



MATHS

BOOKS - CALCUTTA BOOK HOUSE MATHS

(BENGALI ENGLISH)

LAWS OF INDICES

Examples

1. The value of $(0.243)^{0.2} \times (10)^{0.6}$ is

A. 0.3

B. 3

C. 0.9

D. 9

Answer: B



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2. The value of $2^{\frac{1}{2}} \times 10^{-\frac{1}{2}} \times (16)^{\frac{1}{2}}$ is



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3. If $4^x = 8^3$, then $x =$

A. $\frac{3}{2}$

B. $\frac{9}{2}$

C. 3

D. 9

Answer: B

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4. If $20^{-x} = \frac{1}{7}$, then $(20)^{2x} =$

A. $\frac{1}{49}$

B. 7

C. 49

D. 1

Answer: C

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5. If $4 \times 5^x = 500$, then $x^x =$

A. 8

B. 1

C. 64

D. 27

Answer: D



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6. $\left\{ (81)^{-\frac{3}{4}} \times \frac{(16)^{\frac{1}{4}}}{6^{-2}} \times \left(\frac{1}{27} \right)^{-\frac{4}{3}} \right\}^{\frac{1}{3}} =$

A. 4

B. 5

C. 6

D. 8

Answer: C



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$$7. \sqrt[4]{x^{\frac{17}{2}} y^{\frac{5}{2}}} \sqrt{x^{\frac{5}{2}} \sqrt{x^{-7} y^6}} =$$

A. xy

B. x^2y

C. xy^2

D. x^2y^2

Answer: B



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8. $(\sqrt[5]{8})^{\frac{5}{2}} \times (16)^{-\frac{3}{2}} =$

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9. $4^{\frac{1}{3}} \times \left[2^{\frac{1}{3}} \times 3^{\frac{1}{2}} \right] \div 9^{\frac{1}{4}} =$

A. 1

B. 2

C. -2

D. 4

Answer: B

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10. $\left\{ (125)^{-2} \times (16)^{-\frac{3}{2}} \right\}^{-\frac{1}{6}} =$

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11. If $(27)^x = (81)^y$, then find $x : y$.

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12. Which one of the two numbers 3^{3^3} and $(3^3)^3$ is greater?

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13. Find the value of $\sqrt[3]{\left(\frac{1}{64}\right)^{\frac{1}{2}}}$.



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14. If $(5^5 + 0.01)^2 - (5^5 - 0.01)^2 = 5^x$ then what is the value of x ?

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15. If $3 \times 27^x = 9^{x+4}$, then find the value of x?

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16. Find the value of $\frac{\frac{1}{4^{-3}} - \frac{2}{10^{-2}}}{\frac{1}{2^{-2}} + \frac{1}{4^{-1}}}$

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17. Find the value of $\sqrt[\ln]{\frac{x^l}{x^n}} \times \sqrt[mn]{\frac{x^n}{x^m}} \times \sqrt[lm]{\frac{x^m}{x^l}}$.

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18. Calculate: $\left\{ \frac{\left(9^{n+\frac{1}{4}}\right)\sqrt{3\cdot 3^n}}{3\sqrt{3^{-n}}} \right\}^{\frac{1}{n}}$.

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19. Simplify: $\frac{x^{a+b} \cdot x^{a-b} \cdot x^{c-2a}}{x^{c-a}}$.

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20. Simplify: $\left\{ \left(x^{a+b-c} \times x^{a-b+c} \right)^b \right\}^c$.

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21. Simplify : $\left(\frac{4^{m+\frac{1}{4}} \times \sqrt{2 \cdot 2^m}}{2 \cdot \sqrt{2^{-m}}} \right)^{\frac{1}{m}}$.

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22. Simplify :

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

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23. Rearrange according to the ascending values :

$$5^{\frac{1}{2}}, 10^{-\frac{1}{4}}, 6^{\frac{1}{3}}$$

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24. Rearrange according to the ascending values :

$$2^{60}, 3^{48}, 4^{36}, 5^{24}.$$

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25. Prove that : $\left(\frac{a^q}{a^r}\right)^p \times \left(\frac{a^r}{a^p}\right)^q \times \left(\frac{a^p}{a^q}\right)^r = 1$

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26. Prove that : $\left(\frac{x^m}{x^n}\right)^{m+n} \times \left(\frac{x^n}{x^l}\right)^{n+l} \times \left(\frac{x^l}{x^m}\right)^{l+m} = 1.$

