MATHS

BOOKS - CENGAGE

LAWS OF EXPONENTS AND LOGARITHMS

Worked Examples

1. Find the value of 64%

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2. Simplify $(64)^{1/3} + (64)^{-1/3}$.

3. Simplify

$$\frac{3^{n+12} \times 9^{2n-7}}{3^{5n}}$$

4. Solve $7^{x-y} = 49$, $7^{x+y} = 343$.

5. Find the value of x for which the statement are true.

$$\log_2 = 16 = x$$

6. Find the value of x for which the statement are true.

$$\log(16)x = \frac{5}{4}$$

7. Prove that

$$7\log_a \frac{16}{15} + 5\log_a \frac{25}{24} + \log_a \frac{81}{80} = \log_a 2$$

8. Find the value of each of the

$$43.5 \times 75.\ 61$$

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9. Find the value of each of the

$$43.54 \div 12.67$$

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10. Find the value of each of the

$$22.\ 68 \div 81.54$$

11. Simplify the fraction

$$(1.005)^7$$

12. Simplify the fraction

$$\frac{(7.52)^2(30.85)^6}{(0.0087)^3}$$

13. Simplify the fraction

$$\sqrt[3]{2.\,545}$$

14. Simplify the fraction

$$\frac{\sqrt{.\,9516}\,\sqrt[3]{0.\,04364}}{\sqrt[4]{0.003123}}$$

15. If $\log 2 = 0.\,30103$ and $\log 3 = 0.47712,$ then find

(without using the table) the value of

log 25

16. If $\log 2 = 0.30103$ and $\log 3 = 0.47712,$ then find (without using the table) the value of

$\log(0.405)^{1/2}$

Test Yourself Level 1

1. If $2^{x-3} = 1,$ then what is the value of x ?

2. If $x^{x+4} = 8^x$, then what is the vlaue of x ?

3. If $\dfrac{27^x \times 81^x}{243^x} = 9$, then what is the value of x ?

4. What is the value of $16^{-3/4}$?

5. Find the value of

$$\left(\frac{27}{64}\right)^{-2/3}$$

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6. Simplify $32^{3/5} \times 4^{-3/2}$.

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7. Find the value of $\left(\frac{16}{81}\right)^{-1/4}$

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8. If $x = 5, y = 3,$ then what is the value of $(x + y)^{x/y}$?

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9. Evaluate $\left[\left\{\left(2^{-1}\right)^{-1}\right\}\right]^{-1}$

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10. Solve $2^x + 2^3 = 2^4.$

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11. Express $2^5 = 32$ **in logarithmic form.**

12. Express $\log_2 128 = 7$ **in exponent form.**

13. What is the value of $x,$ **if** $\log_4 64 = x$ **?**

14. What is the value of x if $\log_8 x = -8/3$ **?**

15. Find the value of x from the equation, $\log_{\sqrt{2}} x = 6$.

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16. Find the value of x from the equation, $\log_{10} x = -3$.

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17. Find the characteristic of 425.5.

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18. Find the charactristic of each of the

567425.5

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19. Find the charactristic of each of the

$42, 785$

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20. Find the charactristic of each of the

0.425578

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21. Find the charactristic of each of the

0.004237

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22. Find the charactristic of each of the

0.0000567

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23. With the help of the table find value of each of the

$\log 62.52$

24. With the help of the table find value of each of the

$\log 15.75$

25. With the help of the table find value of each of the

$\log 0.01575$

26. With the help of the table find value of each of the

$\log 256$

27. With the help of the table find value of each of the

$\log 0.15625$

28. Find the number whose logarithms are

3.6535

29. Find the number whose logarithms are

4.2817

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30. Find the number whose logarithms are

5.7782

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31. Find the number whose logarithms are

$\bar{3}.6535$

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32. Find the number whose logarithms are

-1.2816

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33. Find the number whose logarithms are

-3.3778

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34. Find the number whose logarithms are

