow x = 9$ (True)

Ans: A

18 $\frac{3^{n+2} \cdot 3^{2n-1}}{3^{4n-3}} = \frac{3^{n+2+2n-1}}{3^{4n-3}} = \frac{3^{3n+1}}{3^{4n-3}}$

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

Ans:

19. $= \frac{2^{a+3} \cdot 3^{3a-1}}{6^{a-2}}$

$= \frac{2^{a+3} \cdot 3^{3a-1}}{(2 \cdot 3)^{a-2}}$

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

$= 2^{(a+3)-(a-2)} \cdot 3^{(3a-1)-(a-2)}$

$= 2^5 \cdot 3^{2a+1}$

Ans: ___

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20. $2^{3x-1} \cdot 4^{x+2} = 8^{2x}$

$\Rightarrow 2^{3x-1} \cdot \left(2^2\right)^{x+2} = \left(2^3\right)^{2x}$

$\Rightarrow 2^{3x-1} \cdot 2^{2x+4} = 2^{6x}$

$\Rightarrow 2^{5x+3} = 2^{6x}$

$\Rightarrow 5x+3 = 6x$

$\Rightarrow x = 3$

Ans: ___

21 $x^{a^2-b^2} \cdot x^{b^2-c^2} \cdot x^{c^2-a^2} = x^0 = 1$

Ans: C

22 $\left(\frac{5}{2}\right)^{-5} \cdot \left(\frac{2}{3}\right)^{-5}$

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

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

Ans: —

23 $5^{2x-1} = 25^{x+2}$

$\Rightarrow 5^{2x-1} = 5^{2x+4}$

$\Rightarrow 2x-1 = 2x+4$

Ans: —

24 $4^{x-2} = 8^{2x+1}$

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

$\Rightarrow 2x-4 = 6x+3$

$\Rightarrow 4x = -4-3$

$\Rightarrow x = \frac{-7}{4}$

Ans: —

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25. $2^{3x} = 16 \cdot 2^{x}$

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

$\Rightarrow 3x = 4 + x$

$\Rightarrow 2x = 4$

$\Rightarrow x = 2$

Ans: 2

26 $3^{x+2} = 18$

$\Rightarrow 3^{x} \cdot 3^{2} = 18$

$\Rightarrow 3^{x} \cdot 9 = 18$

$\Rightarrow 3^{x} = 2$

Ans: 2

27 $8^{x-1} = 2^{x+3}$

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

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

$\Rightarrow 2x = 6$

$\Rightarrow x = 3$

Ans: 3

28

29. a) $5^{-5} = \frac{1}{5^{5}}$

b) $6^{-6} \times 6^{6} = 6^{-6+6} = 6^{0} = 1$

c) If $x^{3} = 7^{3} \Rightarrow x = 7$

d) $2^{1^{2^{3}}} = 2^{1^{8}} = 2^{1} = 2$

Ans: b, a, s, r

Scanned with OKEN Scanner

29 a) $\frac{2^{10}}{2^{-10}} = 2^{10+10} = 2^{20}$ (10)

b) $6^{18} = (2\times3)^{18} = 2^{18}\times3^{18}$

c) $2^{x} = 16 \Rightarrow x = 4$

d) $5^{0} - 6^{0} = 1 - 1 = 0$

Ans: s, y, t, a

LEARNER'S TASK

CUQ's

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

02 $(-n^2)^2 \times (-n^2)^3$

$= n^4 \times -n^6 = -n^{10}$ Ans: A

03 $x = (a^m)^n = a^{mn}$; $y = (a^n)^m = a^{nm}$ $\therefore$ $x = y$ Ans: A

04. $(x^{m-n})^{p} \cdot (x^{n-p})^{m} \cdot (x^{p-m})^{n}$

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

Ans: B

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

06. $20 \cdot (x-y)^4$ Ans: A

07. $(2010)^{2010}$ Ans: B

08. $(7^0 - 5^0) \times 6^0 = (1-1)\times 6^0 = 0$ Ans: D

09. $(-1)^{2014} = 1$ since 2014 is Even.