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27. Prove that :

$$\left(\frac{x^m}{x^n}\right)^{m+n-l} \times \left(\frac{x^n}{x^l}\right)^{n+l-m} \times \left(\frac{x^l}{x^m}\right)^{l+m-n} = 1.$$

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28. মান নির্ণয় করো : $\left(a^{\frac{1}{x-y}}\right)^{\frac{1}{x-z}} \times \left(a^{\frac{1}{y-z}}\right)^{\frac{1}{y-x}} \times \left(a^{\frac{1}{z-x}}\right)^{\frac{1}{z-y}}$

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29. If $x + z = 2y$ and $b^2 = ac$, then prove that $a^{y-z} \cdot b^{z-x} \cdot c^{x-y} = 1$.

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30. If $a = xy^{p-1}$, $b = xy^{q-1}$, $c = xy^{r-1}$ then show that $a^{q-r} \cdot b^{r-p} \cdot c^{p-q}$?



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31. If $x^{\frac{1}{a}} = y^{\frac{1}{b}} = z^{\frac{1}{c}}$ and $xyz = 1$, then show that $a + b + c = 0$.



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32. If $a^x = b^y = c^z$ and $abc = 1$, then prove that $xy + yz + zx = 0$.



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33. Solve : $2^{x+2} + 2^{x-1} = 9$

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34. Solve : $2^{4x} \cdot 4^{3x-1} = \frac{4^{2x}}{2^{3x}}$.

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35. Solve : $9 \times 81^x = 27^{2-x}$.

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36. Solve : $6^{2x+4} = 3^{3x} \cdot 2^{x+8}$

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Exercise 6

1. $(x^{2^{n-1}} + y^{2^{n-1}})(x^{2^{n-1}} - y^{2^{n-1}}) =$

A. $x^{2^n} - y^{2^n}$

B. $x^{2^n} - y^{2^n}$

C. $x^{2^{n+1}} - y^{2^{n+1}}$

D. $x - y$

Answer: B



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2. $\frac{x^{2^n} - y^{2^n}}{x^{2^{n-1}} + y^{2^{n-1}}} =$

A. $x^{2^n} + y^{2^n}$

B. $x^{2n} + y^{2n}$

C. $x^{2^{n-1}} - y^{2^{n-1}}$

D. $x^{2^{n-1}} + y^{2^{n-1}}$

Answer: C



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3. $\left[\left\{ (2^{-1})^{-1} \right\}^{-1} \right]^{-1} =$

A. 2

B. -2

C. 3

D. -3

Answer: A



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4. The value of $\left\{ (x^{-5})^{\frac{2}{3}} \right\}^{-\frac{3}{10}}$ is

A. x

B. x^2

C. $\frac{1}{x}$

D. x^{-2}

Answer: A



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5. Which one of the following numbers is the greatest ?

$$2^{30}, 3^{24}, 4^{18}, 5^{12}.$$



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6. Which one of the following numbers is the smallest?

$$3^{\frac{1}{3}}, 2^{\frac{1}{2}}, 4^{\frac{1}{4}}, 10^{\frac{1}{12}}.$$



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$$7. \left[\left\{ (a^{-1})^{-1} \right\}^{-1} \right]^{-1} =$$

A. $-a$

B. $-\frac{1}{a}$

C. a

D. $\frac{1}{a}$

Answer: C

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8. If $49^x = 7^3$, then $x =$

A. 3

B. $1\frac{1}{2}$

C. $\frac{2}{3}$

D. -3

Answer: B

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9. If $4 \times 8^x = 256$, then $(-x)^{-x} =$

A. -4

B. $\frac{1}{2}$

C. $\frac{1}{4}$

D. $-\frac{1}{4}$

Answer: C



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10. $\sqrt[5]{x^8 \sqrt{x^8 \sqrt{x^{-8}}}} =$

A. a

B. a^2

C. $\frac{1}{a}$

D. $\frac{1}{a^2}$

Answer: B

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11. Find the value of $\left(\left(\frac{8a^3}{27x^{-3}} \right)^{\frac{2}{3}} \times \left(\frac{64a^3}{27x^{-3}} \right)^{-\frac{2}{3}} \right)$.

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12. Simplify $\sqrt[3]{a^{-2}} \cdot b \times \sqrt[3]{b^{-2}} \cdot c \sqrt[3]{c^{-2}} \cdot a$.