-48961

35. Find the number whose logarithms are

$\bar{5}.\ 7782$

36. Find the number whose logarithms are

-4.1234

37. Reduce $\log y = 3\log x + 5\log 4$ **to the simplest form and express y as a function of x.**

38. Find the value of $75.15 \div 15.35.$

Test Yourself Level 2

1. Find the value of $\left(13^2 - 5^2\right)^{3/2}$

2. Simplify $27^{1/3} \times 8^{-1/6} \div 18^{-1/2}.$

3. Solve $3^{3x-5} = 1/9^x$

4. If $\dfrac{\log x}{\log 5} = \dfrac{\log 36}{\log 6} = \dfrac{\log 64}{\log y}$, **then find the values of x and y without using the tables.**

5. Find the value of x from the equation,
$$\log x = \log 3 + 2\log 2 - \frac{3}{4}\ \log\ 6,\ \text{without using the}$$

tables.

6. Use the tables and find the cube root of 1.00456.

7. Use the tables and calculate the value of

$$\frac{17.51 \times 34.46}{0.04 \times 1.23}$$

8. Given log $20 = 1.3010$, find the number of digits in 8^{20}.

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9. Given log 20 = 1. 3010, find the number of digits in 8^{20}

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10. Given log $2 = 3010$, how many zeros are next to the decimal point in 6^{-10} ?

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11. Find the value of

$$\sqrt[3]{\left(\frac{294 \times 125}{42 \times 32}\right)^2}$$

12. Given $\log 2 = 0.30103,$ **find log** 0.0005

13. Given log $2 = 0.30103,$ **find** $\log \frac{1000}{256}.$

14. Given

$\log 2 = 0.30103, \log 3 = 0.47712,$ and $\log 7 = 0.84510.$

Find the value of $\log \dfrac{75}{14}$.

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15. Find the value of

$$\dfrac{(7.25)^3 \times (92.54)^2}{(100.7) \times (3.754)^3}$$

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Test Yourself Level 3 Multiple Choice Questions

1. If $a^x b^{2x} = a^3 b^6$, **then the value of x is** $(a > b > 0)$

A. 0

B. 2

C. 3

D. 6

Answer: C

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2. If $3^x + 2^x = 2 \times 2^{2x}$ **then value of x is**

A. 1

B. -1

C. 0

D. none of these

Answer: C

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3. If $5^{x-2} \times 3^{2x-3} = 135$ **then the value of x is**

A. 2

B. 3

C. 1

D. 0

Answer: B

4. If $2^{5x} + 2^x = 6\sqrt{2^{24}}$ then value of x is

A. 1

B. $1/2$

C. 2

D. 0

Answer: A

5. If $\left(\dfrac{3}{5}\right)^x \cdot \left(\dfrac{5}{3}\right)^{2x} = \dfrac{625}{81}$ **then value of x is**

A. $1/3$

B. 4

C. $1/2$

D. 1

Answer: B

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6. Value of $\dfrac{(0.5)^0 - (0.1)^{-1}}{\left(\dfrac{3}{4}\right)^{-1} \left(\dfrac{3}{2}\right)^3 + \left(\dfrac{-1}{3}\right)^{-2}}$ **is**

A. $3/2$

B. $-2/3$

C. $-3/2$

D. $2/3$

Answer: B

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7. Value of $\left(\left((27)^{-1}\right)^{1/3}\right)^{2}$ is equal to

A. 9

B. 3

C. 27

D. $1/9$

Answer: A

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8. Value of $\dfrac{5\sqrt{729 \times 32}}{5\sqrt{3}}$ is equal to

A. 3

B. 2

C. 6

D. 12

Answer: C

9. If $x = 4, y = -2$ and $z = 3$ then value of $(cy + yz + zx)^{x+5y+3z}$ is

A. 6

B. -6

C. 8

D. -8

Answer: D

10. Value of $\sqrt{a^2 b^2} \times 6\sqrt{a^3 b^3} \times 3\sqrt{a^6 b^6}$ **is**

A. $(ab)^{7/2}$

B. $(ab)^3$

C. $(ab)^{5/2}$

D. $(ab)^2$

Answer: A

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11. $(343)^{2/3} = 49$ **is equivalent to**

A. $\log_{49}(343) = 2/3$

B. $\log_{543} 49 = 2/3$

C. $\log_{2/3}(49) = 343$

D. $\log_{343}(2/3) = 49$

Answer: B

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12. The logarithmic expression equivalent to $\dfrac{1}{a^{3/2}} = b \, is (a > 0, a \neq 1, b < 0)$

