



MATHS

BOOKS - ICSE

INDICES [EXPONENTS]

Example

1. Evaluate : $27^{-1/3}$

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2. Prove that: $9^{\frac{3}{2}} - 3 \times 5^0 - \left(\frac{1}{81}\right)^{-\frac{1}{2}} = 15$

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3. Prove that: $\left(\frac{64}{125}\right)^{-\frac{2}{3}} + \frac{1}{\left(\frac{256}{625}\right)^{\frac{1}{4}}} + \left(\frac{\sqrt{25}}{643}\right)^0 = \frac{61}{16}$

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4. $(27)^{\frac{4}{3}} + (32)^{0.8} + (0.8)^{-1}$

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5. Simplify : $27^{-\frac{1}{3}}\left(27^{\frac{1}{3}} - 27^{\frac{2}{3}}\right)$

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6. Evaluate :

$$\left[5\left(8^{\frac{1}{3}} + 27^{\frac{1}{3}}\right)^3\right]^{\frac{1}{4}}$$

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7. Given : $1176 = 2^p \cdot 3^q \cdot 7^r$. Find :

the numerical values of p, q and r .

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8. If $1176 = 2^a x 3^b x 7^c$, find the values of a, b and c . Hence, compute the value of $2^a x 3^b x 7^{-c}$ as a fraction.

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9. Simplify : $\frac{3^{a+2} - 3^{a+1}}{4 \times 3^a - 3^a}$

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10. Simplify : $\left(\frac{a^m}{a^n}\right)^{m+n} \left(\frac{a^n}{a^l}\right)^{n+l} \left(\frac{a^l}{a^m}\right)^{l+m}$

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11. Solve for x : $9 \times 3^x = (27)^{2x-5}$

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12. Solve for x : $\sqrt{\left(\frac{3}{5}\right)^{1-2x}} = 4\frac{17}{27}$

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13. Solve : $2^{2x+3} - 9 \times 2^x + 1 = 0$

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14. Prove that:

$$\frac{1}{1 + x^{b-a} + x^{c-a}} + \frac{1}{1 + x^{a-b} + x^{c-b}} + \frac{1}{1 + x^{b-c} + x^{a-c}} = 1$$

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15. If $a = b^{2x}$, $b = c^{2y}$ and $c = a^{2z}$, show that $8xyz = 1$.

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16. If $2^x = 4 \times 2^y$ and $9 \times 3^x = 3^{-y}$, find the values of x and y .

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Exercise 7 A

1. Evaluate :

$$3^3 \times (243)^{-\frac{2}{3}} \times 9^{-\frac{1}{3}}$$

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2. Evaluate :

$$5^{-4} \times (125)^{\frac{5}{3}} + (25)^{-\frac{1}{2}}$$

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3. Evaluate :

$$\left(\frac{27}{125}\right)^{\frac{2}{3}} \times \left(\frac{9}{25}\right)^{-\frac{3}{2}}$$

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4. Evaluate :

$$7^0 \times (25)^{-\frac{3}{2}} - 5^{-3}$$

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5. Evaluate : $\left(\frac{16}{81}\right)^{-3/4} \times \left(\frac{\left(\frac{49}{9}\right)^{3/2}}{\left(\frac{343}{216}\right)^{2/3}}\right)$



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6. Simplify :

$$\left(\frac{8x^3}{125y^3}\right)^{\frac{2}{3}}$$



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7. Simplify :

$$(a + b)^{-1}(a^{-1} + b^{-1})$$



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8. Simplify :

$$\frac{5^{n+3} - 6 \times 5^{n+1}}{9 \times 5^n - 5^n \times 2^2}$$

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9. Simplify : $(3x^2)^{-3} \times (x^9)^{\frac{2}{3}}$

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10. Simplify: $\sqrt{\frac{1}{4}} + (0.01)^{-\frac{1}{2}} - (27)^{\frac{2}{3}}$

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11. Evaluate :

$$\left(\frac{27}{8}\right)^{\frac{2}{3}} - \left(\frac{1}{4}\right)^{-2} + 5^0$$