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13. If $a^x = b$, $b^y = c$, $c^z = a$, find the value of xyz .

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14. Calculate : $9^{-3} \times \frac{(16)^{\frac{1}{4}}}{6^{-2}} \times \left(\frac{1}{27}\right)^{-\frac{4}{3}}$.

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15. If $x^y = y^x$, then prove that $\left(\frac{x}{y}\right)^{\frac{x}{y}} = (x)^{\frac{x}{y}-1}$.

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16. Prove that $\frac{a^{\frac{3}{2}} + ab}{ab - b^3} - \frac{\sqrt{a}}{\sqrt{a} - b} = \frac{\sqrt{a}}{b}$.

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17. Show that $(x^{b-c})^{\frac{1}{bc}} \times (x^{c-a})^{\frac{1}{ca}} \times (x^{a-b})^{\frac{1}{ab}} = 1$.



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18. Factorise : $(a + b)$.



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19. Find the value of $\frac{(bc)^{b-c}(ca)^{c-a}(ab)^{a-b}}{(a^{b-c}b^{c-a}c^{a-b})^{-1}}$.



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20. If $p = a^x$, $q = a^y$ and $a^2 = (p^y q^x)^z$, then find the value of xyz .

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21. If $a^{m^n} = (a^m)^n$, then express m in terms of n .

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22. If $a^m a^n = a^{mn}$, then express m in terms of n .

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23. If $x = 2$, $y = 4$, then what is the value of $x + 2y + \sqrt{(x - 2y)^2}$?



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24. Which one is the greatest ? $3^{2^{2^2}}$, $3^{2 \cdot 2 \cdot 2}$, $3 \cdot 2 \cdot 2 \cdot 2$.



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25. Find the value of $\sqrt[3]{x^4 \sqrt{x^{-5} \sqrt{x^6}}}$.



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26. Calculate : $\left(\frac{1}{81}\right)^{-\frac{5}{4}}$.



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27. Calculate : $\left\{ \sqrt[3]{4} \times \frac{1}{\sqrt[6]{8}} \times \sqrt[12]{2^{-1}} \right\}^{\frac{3}{4}}$.

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28. Simplify : $x^{\frac{1}{3}} \cdot x^{-\frac{1}{4}} \cdot x^{-\frac{1}{2}} \div x^{-\frac{7}{12}}$

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29. Simplify : $\sqrt[4]{a^2 b^3 c^4} \times \sqrt[3]{a^4 b^6} \times \left(a^{\frac{1}{2}} b^{\frac{1}{3}} c^{\frac{1}{4}} \right)^{-4}$.

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30. Simplify : $\left\{ (a)^{n^2-1} \right\}^{\frac{n}{n+1}} \times \frac{\sqrt{a^{2n}}}{a}$.

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31. Simplify :
$$\frac{\left(p + \frac{1}{q}\right)^m \left(p - \frac{1}{q}\right)^n}{\left(q + \frac{1}{p}\right)^m \left(q - \frac{1}{p}\right)^n}.$$

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32. Simplify :
$$\frac{2^n \cdot 6^{m+1} \cdot 10^{m-n} \cdot 15^{m+n-2}}{4^m \cdot 3^{m+n} \cdot 25^{m-1}}.$$

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33. Simplify :
$$\left(x^{\frac{b+c}{c-a}}\right)^{\frac{1}{a-b}} \times \left(x^{\frac{c+a}{a-b}}\right)^{\frac{1}{b-c}} \times \left(x^{\frac{a+b}{b-c}}\right)^{\frac{1}{c-a}}.$$

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34. Simplify : $(a + b)^m \times (a - b)^m \times (a^2 + b^2)^m$.

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35. Simplify : $\frac{\left\{ (a^m)^{\frac{1}{r}} (a^q)^{\frac{1}{n}} \right\}^{nr}}{\left\{ \sqrt[q]{b^n} \left(\sqrt[n]{b} \right)^r \right\}^{mq}} \cdot \left\{ \left(\frac{a}{b} \right)^q \right\}^{-r}$.

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36. Simplify : $\frac{1}{(4x^3 - 3x)^2} - \left\{ \frac{\frac{3\sqrt{1-x^2}}{x} - \frac{(1-x^2)^{\frac{3}{2}}}{x^3}}{1 - 3\left(\frac{1-x^2}{x^2}\right)} \right\}^2$.