A. $\log_b a = -3/2$

B. $\log_a(3/2) = -b$

C. $\log_a b = -3/2$

D. $\log_a(-3/2) = b$

Answer: C

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13. If $\log_2 x = \log_4 2$ **then value of x is**

A. $\dfrac{1}{2}$

B. $\sqrt{2}$

C. 4

D. $\dfrac{1}{\sqrt{2}}$

Answer: B

14. If $log_x 16 = 4$ **then value of x is**

A. 4

B. 4096

C. 2

D. 16

Answer: C

15. If $\log_{12} 9 = a$ **then** $\log_2 3$ **is equal to**

A. $\dfrac{2a}{2 - a}$

B. $\dfrac{2 - a}{2a}$

C. $2a$

D. $1 - \dfrac{2}{a}$

Answer: A

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16. If $\log \dfrac{a^2}{bc} + \log \dfrac{b^2}{ac} + \log \dfrac{c^2}{ab} = \log_2 k$ **then value of k is**

A. 0

B. 1

C. $1/2$

D. 2

Answer: B

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17. If $\log_{ab} a = 3$ then value of $\log_{ab} b$ is

A. 2

B. 3

C. -3

D. -2

Answer: D

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18. If $\log_{ab} = a = 2\log_{ab} a$ **then value of** $\log_{ab} a$ **is**

A. $1/3$

B. $2/3$

C. 1

D. $4/3$

Answer: B

19. If $\log \dfrac{P}{q} + \log \dfrac{q}{p} = \log(p+q)$ then value of $(p+q)$ is

A. 1

B. $1/2$

C. 2

D. $-1/2$

Answer: A

20. If $\dfrac{2\log x}{\log 10} = \dfrac{\log 9}{\log 3}$ **and** $\log_{y^3} 27 = 1$ **then value of**

xy is

A. $10\sqrt{3}$

B. 30

C. $3\sqrt{10}$

D. none of these

Answer: B

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21. If $\log_{10} 11 = a$ **then value** $\log_{10}\left(\dfrac{1}{110}\right)$ **is equal to**

A. $(1+a)^{-1}$

B. $-(1+a)$

C. $1+a$

D. $10a$

Answer: B

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22. The value of $(81)^{\log_5 5}$ is

A. 81

B. 5

C. $5/81$

D. 25

Answer: D

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23. If $\log 27 = 1.431$ then the value of log 81 is

A. 1.808

B. 1.708

C. 1.908

D. 2

Answer: C

24. **If** $\log \dfrac{x+y}{2} = \dfrac{1}{2}(\log x + \log y)$ **then** $(c > 0, y > 0)$

A. $x = y$

B. $x = \dfrac{y}{2}$

C. $x = 2y$

D. $x + y = 1$

Answer: A

25. The value of

$$\frac{1}{\log_{\sqrt{bc}} abc} + \frac{1}{\log_{\sqrt{ca}} abc} + \frac{1}{\log_{\sqrt{ab}} abc} \text{ is}$$

A. 2

B. $1/2$

C. $-1/2$

D. 1

Answer: D

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26. If $\log_{a^2}\left(a^2 + 1\right) = 8$ **then value of** $\log_{a^{15}}\left(a + \dfrac{1}{a}\right)$

is

    A. $\dfrac{23}{15}$

    B. $\dfrac{8}{5}$

    C. 1

    D. 25

Answer: A

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27. If m and n are whole numbers such that $m^n = 1331$ then the value of $w(m-1)^{n=1}$ is

   A. 10^3

   B. 10^4

   C. 10^{-3}

   D. 10^{-4}

Answer: B

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28. If $(a)^{\frac{\log a + 5}{3}} = (10)^{5 + \log a}$ **then value of a is (base of log is 10)**

A. 10^3

B. 10^{-3}

C. 10^4

D. 10^{-4}

Answer: A

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29. If

$$\log_2 x + \log_2 y = 2 + \log_2 3 \ \text{ and } \ \log_{16}(x + y) = 3/4$$

then the value of x can be

A. 12

B. 2

C. 4

D. 8

Answer: B

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30. Value of $\dfrac{\log_3(135)}{\log_{15}(3)} - \dfrac{\log_3(5)}{\log_{405} 3}$ **is**