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12. Simplify each of the following and express with positive index :

$$\left(\frac{3^{-4}}{2^{-8}} \right)^{\frac{1}{4}}$$



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13. Simplify each of the following and express with positive index :

$$\left(\frac{27^{-3}}{9^{-3}} \right)^{\frac{1}{5}}$$



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14. Simplify each of the following and express with positive index :

$$(32)^{-\frac{2}{5}} + (125)^{-\frac{2}{3}}$$



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15. Simplify each of the following and express with positive index :

$$\left[1 - \left\{ 1 - (1 - n)^{-1} \right\}^{-1} \right]^{-1}$$

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16. If $2160 = 2^a \cdot 3^b \cdot 5^c$, find a , b and c . Hence calculate the value of $3^a \times 2^{-b} \times 5^{-c}$.

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17. If $1960 = 2^a \times 5^b \times 7^c$, calculate the value of $2^{-a} \times 7^b \times 5^{-c}$

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18. Simplify :

$$\frac{8^{3a} \times 2^5 \times 2^{2a}}{8 \times 3^{3n} - 5 \times 27^n}$$



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19. Simplify :

$$\frac{3 \times 27^{n+1} + 9 \times 3^{3n-1}}{8 \times 3^{3n} - 5 \times 27^n}$$

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20. Show that :

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

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21. If $a = x^{m+n} \cdot Y^l$, $b = x^{n+l} \cdot Y^m$ and $c = x^{l+m} \cdot Y^n$,

Prove that : $a^{m-n} \cdot b^{n-1} \cdot c^{l-m} = 1$

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22.

Prove

that:

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

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23. 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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Exercise 7 B

1. Solve for x :

$$2^{2x+1} = 8$$

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2. Solve for x :

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



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3. Solve for x :

$$3^{4x+1} = (27)^{x+1}$$



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4. Solve for x :

$$(49)^{x+4} = 7^2 \times (343)^{x+1}$$



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5. Find x, if :

$$4^{2x} = \frac{1}{32}$$

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6. Find x , if :

$$\sqrt{2^{x+3}} = 16$$

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7. Find x , if :

$$\left(\sqrt{\frac{3}{5}}\right)^{x+1} = \frac{125}{27}$$

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8. Find x , if :

$$\left(\sqrt[3]{\frac{2}{3}}\right)^{x-1} = \frac{27}{8}$$

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9. Solve :

$$4^{x-2} - 2^{x+1} = 0$$

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10. Solve :

$$3^{x^2} : 3^x = 9 : 1$$

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11. Solve :

$$8 \times 2^{2x} + 4 \times 2^{x+1} = 1 + 2^x$$

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12. Solve :

$$2^{2x} + 2^{x+2} - 4 \times 2^3 = 0$$



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13. Solve :

$$(\sqrt{3})^{x-3} = (\sqrt{3})^{\frac{x+1}{4}}$$



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14. Find the values of m and n if :

$$4^{2m} = (\sqrt[3]{16})^{-\frac{6}{n}} = (\sqrt{8})^2$$



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15. Solve for x and y if:

$$(\sqrt{32})^x \div 2^{y+1} = 1 \text{ and } 8^y - 16^{4-\frac{x}{2}} = 0$$

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16. If x is a positive real number and the exponents are rational

numbers, show that:
$$\left(\frac{x^a}{x^b}\right)^{a+b-c} \left(\frac{x^b}{x^c}\right)^{b+c-a} \left(\frac{x^c}{x^a}\right)^{c+a-b} = 1$$

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17. Show that:
$$\frac{x^{a(b-c)}}{x^{b(a-c)}} \div \left(\frac{x^b}{x^a}\right)^c = 1 \frac{(x^{a+b})^2 (x^{b+c}) (x^{c+a})^2}{(x^a x^b x^c)^4} = 1$$

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18. If $a^x = b$, $b^y = c$ and $c^z = a$, prove that $xyz = 1$

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19. If $a^x = b^y = c^z$ and $b^2 = ac$, prove that $y = \frac{2xz}{x+z}$

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20. If $5^{-p} = 4^{-q} = 20^r$. Show that $\frac{1}{p} + \frac{1}{q} + \frac{1}{r} = 0$

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21. If $m = !n$ and $(m+n)^{-1}(m^{-1} + n^{-1}) = m^x n^y$, show that $x + y + 2 = 0$.

