

A2.A.19: Properties of Logarithms 1: Apply the properties of logarithms to rewrite logarithmic expressions in equivalent forms

- 1 The expression $\log 12$ is equivalent to
 - 1) $\log 6 + \log 6$
 - 2) $\log 3 + 2 \log 2$
 - 3) $\log 3 - 2 \log 2$
 - 4) $\log 3 \cdot \log 4$
- 2 The expression $\log 4x$ is equivalent to
 - 1) $\log x^4$
 - 2) $4 \log x$
 - 3) $\log 4 + \log x$
 - 4) $(\log 4)(\log x)$
- 3 Which expression is *not* equivalent to $\log_b 36$?
 - 1) $6 \log_b 2$
 - 2) $\log_b 9 + \log_b 4$
 - 3) $2 \log_b 6$
 - 4) $\log_b 72 - \log_b 2$
- 4 The expression $\log 4m^2$ is equivalent to
 - 1) $2(\log 4 + \log m)$
 - 2) $2 \log 4 + \log m$
 - 3) $\log 4 + 2 \log m$
 - 4) $\log 16 + 2 \log m$
- 5 If $A = \pi r^2$, $\log A$ equals
 - 1) $2 \log \pi + \log r$
 - 2) $\log \pi + 2 \log r$
 - 3) $2 \log \pi + 2 \log r$
 - 4) $2 \pi \log r$
- 6 If $2x^3 = y$, then $\log y$ equals
 - 1) $\log(2x) + \log 3$
 - 2) $3 \log(2x)$
 - 3) $3 \log 2 + 3 \log x$
 - 4) $\log 2 + 3 \log x$
- 7 If $L = \frac{x^2}{k}$, then $\log L$ is equal to
 - 1) $2 \log \frac{x}{k}$
 - 2) $2(\log x - \log k)$
 - 3) $2 \log x - \log k$
 - 4) $\frac{2 \log x}{\log k}$
- 8 The expression $\log \frac{b^3}{a}$ is equivalent to
 - 1) $3(\log b - \log a)$
 - 2) $\log 3b - \log a$
 - 3) $3 \log b - \log a$
 - 4) $\frac{3 \log b}{\log a}$
- 9 If $u = \frac{x}{y^2}$, which expression is equivalent to $\log u$?
 - 1) $\log x + 2 \log y$
 - 2) $2(\log x - \log y)$
 - 3) $2(\log x + \log y)$
 - 4) $\log x - 2 \log y$
- 10 If $T = \frac{10x^2}{y}$, then $\log T$ is equivalent to
 - 1) $(1 + 2 \log x) - \log y$
 - 2) $\log(1 + 2x) - \log y$
 - 3) $(1 - 2 \log x) + \log y$
 - 4) $2(1 - \log x) + \log y$

11 The expression $\log \sqrt{xy}$ is equivalent to

- 1) $2 \log x \log y$
- 2) $2(\log x + \log y)$
- 3) $\frac{1}{2} \log x \log y$
- 4) $\frac{1}{2} (\log x + \log y)$

12 If $x = (8^2)(\sqrt{5})$, which expression is equivalent to $\log x$?

- 1) $2 \log 8 + 2 \log 5$
- 2) $2(\log 8 + \frac{1}{2} \log 5)$
- 3) $2 \log 8 + \frac{1}{2} \log 5$
- 4) $(2 \log 8)(\frac{1}{3} \log 5)$

13 If $x = \frac{a\sqrt{b}}{c}$, then $\log x$ is equal to

- 1) $\log a + \frac{1}{2} \log b - \log c$
- 2) $\log a + 2 \log b - \log c$
- 3) $\log a - \frac{1}{2} \log b + \log c$
- 4) $\log a - 2 \log b - \log c$

14 $\text{Log} \frac{\sqrt{xy}}{z}$ is equal to

- 1) $\frac{1}{2} \log x + \frac{1}{2} \log y - \log z$
- 2) $\frac{1}{2} \log x + \log y - \log z$
- 3) $\frac{1}{2} (\log x + \log y - \log z)$
- 4) $\frac{\frac{1}{2} \log xy}{\log z}$

15 The expression $\log \frac{\sqrt{xy}}{w}$ is equivalent to

- 1) $\frac{2 \log xy}{\log w}$
- 2) $\log x + \log y - \log w$
- 3) $\frac{1}{2} (\log x + \log y) - \log w$
- 4) $\frac{1}{2} (\log xy - \log w)$

16 $\text{Log} \sqrt{\frac{a}{b}}$ is equivalent to

- 1) $\frac{1}{2} \log a - \log b$
- 2) $\frac{1}{2} (\log a - \log b)$
- 3) $\frac{1}{2} (\log a + \log b)$
- 4) $\frac{1}{2} \log a + \log b$