A. -3

B. 3

C. 6

D. -6

Answer: B

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31. If $x = (1.5)^{10}$ **then characteristic of** $\log_{10} x$ **is (Given**

that $\log_{10} 2 = 0.301$ and $\log_{10} 3 = 0.477$**)**

A. -1

B. 0

C. 1

D. 2

Answer: C

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32. If $\log_{ab} a = b$ then value of $\log_{ab} \dfrac{3\sqrt{a}}{\sqrt{b}}$ is

A. 2

B. $9/2$

C. $5/2$

D. $1/2$

Answer: B

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33. **If** $\log 25 = a$ **and** $\log 225 = b$ **then value of** $\log\left(\dfrac{1}{9}\right)$ **is**

A. $a + b$

B. $a - b$

C. $(a - b)^2$

D. $\sqrt{a + b}$

Answer: B

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34. If $2^{\log_2 x^2} - 3^{\log_9 36} = 10$ **then e value of x is**

A. ± 4

B. ± 2

C. ± 16

D. none of these

Answer: A

35. If $x^{\log x + 4} = 343$ then value of x is (bas f log is 3)

  A. 3^{-5}

  B. 3^{-4}

  C. 9

  D. none of these

Answer: A

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36. If $\log_{10} 2 = 0.3010$ the number of digits in 2^{75} is

  A. 22

B. 24

C. 23

D. 20

Answer: C

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37. If $\log_{10} 3.456 = 0.15386$ **then the value of** $\log_{10} = 345.6$ **is**

A. 153.86

B. 15.386

C. 3.15386

D. 2.15386

Answer: D

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Olympiad And Ntse Level Exercises

1. The number $N = 6\log_{10} 31,$ lies between two successive integers whose sum is equal to

A. 5

B. 7

C. 9

D. 10

Answer: B

2. If $x = \dfrac{1}{2}\log_k b = \dfrac{1}{3}\log_b c = \dfrac{1}{4}\log_c d,$ **then** $\log_k d$ **is**

A. $6x^3$

B. $2x^3$

C. $12x^3$

D. $24x^3$

Answer: D

3. The value of $\dfrac{\log_3 135}{\log_{15} 3} - \dfrac{\log_3 5}{\log_{405} 3}$ is

A. 2

B. 3

C. 3

D. none of these

Answer: B

4. If $(4)^{\log_9 3} + (9)^{\log_2 4} = (10)^{\log_x 83}$, then x is equal to

A. 2

B. 3

C. 1

D. 30

Answer: C

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5. The value of x satisfying $\sqrt{3}^{-4+2\log\sqrt{5}^x} = \dfrac{1}{9}$ is

A. 2

B. 3

C. 4

D. none of these

Answer: D

6. If $a^4 + b^5 = 1$ then the value of $\log_a\left(a^5 b^4\right)$ equals to

A. $9/5$

B. 4

C. 5

D. $8/5$

Answer: A

7. If $\log_4 5 = a$ and $\log_5 6 = b$ **then** $\log_3$ **2 is equal to**

A. $\dfrac{1}{2a + 1}$

B. $\dfrac{1}{2b + 1}$

C. $2ab + 1$

D. $\dfrac{1}{2ab - 1}$

Answer: D

8. If $\log_{12} 2 = 1,$ **then** $\log_6$ **16 is equal to**

A. $\left(\dfrac{3 - a}{3 + a} \right)$

B. $3 \left(\dfrac{3 - a}{3 + a} \right)$

C. $4 \left(\dfrac{3 - a}{3 + a} \right)$

D. $5 \left(\dfrac{3 - a}{3 + a} \right)$

Answer: C

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9. The value of $3^{\log_4 5} - 5 \log_4^3$ **is**

A. 0

B. 1

C. 2

D. none of these

Answer: A

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10. If $2x^{\log 43} + 3^{\log_x^x} = 27,$ then x is equal to

A. 2

B. 4

C. 8

D. 16

Answer: D