Ans: A

Scanned with OKEN Scanner

10. $a^3 - b^5 = 5^3 - 3^5$

$= 125 - 243$

$= -118$

Ans: D

11. $\frac{a^{10}}{a^{12}} = a^{10-12} = a^{-2}$

Ans: C

12. $4^{3^2} - 4^8$

$= 4^9 - 4^8 = 4^8(4-1) = 3 \times 4^8$

$= 3 \times 2^{16}$

Ans: B

13. $8^x \times 2^2 = 2^6$

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

Ans: B

14. 96326000000

$= 96326 \times 10^6$

$= 9.6326 \times 10^{10}$

Ans: B

JEE MAINS LEVEL

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

$3^x - \frac{3^x}{3} = 162 \Rightarrow x = 5$ (Option Verification)

Ans: D

02 0.0000019

$= \frac{19}{1000000} = 19 \times 10^{-6}$

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

Ans: A

03 $(x^{-1} + y^{-1})^{-1} = \left(\frac{1}{x} + \frac{1}{y}\right)^{-1} = \left(\frac{x+y}{xy}\right)^{-1} = \frac{xy}{x+y}$

Ans: C

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$$\left[x^{2-3n+4+3n-3}\right]^3$$

(12)

$$= \left(x^3\right)^3 = x^9$$

Ans: D

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

$\Rightarrow x = 3$

$4^{y+2} = 4^3$

$\Rightarrow y = 1$

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

Ans: B

$$\left\{\left(\frac{3}{2}\right)^{-1} \div \left(\frac{-2}{5}\right)^{-1}\right\}$$

$$= \left\{\frac{2}{3} \div \left(\frac{-5}{2}\right)\right\} = \frac{2}{3} \times \frac{-2}{5} = \frac{-4}{15}$$

Ans: D

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

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

$\Rightarrow 32x = -21$

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

Ans: A

9. $x + y = 5$

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

$\Rightarrow 10 + 2xy = 25$

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

Ans: A

10. $(50.5)^2 - (49.5)^2$

$= (50.5 + 49.5)(50.5 - 49.5)$

$= 100 \times 1$

$= 100$

Ans: B

Scanned with OKEN Scanner

04. $\left[x^{2-3n+4+3n-3}\right]^3$

$= \left(x^3\right)^3 = x^9$

Ans: D

05. $3^{x-1} = 3^2 \Rightarrow x = 3$ | $4^{y+2} = 4^3 \Rightarrow y = 1$ | $\therefore \frac{x}{y} = 3$

Ans: B

06. $\left\{\left(\frac{3}{2}\right)^{-1} \div \left(\frac{-2}{5}\right)^{-1}\right\}$

$= \left\{\frac{2}{3} \div \left(\frac{-5}{2}\right)\right\} = \frac{2}{3} \times \frac{-2}{5} = \frac{-4}{15}$

Ans: D

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

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

$\Rightarrow 32x = -21$

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

Ans: A

09. $x + y = 5$

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

$\Rightarrow 10 + 2xy = 25$

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

Ans: A

10. $(50.5)^2 - (49.5)^2$

$= (50.5 + 49.5)(50.5 - 49.5)$

$= 100 \times 1$

$= 100$

Ans: B

Scanned with OKEN Scanner

12. $2^{0.64+0.36} = 2^1 = 2$

Ans: B

13. $a^3 \times b^2 = a^5 \times b$

$\Rightarrow b = a^2$

The value of b is a^2

Ans A

14. $\frac{1}{2^2} + \frac{1}{3^3} = \frac{1}{4} + \frac{1}{27}$

$= \frac{31}{108}$

Ans: B

15. ~~$x^4 \left(\frac{1}{x^3}\right)$~~ $\frac{x^3(x - x^4)}{x^3} = x - x^4$

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

Ans: B

16. $3^4 * x = 729 = 3^6$

$\therefore x = 3^2 = 9$

Ans: —

17. $x^0 = 1$

Ans: D

18. $3^{2x-1} = 3^3$

$\Rightarrow x = 2$

Ans: C

19. $8x^6 \cdot 9x^2 = 72x^8$

Ans: —

20. $a^{3+1} \cdot b^{-2-4} = \frac{a^4}{b^6}$

Ans: —

21. $\frac{r^2}{p^2 \cdot q^{-3}} \times \frac{r^6}{p^2 \cdot q^2} = \frac{r^8}{p^4 \cdot q^{-1}} = p^{-4} \cdot q \cdot r^8$

Ans:

Scanned with OKEN Scanner

22. $(ab)^2 = \frac{c}{d^3}$

$\Rightarrow ab = \frac{c^{1/2}}{d^{3/2}}$

$(ab)^3 = (ab)^2 \cdot (ab)$

$= \frac{c}{d^3} \times \frac{c^{1/2}}{d^{3/2}}$

$= \frac{c^{3/2}}{d^{7/2}} =$

ADVANCED LEVEL QUESTIONS

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

$\Rightarrow m^{3n} = m^p$

$\Rightarrow 3n = p$

Ans: C

02. $\frac{x^{-6}}{y^{-4}} \times \frac{y^{15}}{x^{-3}} = \frac{y^{19}}{x^6} = x^{-6} \cdot y^{19}$

Ans. C

03. $8^{\frac{2}{3}} = (2^3)^{2/3} = 2^2 = 4$ (or) $\sqrt[3]{64}$ (or) 2^2

Ans: A, B, C

04. $2^{9+14} = 2^{23}$ or 2^{14+9} or $2^9 \times 2^{14}$

Ans: A, C, D

05. $\frac{3^{2n} \cdot 3^2 \cdot 3^m \cdot 3^{3n}}{3^{3m} \cdot 8} = \frac{1}{27}$

$\Rightarrow \frac{3^{3n}(9-1)}{3^{3m} \cdot 8} = \frac{1}{27}$

$\Rightarrow 3^{3n-3m} = 3^{-3}$

$\Rightarrow n - m = -1$

$\Rightarrow m - n = 1$

Ans: A

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06 Assertion: True

Reason : Conceptual (True)

Ans. A

07. Assertion: $\frac{7^3}{7^4} = \frac{1}{7} = 7^{-1}$ (True)

Reason: Conceptual (True)

Ans. A

08 Assertion: False

Reason: ~~False~~ True

Ans: B

09. Statement I: $\left(\frac{3}{2}\right)^2 = 2^6 = 64$ (True)

$3^2 \cdot 3^3 = 3^{2+3} = 3^5$ (True)

Statement II: Conceptual (True)

Ans: A

10. Statement I: Conceptual (True)

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

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

$\Rightarrow 2x+6 = 4x-3$

$\Rightarrow 2x = 9$

$\Rightarrow x = 9/2$ (False)

Ans: C

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

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

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

$= x^{\frac{x}{y}-1}$ (True)

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

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

$\Rightarrow x = 2y = 3z$

Given $xyz = 288$

$\Rightarrow x\left(\frac{x}{2}\right)\left(\frac{x}{3}\right) = 288$

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

$\Rightarrow x^3 = 4^3 \times 3^3 = (12)^3$

$\therefore x = 12, \quad y = 06, \quad z = 04$

$\therefore \frac{1}{2x} + \frac{1}{4y} + \frac{1}{8z} = \frac{1}{24} + \frac{1}{24} + \frac{1}{32}$

$= \frac{11}{96}$ (Tone) Ans: A

12. $x^0 = 1$

13. $2^{-5+2x+1} = 2^6$

$\Rightarrow 2x - 4 = 6$

$\Rightarrow x = 5$

14. 0.000939478

$= \frac{939478}{10^9} = 939478 \times 10^{-9}$

$= 9.39478 \times 10^5 \times 10^{-9}$

$= 9.39478 \times 10^{-4}$

Ans: A

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15. $3^{x+5} = 81^{x-1}$

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

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

$\Rightarrow 3x = 9$

$\Rightarrow x = 3$

Ans: 3

16. $0^{100-100} = 2^0 = 1$

Ans: 1

17. $2^{3x-3} = 2^{x+3}$

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

$\Rightarrow 2x = 6$

$\Rightarrow x = 3$

Ans: 3

18. a) $100^{2^{3^{0^{10}}}} = 100^{20} = 100^2$

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

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

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

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

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

Now, $x^2 - y^2 = 4^2 - 2^2 = 16 - 4 = 12$

Ans: t, p, r, q

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19. a) $2^{(8-(-12))} = 2^{20}$

b) $6^{18} = (2\times3)^{18} = 2^{18} \times 3^{18}$

c) $2^{x} = 16 \Rightarrow x = 4$

d) $6^{0} - 6^{0} = 1 - 1 = 0$

Ans: 5, 20, 6, 4

⟹ THE END ⟸

19. a) $2^{10-(-10)} = 2^{20}$

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

c) $2^{x} = 16 \Rightarrow x = 4$

d) $5^{6} - 6^{0} = 1 - 1 = 0$

Ans: S, U, T, Q

$\Rightarrow$ THE END $\in$

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