17 The expression $\log \left(\frac{x^n}{\sqrt{y}} \right)$ is equivalent to

- 1) $n \log x - \frac{1}{2} \log y$
- 2) $n \log x - 2 \log y$
- 3) $\log(nx) - \log \left(\frac{1}{2} y \right)$
- 4) $\log(nx) - \log(2y)$

18 The expression $\log\left(\frac{x^2y^3}{\sqrt{z}}\right)$ is equivalent to

- 1) $\frac{(2x)(3y)}{\frac{1}{2}z}$
- 2) $2\log x + 3\log y + \frac{1}{2}\log z$
- 3) $\log 2x + \log 3y - \log \frac{1}{2}z$
- 4) $2\log x + 3\log y - \frac{1}{2}\log z$

19 The expression $\log\frac{\sqrt{x^2y^3}}{z}$ is equivalent to

- 1) $\frac{1}{2}(2\log x + 3\log y - \log z)$
- 2) $\frac{1}{2}(2\log x + 3\log y) - \log z$
- 3) $2\log x + 3\log y - \log z$
- 4) $\frac{x^2y^3}{z}$

20 The expression $\log\frac{\sqrt[3]{a}}{b}$ is equivalent to

- 1) $\frac{1}{3}\log a - \log b$
- 2) $\frac{1}{3}\log(a - b)$
- 3) $3\log a - \log b$
- 4) $3\log(a - b)$

21 If $r = \sqrt[3]{\frac{A^2B}{C}}$, then $\log r$ can be represented by

- 1) $\frac{1}{6}\log A + \frac{1}{3}\log B - \log C$
- 2) $3(\log A^2 + \log B - \log C)$
- 3) $\frac{1}{3}\log(A^2 + B) - C$
- 4) $\frac{2}{3}\log A + \frac{1}{3}\log B - \frac{1}{3}\log C$

22 The equation $N = \frac{\sqrt[4]{x^2y}}{z}$ is equivalent to

- 1) $\log N = \frac{1}{4}(2\log x + \log y - \log z)$
- 2) $\log N = \frac{1}{4}(2\log x + \log y) - \log z$
- 3) $\log N = \frac{1}{4}\log 2x + \frac{1}{4}\log y - \log z$
- 4) $\log N = \frac{2}{4}\log x + \frac{1}{4}\log(y - z)$

23 The expression $\log\sqrt[4]{\frac{a^2}{b}}$ is equivalent to

- 1) $\frac{1}{4}\left(\frac{\log a^2}{\log b}\right)$
- 2) $4(\log a^2 - \log b)$
- 3) $\frac{1}{2}(4\log a - \log b)$
- 4) $\frac{1}{4}(2\log a - \log b)$

24 If $\log x^2 - \log 2a = \log 3a$, then $\log x$ expressed in terms of $\log a$ is equivalent to

- 1) $\frac{1}{2}\log 5a$
- 2) $\frac{1}{2}\log 6 + \log a$
- 3) $\log 6 + \log a$
- 4) $\log 6 + 2\log a$

25 $\text{Logcot} A$ is equivalent to

- 1) $\log \sin A + \log \cos A$
- 2) $\log \sin A - \log \cos A$
- 3) $\log \cos A + \log \sin A$
- 4) $\log \cos A - \log \sin A$

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Answer Section

1 ANS: 2 REF: 060029siii

2 ANS: 3 REF: 080022siii

3 ANS: 1 REF: 010208b

4 ANS: 3

$$\log 4m^2 = \log 4 + \log m^2 = \log 4 + 2 \log m$$

REF: 061321a2

5 ANS: 2 REF: 010220siii

6 ANS: 4

$$\log 2x^3 = \log 2 + \log x^3 = \log 2 + 3 \log x$$

REF: 061426a2

7 ANS: 3 REF: 068529siii

8 ANS: 3 REF: 060319siii

9 ANS: 4 REF: 089315siii

10 ANS: 1

$$\log T = \log \frac{10x^2}{y} = \log 10 + \log x^2 - \log y = 1 + 2 \log x - \log y$$

REF: 011615a2

11 ANS: 4 REF: 068122siii

12 ANS: 3 REF: 068918siii

13 ANS: 1 REF: 068023siii

14 ANS: 1 REF: 019025siii

15 ANS: 3 REF: 010124siii

16 ANS: 2 REF: 069519siii

17 ANS: 1 REF: 089718siii

18 ANS: 4 REF: 069917siii

19 ANS: 2 REF: 080122siii

20 ANS: 1 REF: 068821siii

21 ANS: 4 REF: 061120a2

22 ANS: 2 REF: 069420siii

23 ANS: 4 REF: 019619siii

24 ANS: 2

$$\log x^2 = \log 3a + \log 2a$$

$$2 \log x = \log 6a^2$$

$$\log x = \frac{\log 6}{2} + \frac{\log a^2}{2}$$

$$\log x = \frac{1}{2} \log 6 + \frac{2 \log a}{2}$$

$$\log x = \frac{1}{2} \log 6 + \log a$$

REF: 011224a2

25 ANS: 4

REF: 018625siii