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22. If $5^{x+1} = 25^{x-2}$, find the value of $3^{x-3} \times 2^{3-x}$.

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23. If $4^{x+3} = 112 + 8 \times 4^x$, find $(18x)^{3x}$

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24. Solve for x :

$$4^{x-1} \times (0.5)^{3-2x} = \left(\frac{1}{8}\right)^{-x}$$

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25. Solve for x :

$$(a^{3x+5})^2 \cdot (a^x)^4 = a^{8x+12}.$$

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26. Solve for x : $(81)^{\frac{3}{4}} - \left(\frac{1}{32}\right)^{-\frac{2}{5}} + x\left(\frac{1}{2}\right)^{-1} \cdot 2^0 = 27$



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27. Solve for x :

$$2^{(3x+3)} = 2^{(3x+1)} + 48.$$



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28. Solve for x :

$$3(2^x + 1) - 2^{x+2} + 5 = 0.$$



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29. Solve for x :

$$9^{x+2} = 720 + 9^x$$



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Exercise 7 C

1. Evaluate :

$$9^{\frac{5}{2}} - 3 \times 8^0 - \left(\frac{1}{81}\right)^{-\frac{1}{2}}$$



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2. Evaluate :

$$(64)^{\frac{2}{3}} - \sqrt[3]{125} - \frac{1}{2^{-5}} + (27)^{-\frac{2}{3}} \times \left(\frac{25}{9}\right)^{-\frac{1}{2}}$$



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3. Evaluate :

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



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4. Simplify :

$$\frac{3 \times 9^{n+1} - 9 \times 3^{2n}}{3 \times 3^{2n+3} - 9^{n+1}}$$

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5. Solve : $3^{x-1} \times 5^{2y-3} = 225$.

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6. If $\left(\frac{a^{-1}b^2}{a^2b^{-4}}\right) \div \left(\frac{a^3b^{-5}}{a^{-2}b^3}\right) = a^x \cdot b^y$, find $x + y$.

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7. If $3^{x+1} = 9^{x-3}$, find the value of 2^{1+x} .

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8. If $2^x = 4^y = 8^z$ and $\frac{1}{2x} + \frac{1}{4y} + \frac{1}{8z} = 4$ find the value of x.

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9. If $\frac{9^n x 3^2 x 3^n - 27^n}{3^{3m} x 2^3} = \frac{1}{27}$, prove that $m - n = 1$

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10. Solve for x : $x : (13)^{\sqrt{x}} = 4^4 - 3^4 - 6$.

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11. If $3^{4x} = (81)^{-1}$ and $(10)^{\frac{1}{y}} = 0.0001$, value of $2^{-x} \times 16^y$.

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12. Solve the equation: $3(2^x + 1) - 2^{x+2} + 5 = 0$

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13. If $(a^m)^n = a^m \cdot a^n$, find the value of : $m(n - 1) - (n - 1)$

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14. If $m = \sqrt[3]{15}$ and $n = \sqrt[3]{14}$, find the value of

$$m - n - \frac{1}{m^2 + mn + n^2}$$

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

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16. Evaluate : $\left(\frac{x^q}{x^r}\right)^{\frac{1}{qr}} \times \left(\frac{x^r}{x^p}\right)^{\frac{1}{rp}} \times \left(\frac{x^p}{x^q}\right)^{\frac{1}{pq}}$

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17. Prove that: $\frac{a^{-1}}{a^{-1} + b^{-1}} + \frac{a^{-1}}{a^{-1} - b^{-1}} = \frac{2b^2}{b^2 - a^2}$

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18. Prove that: $\frac{a + b + c}{a^{-1}b^{-1} + b^{-1}c^{-1} + c^{-1}a^{-1}} = abc$

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19. Evaluate : $\frac{4}{(216)^{-2/3}} + \frac{1}{(256)^{-3/4}} + \frac{2}{(343)^{-1/3}}$

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