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37. Simplify :

$$\frac{1}{1 + x^{m-n} + x^{m-p}} + \frac{1}{1 + x^{n-p} + x^{n-m}} + \frac{1}{1 + x^{p-m} + x^{p-n}}$$



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38. Compute the product : $(x^n - y^{-n})(x^n + y^{-n})$.



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39. Compute the product :

$$(a^{-m} + b^n)(a^{-2m} - a^{-m}b^n + b^{2n})$$



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40. Compute the division : $\frac{a^{3^n} - b^{3^n}}{a^{3^{n-1}} - b^{3^{n-1}}}$.



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41. Compute the division : $(x^3 - y^2) + (x^{\frac{1}{2}} - y^{\frac{1}{3}})$.



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42. Rearrange according to the ascending values : $3^{\frac{1}{2}}, 4^{\frac{1}{3}}, 5^{\frac{1}{4}}$.



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43. Rearrange according to the ascending values :
 $2^{18}, 3^{12}, 4^{24}, 5^6$.



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44. Prove that : If $(4.44)^x = (0.444)^y = 1000$, then prove that

$$\frac{1}{x} - \frac{1}{y} = \frac{1}{3}.$$

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45. If $(111.1)^x = (11.11)^y = (1.111)^z$ then prove that

$$\frac{1}{x} - \frac{2}{y} + \frac{1}{z} = 0.$$

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46. If $2^a = 3^b = 6^{-c}$, then prove that $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 0$.

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47. If $x^a = y^b = z^c$ and $y^3 = zx$, then prove that $b(c + a) = 3ca$.



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48. If $4^a = 36^b = 9^c$, then prove that $\frac{b}{a} + \frac{b}{c} = 1$.



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49. If $x^2 = y^3$, then prove that

$$\left(\frac{x}{y}\right)^{\frac{3}{2}} + \left(\frac{y}{x}\right)^{-\left(\frac{2}{3}\right)} = x^{\frac{1}{2}} + y^{\frac{1}{3}}.$$



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50. If $a^x = z^y$ and $a^z = z^x$, then prove that $x^2 = yz$.

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51. If $(x^{n^2})^n = (x^{2n})^2$, then show that $\sqrt[n+1]{n^3} = 2$.

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52. If $x = (\sqrt{2} + 1)^{-\frac{1}{3}}$, then prove that $(x - x^{-1})^3 + 3(x - x^{-1}) + 2 = 0$.

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53. If $\left(\frac{y}{z}\right)^a \left(\frac{z}{x}\right)^b \left(\frac{x}{y}\right)^c = 1$, then prove that

$$\left(\frac{y}{z}\right)^{\frac{1}{b-c}} = \left(\frac{z}{x}\right)^{\frac{1}{c-a}} = \left(\frac{x}{y}\right)^{\frac{1}{a-b}}.$$



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54. If $a = xy^{p-1}$, $b = xy^{q-1}$, $c = xy^{r-1}$, then show that

$$a^{q-r} \cdot b^{r-p} \cdot c^{p-q}.$$



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55. The angle of elevation of the sun, when the length of the shadow of a tree $\left(\frac{1}{\sqrt{3}}\right)$ times the height of the tree is ____



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56. If $x = 3^{\frac{1}{3}} + 3^{-\frac{1}{3}}$, find the value of $(3x^3 - 9x)$.

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57. If $x = 2^{\frac{2}{3}} + 2^{\frac{1}{3}}$, find the value of $(x^3 - 6x)$.

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58. If $x = 1 + 3^{\frac{2}{3}} + 3^{\frac{1}{3}}$, find the value of $(x^3 - 3x^2 - 6x - 4)$.

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59. If $x = 2^{\frac{1}{3}} - 2^{-\frac{1}{3}}$, find the value of $(2x^2 + 6x)$.

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60. Solve : $3^{2x} + 9 = 10.3^x$

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61. Solve : $6^{2x+4} = 3^{3x} \cdot 2^{x+8}$

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62. Solve : $y^x = 4, y^2 = 2^x$.

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63. Solve : $3^x = 9^y, 5^{x+y+1} = 25^{xy}$

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64. Solve : $8^x \cdot 4^y = 128$, $9^{x+y} = 27^{xy}$

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65. Solve : $\frac{5^x}{5^y} = 25$, $\frac{4^y}{2^x} = 2$

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66. Solve : $x^y = 2^x$, $x = 2y$.

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67. Solve : $5^x + 3^y = 8$, $5^{x-1} + 3^{y-1} = 2$.



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